

Fourth World Congress on Disaster Management

Volume II

Mumbai | India



Edited by
Dr S. Ananda Babu
President and Convener
DMICS-WCDM

This is the second in the series of three-volume compendium of 61 papers, presented at the Fourth World Congress on Disaster Management held in Mumbai in 2019. Authored by researchers, policy makers and practitioners, the papers cover a wide range of themes arranged around impacts of disasters and risk governance.

Dr S. Ananda Babu is a PhD from Osmania University (OU), India. He is a societal awareness specialist and scholar, an author and editor of numerous books including *Disaster Risk Reduction, Community Resilience and Responses*. In addition, Dr S. Ananda Babu is the Founder President of the Disaster Management, Initiatives and Convergence Society (DMICS) and the Convener of the World Congress on Disaster Management (WCDM) established in 2005. In the aftermath of the Indian Ocean Tsunami, to enhance understanding and awareness among people about the risk of various types, dimensions of disasters and the measures to be taken for reducing the risks, for better preparedness, response and recovery, the DMICS and the WCDM takes on the task of creating awareness through multi-disciplinary research, publications and multi-stake holder's consultations.



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Disaster Impacts and Risk Governance



Disaster Impacts and Risk Governance

Papers Presented at the Fourth World Congress on Disaster
Management, Mumbai, January 29–February 1, 2019

Edited by
Dr S. Ananda Babu
President and Convener
DMICS-WCDM



DMICS 
Disaster Management, Initiatives and Convergence Society
Envisioning a Disaster Resilient Future



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Preface

The Fourth World Congress on Disaster Management (WCDM) was organised in Mumbai from January 29 to February 1, 2019 jointly by the Government of Maharashtra, the Indian Institute of Technology Bombay, the Tata Institute of Social Sciences Mumbai and the Disaster Management Initiative and Convergence Society Hyderabad which created the platform of WCDM. Over the years WCDM has emerged as the largest biennial conference on disaster management in the developing world.

The theme of the fourth WCDM was *The Future We Want: Bridging Gaps between Promises and Action*. Nine Plenary Sessions, 62 Thematic Sessions, five Special Thematic Sessions and five Special Feature Events were organised around this overarching theme. More than 2000 participants from 68 countries attended these sessions.

While the Plenary Sessions were addressed by eminent speakers, the Special Thematic Sessions and the Special Feature Events were organised by the knowledge partners on different themes. It is the Thematic Sessions that received longest traction as Call for Papers was issued for these sessions months in advance and more than 600 researchers, practitioners and policy makers responded with abstracts of their ideas. These were reviewed by experts and 525 abstracts were selected for presentation in the 62 Thematic Sessions of the WCDM. Subsequently, 165 of these abstracts were developed as full papers. This is the second of three-volume series of compendium of these papers.

The papers have been published in the same form these were received without any peer review to provide a flavour of the raw ideas that emerged from the Thematic Sessions of the conference. Some of these papers presented by the young researchers and practitioners may not have the rigours of academic disciplines, but these do reflect the cross current of thoughts that went around in these sessions of the Conference. These provide new ideas and insights that provide value to the current discourses on the subject.

These papers have been arranged under three broad themes – first: hazard, vulnerability and risks of disasters, second: disaster impacts and risk governance, and third: technology, infrastructure and resilience of urban systems.

The present volume is a compilation of 61 papers on the theme of disaster impacts and risk governance. The papers have been arranged in ten broad sections on education, health, gender, children, disability, economy, communities, culture, risk governance and disaster recovery. Understandably the papers do not cover every aspect of the themes, these discuss only those aspects that the authors have chosen to highlight.

The Conference secretariat has brought the papers together, but the credit lies solely and exclusively with the authors.

Dr S. Anandababu
Convener
Fourth World Conference on Disaster Management

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Education and Disaster

Post-disaster Crisis in Education Sector: How Best Can We Resolve

Ashraf Al Deen^a

ABSTRACT: Focusing on the aftermath of natural disasters in Bangladesh, this paper attempts to examine the devastation it brings to the educational environment, particularly, in rural and coastal areas. In order to understand the Post-Disaster Crisis in respect of the childrens' education, the paper addresses the following question: How does the 'Formal School Education' suffer after the disaster, without having any priority in the 'Relief and Rehabilitation' works?

Key objective is to examine how a social safety net can be developed, focusing on 'Education is a Priority' slogan, through the governmental measures, and also create a Motivated Volunteer Force with the teachers, students and guardians to fight all odds. The paper aims to construct an advanced conceptual and practical understanding of issues related to natural disasters, disaster management, minimising the loss and rebuild on whatever is left, priority of education and creating the generations as volunteer forces motivated to fight disasters and odds that overshadow our development repeatedly over the years in this part of the planet.

KEYWORDS: education, social safely net, vulnerability, post disasters, relief and rehabilitation

Introduction

Natural disasters strike countries, both developed and developing, cause enormous destruction and create human sufferings, and thus leave negative impacts on national economies. Bangladesh suffers regularly and frequently from disasters like flood, cyclone storm, tidal surge, river bank erosion, drought and mountain collapse.

Bangladesh with a poor economy and a huge population is probably the most disaster-prone in the world. A slow rate of economic growth has forced a substantial part of the ever-increasing population to settle in areas too risky for human habitation. Floods destroy the traditional mud-houses and cyclones destroy the huts and non-constructed houses, particularly in the rural and coastal areas. Only shelter available for the victim families are the school buildings, thus putting the restart of the schooling of the children at risk.

Every year natural disasters occur in Bangladesh in various magnitudes and create a vulnerable situation for our community people. But we need to learn to live with it. So, can we not minimise the educational losses of our children? Can we not give education a priority in respect of relief and rehabilitation works? As a methodology, a detailed study of the effects of natural disasters, prevention of disasters, mitigation measures and state-sponsored organisational setup for disaster preparedness was undertaken. It has been found that within an institutional framework of disaster management several non-government organisations (NGOs) work for disaster preparedness alongside the government organisations. But their formal and non-formal education programmes on disaster management don't have any special attention for the disturbed environment of general education of our children. Education and awareness-building programmes for reinstalling institutional general education need wider and easier access to the people. Finally, this paper

^a NAPSIPAG; Orchid International School Dhaka

suggests creating an effective social safety net in respect of school education and recommends for governmental measures to create awareness among the population to minimise the educational losses due to disasters. People, including students and guardians, will remain prepared to challenge the odds and bring back the educational environment sooner.

Natural Disaster: A Brief Note

Disaster is a sudden adverse or unfortunate extreme event which causes great damage to human beings as well as plants and animals. Disasters occur rapidly, instantaneously and indiscriminately. These extreme events either natural or man-induced exceed the tolerable magnitude within or beyond certain time limits, make adjustment difficult, result in catastrophic losses of property and income and life is paralysed.¹ These events which occur aggravate natural environmental processes to cause disasters to human society such as sudden tectonic movements leading to earthquake and volcanic eruptions, continued dry conditions leading to prolonged droughts, floods, atmospheric disturbances, collision of celestial bodies and so on (Joshi, 2008). Disasters have always co-existed with civilisations.

The term disaster owes its origin to the French word “Desastre” which is a combination of two words “des” meaning bad and “aster” meaning star. Thus the term refers to “Bad or Evil star”. The United Nations defined “Disaster” as “A serious disruption of the functioning of a community or a society causing widespread human, material, economic and environmental losses which exceed the ability of the affected community/society to cope using its own resources”.²

Conceptual and Practical Understanding

It is important to understand that disasters have profound impact on life and everything around us including our future. We can be smart enough to do something about it. Post-disaster situation demands response and disaster relief that concerns our ability to help fellow men under trying circumstances as the result of disaster. Recovery, rehabilitation and

reconstruction are indicators of the indomitable human spirit to come back from adversity even better and stronger. In the study of the disaster management the fundamental belief is that we can do something about avoiding disasters and lessen the potential for substantial losses. The expanded scope of disaster management extends to recovery and preparing better for the next challenge.

Natural Disaster. From the very beginning “natural disaster” accompanied the human history. Even before that, in early stages of creation natural disasters occurred as God’s act. Even Big Bang was a natural disaster and a God’s act. Apart from the secrets of the “nature”, development works/activities of the human being said to have caused/enhanced natural disasters. For example, modern-day coastal development has lot to do with the 283,106 lives lost from Indian Ocean Tsunami in 2004.

Cope and Live with Natural Disasters. Disaster management has developed as a subject to help people to a) be prepared of the disasters, forthcoming with or without warning; b) cope with disasters in post-disaster situation; c) take actions to minimise the losses; and d) get back to life and to start rebuilding on whatever is left. In light of this we can be prepared and resilient to reduce the practical and virtual losses in the field of education. This can be done by strengthening the “Priority of Education” and creating a motivated volunteer force among the generations.

DM: A Discipline of Interest

Disaster Management

During the previous century, disasters emanating from natural and technological hazards have occurred with increasing frequency. Although the occurrence of such hazards has increased, deaths from them have been steadily declining worldwide. Nevertheless there has been an increase in the resulting financial impacts of such occurrences.³

Almost every year natural disasters occur in Bangladesh and have created a vulnerable situation for our community people. We know it well that nature is beyond any kind of human control. But the massive

losses caused by disasters can be minimised by proper disaster management. For this reason, disaster management has become recognised as a discipline in the world. This paper discusses the theoretical aspects, stages and approaches of disaster management, especially the regulatory framework and social work perspectives to disaster management in Bangladesh.

The Concept of Vulnerability

“When scholars discuss vulnerability, it is usually from two vintage points: disaster-proneness and insufficient capability. When discussing proneness, authors usually look at vulnerability as it relates to one’s risk of susceptibility. The other view of vulnerability is in terms of insufficient capability. This relates to an entity’s lack of capacity to mitigate, prepare for, respond to, and recover from a disaster.”⁴

Vulnerability Reduction

The ever-important question is: how does an individual, organisation, community or nation address vulnerability to disasters? The answer to this inquiry lies in two important principals⁵:

- Liability reduction (i.e., the diminution of risk and susceptibility) and
- Capacity building (i.e., augmenting of resistance and resilience)

Being proactive, we can reduce the damages in the education sector, focusing on children’s formal school education. We can do the following:

- We can develop a social safety net by involving everyone, government and public alike.
- All in the nation to be motivated on the slogan: “Education is a Priority.” For a poor country like ours, education is the prime asset we should be careful about.
- We must create a motivated volunteer force with the teachers, students and their guardians to fight all odds. Everyone in the society will join hands to show the resilience to a) get back to life immediately after the shock; b) restart the classes wherever it is: in the open, under the trees or in the broken houses after clearing the debris; c)

teachers, guardians and students all cooperate wholeheartedly to start the classes and continue the lessons.

- Systems can be developed to save the study materials of every student from destruction through water-proof, fire-proof boxes, bags or packets. This may be done individually, in group or by classes. Safe boxes/bags must be devised by the government and made readily available.

Post-disaster Educational Environment in Rural and Coastal Areas

The Picture in General

Bangladesh, a small poor country with a huge population, is probably the most disaster-prone in the world. Rapid growth in population and a slow rate of growth of the economy have forced a substantial part of the ever-increasing population to settle in areas too risky for human habitation, such as in newly emerging river-beds, called ‘Char’, and the foothills, prone to have mud-slides during monsoon. Thus a large number of new settlements in coastal areas, in river-beds (char lands) and old settlements near fluctuating rivers are all in constant threat of being destroyed or removed away by the disasters such as cyclones, tidal surges and river bank erosions. In Bangladesh every year floods destroy the traditional mud-houses and cyclones destroy the huts/non-constructed houses. The effects are catastrophic, particularly in the rural and coastal areas. Too many people become shelter less. Only shelter available for the victim families are the school buildings, thus putting the restart of the schooling of the children at risk.

Relief and Rehabilitation

After the initial onslaught of the disaster the process of ‘Relief and Rehabilitation’ starts. This is done by the state institutions, if they can survive the catastrophe and remain functional, the NGOs and the people away from the affected areas/region. During this elaborate and usually long-term operation do we give any priority to

“reopening the schools” and “reengaging the students with their lessons”? Usually the answer is “No”. The result is a huge loss in respect of education and sum total of the damages from this loss is un-measurable. It directly affects the quality of life, development of the nation and its economy. So, due priority must be given to “Education” to go back to its previous state without any delay. We have to realise that everyday’s delay adds to the national loss which is readily visible.

Post-disaster Ground Reality in South Asian Countries

In 2010, heavy monsoons led to devastating floods in Pakistan that destroyed 11,000 schools. Thousands of schools, that didn’t suffer destruction, had to be used as community shelters, preventing them from operating as classrooms. This makes the South-Asian post-disaster picture vivid that, in the immediate aftermath of climate-related events, damage to schools and infrastructure often interrupts a child’s education. This is even more devastating in countries and communities where access to educational resources is already strained. Practically, in these countries repairs to damaged/reconstruction of destroyed schools tend to be slow and delayed. The reason is: there are many works to do and resources are very limited. Research has shown an overall reduction in educational attainment, lower academic performance, and higher rates of absenteeism among children who have experienced climate shocks.⁶

Take two districts in Bangladesh where the Population Council is working to delay child marriage, which has been linked to environmental shocks and is likely to derail education for girls. Analyses show that 45 out of 96 secondary schools are in high flood risk areas. Using this information, schools and communities can develop action plans to prevent education disruption following climate shocks, such as running double shifts at unaffected schools temporarily.⁷

The effects of climate-related disasters, such as drought, appear to be less immediate or direct, but they often have significant long-term implications. Droughts destabilise the income of poorer households, many of whom are reliant on agriculture for income. So, households may take their children out of school at an

early stage to have them available to work in the formal labour market or within the household. Evidence from India, for example, shows that households in areas with high variability in agricultural production may send their daughters to get married in areas with less risk as a way to protect against household income and food shortages.⁸

What We Should Do?

We should do the following:

- Maps and models may be prepared identifying high-risk areas, which can be utilised by the countries and communities to develop strategies for emergency response and resilience building.⁹
- Motivational programmes must be undertaken to bring home the importance of education in the minds of every citizen, men and women, young and old, and schooling of the children is the only way forward for us.
- Every student should be aware and take adequate preparation to keep his or her study materials like text books, note books, writing materiel and so on. State should supply water-proof and fire-proof bags/packets to the students of, if not all, disaster-prone areas.
- During relief and rehabilitation operations, with the arrangements of food and shelter, restarting the schooling MUST start simultaneously.
- Without waiting for the school buildings to be free and ready, classes can be started on the ground without furniture under the open sky and under the trees. This requires robust mental and physical preparedness of the students, teachers and guardians. The state machinery should have the passion for it.
- Action plans can be developed to prevent education disruption following climate shocks, such as running double shifts at unaffected schools temporarily.
- Repair and reconstruction of school buildings should be given the highest priority.
- Short-term support for families with school-age children, especially girls, may be arranged to reduce the risk of more permanent schooling disruptions.

Conclusion

Bangladesh and its people have been one of the worst victims of natural disasters from time immemorial. Conversely, facing the natural disasters and learning to live with them are equally an ancient preoccupation of Bangladeshi people. Over long period of time disaster management in this part of the planet has undergone a complex process of development. While it received its impetus from concrete challenges faced at home, it also received inputs from developments, institutions and policies outside Bangladesh. In the process, Bangladesh has developed a workable system of disaster management that includes a set of mechanisms and processes, as well as a whole range of ways and means for the management of disasters. Deterioration of educational environment should be minimised through a smart preparation and overall motivation so that students go back to their books and notes without elapsing much time. Disaster and disaster management transcend and intersect national boundaries and geographical regions. Therefore, such improvement in the prevailing system of disaster management in Bangladesh could be of considerable importance to others involved in the same venture elsewhere in the world.

Recommendations

- Bangladesh Government's Act enacted to make the activities about disaster management coordinated, object oriented and strengthened and to formulate rules to build up infrastructure of effective disaster management to fight all types of disaster should include the measures to restore the education-friendly environment in the post-disaster situation.¹⁰
- School text books must include the lessons emphasising the importance of education and at the same time coping with the disasters.

- Every citizen must understand the dividends of school-closure and the fact that, the losses are so overwhelming and unending that we can't remain callous about it. We should be bold and resilient to reopen the schools to save our generations from grief of damage.

Notes

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- ² Ibid.
- ³ Misomali, Raymond and McEntire, David., Rising Disasters and Their Reversal: An Identification of Vulnerability and Ways to Reduce It, *Disaster Management Handbook*, CRC Press. Taylor and Francis Group, New York. 2008. P-23.
- ⁴ Ibid, p-20.
- ⁵ Ibid, p-30.
- ⁶ Chuang, Erica; Pinchoff, Jessie and Psaki, Stephanie., *How natural disasters undermine schooling*, The Daily Star, 01 Feb 18. Retrieved 07 January 2019, from <https://www.thedailystar.net/opinion/environment/how-natural-disasters-undermine-schooling-1527949>
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Restructuring Disaster Education in India: The Way Forward

Pragati Pandey^a

ABSTRACT: Education is the key to development. When we talk about mainstreaming disaster risk reduction into development practices, much has been discussed on how to bring this to national and local development plans and policies. While development plans are important to disaster risk reduction, real mainstreaming begins with education.

With nearly 85 per cent of the land area in India prone to disasters it is high time the younger generation is prepared to combat disasters. In a country like India where a significant part of the population falls in the school and college going age it becomes increasingly important to have an effective disaster education framework. It is considerably of more importance than building resilient infrastructure because this specific age group in the populations would lead the future and their capabilities and awareness in terms of disaster risk reduction would play a major role in combating disasters. Empowering the younger generation on the preventive aspects, the types of services to be rendered in a disaster situation and the need for humane approach should necessarily form part of the curriculum. Various instances in different parts of the world exemplify the fact that disaster education has gone a long way in mitigating the impact of severe disasters.

Disaster reduction is ultimately linked to human behaviour. The national planning, local government planning, civil society participation, interventions of donors and international agencies are all important to create the enabling atmosphere. However, within that enabling atmosphere, it is of utmost importance to generate activities at the individual level, family level, and community level. To do this, education is the primary vehicle.

Disaster preparedness has become increasingly critical to many national governments. Government of India, Ministry of Human Resource Development in its Tenth Five Year Plan also emphasised the need for integrating disaster management in the existing education system in India. One of the important initiatives includes disaster management in the curriculum of school and professional education has been recommended to the Boards.

Two key issues in Disaster Risk Reduction Education are important: Disaster education should not be an event (like an evacuation drill alone), it should rather be a process. Disaster education should break the school boundary, and be linked to the community and family. The importance of linking school education with family and community education is gradually recognised and currently practiced in some countries, engaging students in more pro-active partnership with the neighborhood.

Disasters affect different segments of the population in different ways. Although age-based vulnerabilities place children at risk, children may also offer unique capacities for bolstering disaster resilience. The paper calls for more systematic research to explore the effectiveness of disaster education initiatives in India that seeks to educate youth. Disaster management endeavour cannot go along without integrating the aspect of education into the discourse of disaster risk reduction. Once it has been achieved disaster awareness and preparedness will organically grow bottom up, creating resilient community.

KEYWORDS: disaster education, effectiveness, disaster education initiatives, mainstreaming, restructuring

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Introduction

Education is the key to development. When we talk about mainstreaming disaster risk reduction into development practices, much has been discussed on how to bring this to national and local development plans and policies. While development plans are important to disaster risk reduction, real mainstreaming begins with education.

Education plays a vital role in reducing people's vulnerability, and in enhancing their resilience to extreme events as it enables one to be prepared and to contribute fruitfully to society (Luna, 2012). This idea supported Priority for Action 3, Core Indicator 2 of the lapsed Hyogo Framework for Action (2005–2015) which resolved to use knowledge, innovation and education to build a culture of safety and resilience at all levels of society. The Hyogo Framework has been succeeded by the Sendai Framework, Priority for Action 1, Indicator 24 (I) (Kagawa & Selby, 2014) which seeks to “promote the incorporation of disaster risk knowledge, including disaster prevention, mitigation, preparedness, response, recovery and rehabilitation, in formal and informal education, as well as in civic education at all levels, as well as in professional education and training”. This is supported by UNESCO (2011) which argued that “making disaster risk reduction part of the national primary and secondary school curricula fosters awareness and a better understanding of the immediate environment in which children and their families live and work”.

Anecdotal examples of children's capacities to turn their knowledge of disasters into proactive helping strategies find their way into news articles after media-worthy events take place, such as when Tilly Smith, a young British girl, warned her family and other tourists in 2004 at Thailand's Maikhao Beach of the impending tsunami after learning about the natural phenomenon in her school geography class a few weeks prior. Children play an important role in the preparation of disasters as the education of a child has the potential to influence others in the home through sharing of information from school.

The above example shows the advantage of integrating disaster risk reduction in the school curriculum. Selby and Kagawa (2012) support this view by arguing that, “Education can be instrumental in

building knowledge, skills, and attitude necessary to prepare for and cope with disasters as well as in helping learners and the community return to normal life”. This is also supported by Wisner (2006) who believes that education, knowledge and awareness are critical to building the ability to reduce losses from natural events when they do inevitably occur. It can then be argued that it is important for countries to integrate disaster risk reduction into the primary school curriculum in order to reduce the children's vulnerability to disasters.

India, a country with diverse hypsographic and climatological conditions, 70 per cent of the cultivable land is prone to drought, 60 per cent of the land area is prone to earthquake, 12 per cent to floods, 8 per cent to cyclones, 85 per cent of the land area is vulnerable to number of natural hazards and 22 states are categorised as multi-hazards states. Tens of thousands of people are affected by these natural disasters. We have seen in the recent past that country suffered impact of earthquake even where the seismicity was low as per the seismic zoning map, as in the case of Maharashtra and droughts have occurred in the areas with highest rainfall, that is Cherrapunji in the North East. In spite of the best efforts by the governments, external assistance and available technologies and media, the 1999 super cyclone of Orissa and 2001 earthquake of Gujarat have inflicted untold misery. The socio-economic backwardness of the majority of our population, coupled with lack of skills or for mitigating, preparing for and responding to disasters, increases their vulnerability, negatively affecting their ability to respond and recover from periodic and intense disasters. The lesson learnt clearly brings out the fact that no state, no government can meet the challenges alone. The governments' efforts have to be strengthened by communities themselves getting involved in the emergency response system and being aware of the do's and don'ts to be prepared for any eventuality.

With nearly 85 per cent of the land area in India prone to disasters it is high time the younger generation is prepared to combat disasters. In a country like India where a significant part of the population falls in the school- and college-going age it becomes increasingly important to have an effective disaster education framework. It is considerably of more importance than building resilient infrastructure because this specific age group in the populations would lead the future and

their capabilities and awareness in terms of disaster risk reduction would play a major role in combating disasters. Empowering the younger generation on the preventive aspects, the types of services to be rendered in a disaster situation and the need for humane approach should necessarily form part of the curriculum. Various instances in different parts of the world exemplify the fact that disaster education has gone a long way in mitigating the impact of severe disasters.

The paper discusses the extent to which children's physical/material, social/organisational and motivational/attitudinal vulnerabilities are taken into account, as well as how children are framed, if at all, as capable actors in individual, household or community disaster resiliency efforts. The paper ends with calling for more systematic research to explore the effectiveness of disaster education initiatives that seek to educate youth.

The study is guided by the following research questions:

- What is the current scenario of disaster risk reduction education in India?
- What factors act as barrier to effective integration of DRR into the curriculum?
- How to enable effective disaster management education in schools?

A small primary-level survey was done in order to enquire about the present level and quality of disaster awareness among students in some schools and colleges of Delhi and with some school-going students in Jharkhand and based on that conclusions have been drawn.

What Is a Disaster and Disaster Risk Reduction?

Disaster is defined by Kapoor (2012) as, "A result of the combination of hazard, vulnerability and inefficient capacity or measure to reduce the potential chance of risk". This supports the definition of disaster as penned by UNISDR (2009) which argues that "Disasters are often a combination of the exposure to a hazard, the conditions of vulnerability that are present and insufficient capacity or measures to reduce or cope

with the potential negative consequences". In addition, Wisner et al. (2012) define disaster as "a situation involving a natural hazard which has consequences in terms of danger, livelihoods/economic disruption and/or casualties that are too great for the affected area and people to deal with properly on their own". Many definitions have been written on the meaning of disaster but they all point to the same issues, that there is disruption of life and that disasters occur when the effects on the communities are too great for the communities to cope using their own resources.

Disaster Risk Reduction is defined by UNISDR (2011) as, "the concept and practice of reducing disaster risks through systematic efforts to analyse and manage the causal factors of disaster, including through reduced exposure to hazards, lessened vulnerability of people and property, wise management of land and the environment and improved preparedness for adverse effects".

The Need for Child-Centred Disaster Risk Reduction Strategy

2006/2007 marked the launch of the United Nations/International Strategy for Disaster Reduction's (ISDR) *Disaster Risk Reduction Begins at School* (DRRBS) campaign, and with good cause. Children are often overlooked as a segment of the population affected by disaster events, yet the impact on this group is significant. The DRRBS campaign argues that given the direct link schools have to youth, it is imperative that school safety is ensured and that the educational mission of schools includes disaster risk reduction.

While children have been studied with respect to their psychological well-being after disaster, considerably less attention has been given to other areas of vulnerability or the extent to which children possess capacities that may make them particularly resilient to disasters. Research suggests that children's disaster responses depend largely on demographic characteristics, family closeness and characteristics of the disaster event (Vogel and Vernberg 1993). Despite youth-based vulnerability, research by Fothergill and Peek (2006) maintains that children do demonstrate the capacity to cope with disaster trauma. Their research on children impacted by Hurricane Katrina

found that children were able to talk about risk with each other and adults in their social network, and older children were more likely to openly discuss their Katrina experiences than younger children. The youth in their study used journal writing and art as forms of catharsis, and spent time with friends as a coping mechanism.

Children are typically reliant on adults for financial and material resources, may have physical limitations based on their age and may have limited ability to influence some decisions that impact their lives. We know very little, however, about the impact these vulnerability factors may have on children's lives when disaster strikes. At the same time, children are connected to a large social network and support system through their schools, and school-aged children spend much of their weekdays in an environment devoted to learning. Given the social location of children in schools, children have the potential to serve as conduits for disaster mitigation, preparedness, response and recovery information dissemination, both among their peers and to other household members. Although reducing disaster vulnerability for children requires a comprehensive approach that addresses age-based inequalities, recognising the social capacities of children in disaster education may indeed work to foster community resiliency to disasters. Much of the disaster discourse on children considers them as extensions of their mothers, referring to the vulnerability of women and children rather than considering their vulnerabilities as distinct. Finally, the dependency of youth on adults for many facets of their lives encourages a viewpoint that sees children as strictly vulnerable to external forces rather than capable actors in their own lives.

It is often said education makes the world a better place. Children's educational experience is viewed as a catalyst for change at the individual and community level. Children should be prepared as knowledgeable actors with the capacity to survive the physical impacts of disasters and participate in educating others in their community. Overall, children are presented as having a proactive attitude towards disaster reduction. Disaster education in school should demonstrate an acknowledgment of youth capacities. It should position youth as capable actors who are able to

prepare for disasters and educate others. Youth do not take a passive victim role but instead are charged with taking responsibility for steps that can mitigate the impact of a disaster.

As Anderson (2005) noted in his call for research on children and disasters, educating children about disasters could pay dividends beyond youth preparedness. Given their connection to the school system, children could potentially serve as an effective way to communicate disaster mitigation, preparedness, response and recovery information to their parents, particularly since research has suggested that higher levels of earthquake preparedness are positively correlated with the presence of children in the home (Turner et al. 1986).

Our disaster education programmes in schools should strive in varying degrees to educate young people and turn them into disaster educators. Children should be refigured as capable or with the capacities to become more capable in their own safety and the safety of others. Yet little systematic research has been conducted on the effectiveness of these or other child-targeted disaster education initiatives (particularly for specific age groups).

Disaster Risk Reduction Awareness Scenario in Indian Schools and Colleges

To study the current state of disaster risk reduction in schools the approach followed was to interview some school kids and some college-going kids in Delhi and some from Jharkhand. On having discussions with students from the government schools of Delhi it was found that the students had a high level of awareness regarding disasters. It was also conveyed that periodic drills and practical engagement related to disaster risk reduction take place. Though on further deeper engagement one can make out that this preparedness is majorly in the form of knowing correct definitions of terminologies related to disaster and how to react in which situations and the type of disaster that can occur locally or are particular to that region. There is an incomplete understanding of post-disaster management in students that is related community

participation or post-disaster stress handling or first aid.

Two key issues in Disaster Risk Reduction Education are important: Disaster education should not be an event (like an evacuation drill alone), it should rather be a process. Disaster education should break the school boundary, and be linked to the community and family. The importance of linking school education with family and community education is gradually recognised and currently practiced in some countries, engaging students in more proactive partnership with the neighbourhood.

While interacting with the students it was also observed that the disaster preparedness that they are being skilled is only limited to particular environment like the surroundings of a school. There are completely no practical efforts in direction of engaging the students with the community in which they live in. As there is no given time or place where disaster can come one has to review even the practical disaster education that we are imparting.

On interacting with the college-going students in Delhi it was surprising that the level of awareness among them is very low. It was found that at the college level not much initiatives are taken and most of the students are almost unaware of any emergency execution plan.

The most important point through my interview with the kids in the schools of Jharkhand brought out the fact that the awareness levels in these schools related to disaster still continue to remain low. Delhi government schools either by the virtue of the location and subject to various assessments regularly have imparted better disaster management education. The students in the schools of Jharkhand have particularly lower levels of awareness regarding disaster.

The problem here comes out that it is heavily dependent on the type of education quality being imparted in a school that what is the level of disaster preparedness the students will have. The level of teacher training has also seen to impact the levels of disaster risk reduction capacity that the students have.

On the one hand, these youth are vulnerable to the particular physical environment in which they live. They reside in an earthquake-prone region and

have little control over the extent to which their school facilities are indeed hazard-prone or hazard-resistant. Students are rarely involved in school district decision-making and have little influence on curriculum. Indeed, this lack of influence over what material is taught and how it is presented could foster a sense of apathy regarding the information included in disaster education programmes.

Factors Acting as Barriers to Effective Disaster Risk Reduction Preparedness of Children

It further emerged in the study that there are a number of challenges that inhibit effective integration of DRR in the curriculum in primary schools. This then means teachers find it difficult to integrate concepts of DRR during teaching. Among some of the challenges highlighted in the study include lack of resources, lack of skills to manage disasters should they happen, lack of policies and direct institutional objectives that guide the current syllabus.

Given the “huge drop-out rate” from Indian schools after grade 5 meaning that as many as half of the student bodies are not exposed in any depth to disaster themes and topics and to aspects of disaster preparedness. This speaks to grade 5 being the optimal grade for mature consideration of DRR for a substantial proportion of students and yet it is not addressed at that grade level.

Teacher attitude in choosing which chapters they will use in already overcrowded textbook compounds the problem of student access to DRR learning. Teachers decide which chapters to read with their class. Typically in a book of, say, fifteen chapters, nine or ten will be covered within the school year.

The textbook chapters listed above do not convey any sense of considered development and deepening of understanding of disaster risk through the grade levels. There is a lack of sequence and continuity to the disaster-related curriculum content grade by grade. There is no consistency and progression, no design, no elementary, intermediate and advanced knowledge steps; the same knowledge is repeated at different grades.

Another way of looking at this problem is to say that information and knowledge as conveyed by the text books are organised within the restrictive confines of traditional academic disciplines with an emphasis on what matters to each discipline. The approach is multidisciplinary, that is one of applying the lens of a variety of subjects to DRR but falling short of having students consider how the learning from each subject relates to and raises learning challenges within other subjects (Selby & Kagawa, 2012, 17).

“Teachers see the best student as the one who can remember the facts, the worst student as the one who can’t remember.” This presents a challenge to DRR curriculum in that disaster risk reduction learning not only calls for knowledge accumulation and the development of conceptual understanding but also for skills building (e.g. critical thinking, coping, self-protection and decision-making skills development) and the fostering of pro-social attitudes and dispositions in the student (e.g. cultivating responsibility for community protection and resilience). Textbook learning, a predominantly sedentary affair, is not best placed for practicing the range of skills and for actively internalising the range of attitudes and dispositions that DRR learning calls for (Selby & Kagawa, 2012, 45–52).

Enabling Effective Disaster Management Education in Schools and Linking It with the Community

Currently, less than half of the 83 nations belonging to the International Strategy for Disaster Reduction reported evidence of disaster-focused teachings in their primary and secondary education curricula (for a complete summary, see Wisner 2006). Results indicate that current school disaster education in India is lecture-based and primarily serves to raise risk perception, with less attention placed on how to implement pre-disaster measures for disaster reduction. This study suggests that future disaster education in schools should include active learning and engagement with the local community. As we consider the school as a mechanism to reach children, school attendance rates in various countries as well as the attendance of girls versus boys must be taken into account. The age that children are likely to leave school will impact where

efforts are initially made, where resources are invested and the age-appropriateness of that information.

There is a need for greater emphasis on systematisation and coordination of disaster risk reduction learning – across the curriculum, through the curriculum, between schools and teacher education institutions, between school and community

- The need to underpin the importance of government sector and agency sector working partnerships to embed disaster risk reduction in education
- The importance of promoting low-cost provision and initiatives
- The need for higher education institutions to embed disaster risk reduction in their own curricula and to contribute to curriculum development generally, including through teacher education
- The need to promote disaster risk reduction competencies amongst public officials and to provide technical training to the curriculum arm of ministries of education
- The need for greater clarity about how formal and informal disaster risk reduction learning can be complementary
- The need for concrete indicators, benchmarks and milestones so that practitioners can be clear about what they need to achieve and in what order and progression and to make achievement measurable

Project Method

School retrofits provided an opportunity to educate students about disaster risks and the benefits of mitigation. For example, schools introduced a Hazard Hunt in which the students themselves participated in risk reduction efforts at home and at school. Students can play an active role in non-structural mitigation of fixtures within the facility, an activity that can educate the youth and give them an opportunity to proactively participate in safeguarding against potential disaster situations.

The other possible solutions can be

- Age-specific disaster education programmes should be run on television, in form of animations or in form of YouTube videos in which children and

students are being shown as active participants in disaster risk reduction.

- Mandatory disaster training programmes should be run in schools, on the level of NSS and NCC.
- Disaster education should not be like drills or event, rather from the very beginning level of awareness through community participation at different levels should be raised.
- Trained personnel from the armies or retired professionals should be instilled and sent in for training in schools or in community centres.
- Interesting television programmes making students aware about the local geography of the region that they live in and also general geography around the world should be introduced.
- Teaching learning about disaster to students should also take place in different environments.
- More disaster learning centres and certificate courses should be run that encourage students to actively learn disaster risk reduction strategies.
- National and state level disaster management competitions should be organised either related to innovative ideas or even simple quiz to raise the general level of awareness.
- Students should be encouraged to take leadership roles and more empathy should be nourished in them to react in post-disaster situation
- Awareness about post-disaster situations of sexual abuse through much more engagement in post-disaster social cultural problems that may arise.
- Level of training of teachers educating disaster management should also be increased through continuous updating and trainings

Conclusion

Disaster reduction is ultimately linked to human behaviour. The national planning, local government planning, civil society participation, interventions of donors and international agencies are all important to create the enabling atmosphere. However, within that enabling atmosphere, it is of utmost importance to generate activities at the individual level, family level and community level. To do this, education is the primary vehicle.

To establish this, future research must examine the impact of youth-focused disaster education, the extent to which initiatives lead to long-term increases in knowledge and the role children can play in building community capacity and reducing community vulnerability. By doing so, we may be able to better help schools develop and select programmes that have the greatest impact in bolstering children's disaster resiliency. Greater attention to the vulnerabilities and capacities of children distinct from considerations of women must continue to move forward in the disaster field.

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Children, Education and Disaster Risk Reduction: Investing Towards a Risk-Resilient Future

Naghma Firdaus^a

ABSTRACT: As the global community moves towards implementing targets set at the Sendai Framework on Disaster Risk Reduction, there is an urgent need to reinterpret disaster risk reduction. Natural disasters and hazards increase vulnerabilities to children leading to exploitation, abuse, and neglect thereby needing special care and attention to ensure that their rights are appropriately met with.

There are three cardinal priorities that need attention with respect to making children risk resilient - firstly to ensure survival and safety of children in the aftermath of any disaster, secondly - child – centred disaster risk reduction and emergency preparedness should be prioritised with development interventions especially the ones on education should integrate elements pertaining to child centric disaster preparedness. Concerted efforts are required in addressing the safety of children in a more inclusive and holistic manner in the policy sphere and school safety needs integration and mainstreaming in the existing government schemes and programmes.

In the national context, our national policy instruments, the National Policy on Children (2013), the Disaster Management Act (2005), the National Policy on Disaster Management (2009) and the Right to Education (2009) reinforce the concept of safe, secure and risk free education. This highlights the urgent need to ensure that schools are less vulnerable to disasters/emergencies and better prepared to bounce back and children return to learning as soon as possible. The National Disaster Management Guidelines on School Safety Policy formulated by NDMA in 2016 presents a detailed perspective into the various safety measures that need to be taken to strengthen school safety and disaster preparedness right from the National Level to local levels.

Investments in education, and particularly in female education, have been shown to reduce vulnerability and should therefore be included as a core strategic investment in disaster risk reduction. Evidence reflects that preparedness drills and simulation activities in schools make important contributions to risk awareness, particularly amongst children and youth.

The “National School Safety Programme (NSSP)” implemented by NDMA in partnership with the State/UT Governments has been successfully implemented in 8600 schools in each of the selected 43 districts spread over 22 States/UTs of the country falling in seismic zone IV & V. The article will further look into/dwell upon the various national, regional (state) and local efforts like NSSP undertaken in the country during the last few decades which have contributed towards addressing matters on school safety and disaster preparedness and will examine as well as identify the good practices and lessons learnt in the domain.

The article will attempt to put forward the existing challenges, areas for concerted action as well as the methodologies that could be deployed to address school safety and disaster preparedness in the national context. Children have their own perspective on how to reduce the effects of disasters on their communities and are helping to put to practice their ideas on how to solve these problems.

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KEYWORDS: vulnerabilities, child-centred disaster risk, education, disaster risk reduction, strategic investment

Introduction/Background

We live in a world that is increasingly affected by disaster events. Recent decades have seen significant growth in the number of reported disasters. “Between 1998 and 2017, climate-related and geophysical disasters killed 1.3 million people and left a further 4.4 billion injured, homeless, displaced or in need of emergency assistance. While the majority of fatalities were due to geophysical events, mostly earthquakes and tsunamis, 91 per cent of all disasters were caused by floods, storms, droughts, heatwaves and other extreme weather events. For the said period, disaster-hit countries experienced direct economic losses valued at US\$ 2,908 billion, of which climate-related disasters caused US\$ 2,245 billion or 77 per cent of the total. This is up from 68 per cent (US\$ 895 billion) of losses (US\$ 1,313 billion) reported between 1978 and 1997. Overall, reported losses from extreme weather events rose by 151 per cent between these two 20-year periods” (*Source: Economic losses, poverty & disasters: 1998–2017-CRED, UNISDR*).

Weather-related disasters are becoming increasingly frequent on account of a sustained rise in the numbers of floods and storms. Flooding alone accounted for 47 per cent of all weather-related disasters (1995–2015), affecting 2.3 billion people, the majority of whom (95 per cent) live in Asia. While less frequent than flooding, storms were the most deadly type of weather-related disaster, killing more than 242,000 people in the past 21 years; that is 40 per cent of the global total for all weather-related disasters. The vast majority of these deaths (89 per cent) occurred in lower-income countries, even though they experienced just 26 per cent of all storms (*Source: The Human Cost of Weather related Disasters 1995–2015, CRED, UNISDR*).

As enunciated above, besides mortality and displacement at significant scale, disasters particularly lead to negative impacts on health, education, nutrition and morbidity. As the global community moves towards implementing targets set at the Sendai Framework on Disaster Risk Reduction, there

is an urgent need to reinterpret disaster risk reduction so that it weaves and flows through development as a set of mutually supportive approaches and practices. Without effective disaster risk management, sustainable development will not be sustainable enough and achieving sustainable development goals would only be a wishful dream.

The Year That Was – “2018”

2018 itself saw some of the deadliest disasters across the world, killing thousands and displacing millions of people right from Japan to California (USA) and from Indonesia to Kerala (India).

- California fire, November 2018: The deadliest and most destructive fire in California’s history killed at least 85 people.
- Papua New Guinea was hit by an earthquake with a magnitude of 7.5 in February, 2018, that killed at least 160 people, leaving injured in thousands.
- North Korea floods: Heavy rains that began on August 28 led to severe flooding in North Korea and killed at least 76 people. The heavy rains triggered large-scale flooding and landslides in low-lying areas, destroying more than 800 buildings including homes, clinics and schools in North and South Hwanghae provinces.
- Pakistan heat wave: One of Pakistan’s most biggest cities, Karachi was in the grip of a heatwave in May 2018, that left at least 65 people dead.
- Nigeria floods: 199 people died in Nigeria due to the large-scale flooding in August-September this year in which more than 1000 other people were also injured.
- Japan floods: In late June through mid-July 2018, successive heavy downpour in southwestern Japan resulted in widespread, devastating floods and mudflows resulting in the death of at least 225 people.
- Kerala Floods 2018: Due to unusually high rainfall during the monsoon season, Kerala witnessed the worst floods in August in nearly a century that killed over 400 people and many missing. Broad state

government's estimates reflect that Kerala suffered a loss of Rs. 31,000 crores during the floods. More than one million of Kerala's 35 million people were forced to abandon their homes and take shelter in relief camps.

- **Guatemala Volcano:** Guatemala witnessed several volcanic eruptions this year, the latest one in November after the authorities declared a red alert and evacuated around 4000 people for the fifth time in 2018.
- **Indonesia earthquake:** Indonesia was rocked by a series of earthquakes this year, the strongest of those was a magnitude of 6.9 on August 5. More than 500 people were killed and nearly 1500 were injured in the quakes. On December 23, a tsunami killed at least 373 people on the Indonesian islands of Java and injured hundreds following an underwater landslide caused by a volcanic eruption. A 7.5 magnitude earthquake struck Indonesia's Central Sulawesi province on September 28, 2018, triggering a tsunami and landslides that caused widespread destruction and loss of life. More than 2000 people are known to have died and 4400 were seriously injured, according to the Indonesian disaster management agency.

Impact of Disasters on Children

Disasters have a differentiated impact on different groups as on account of certain intrinsic vulnerabilities, some groups are more susceptible to the adverse impacts of disasters than others. Children represent one of the most vulnerable groups to these adverse impacts. Their vulnerability emanates from unique stage of physical, mental and social development along with their dependence on parents and other care givers during emergencies/disasters.

Natural disasters and hazards increase vulnerabilities of children leading to exploitation, abuse and neglect thereby needing special care and attention to ensure that their rights are appropriately met with. The loss of precious lives including children and the damage to educational assets in Gujarat in 2001, Thailand in 2004, Muzaffarabad in 2005 constantly remind us to address child risk resilience in a more focussed and integrated manner. With

respect to the Nepal earthquake (2015), post-disaster need assessment reveals that educational services were severely disrupted; there has been increase in the number of out-of-school children and in the number of children with disabilities/injuries as well. Natural disasters are one of the key factors inhibiting school attendance of approximately 57 million school children. In particular, those who are displaced from their homes often find it difficult to get back to school in a timely way. For example, the 2008 earthquake in Sichuan, China, caused severe structural damage to more than 6500 school buildings and took the lives of 10,000 children. The 2010 floods in Pakistan affected 1.8 million children and more than 8600 schools were fully or partially damaged. The Bhuj earthquake led to the death of 971 students and 31 teachers. In addition, 1884 school buildings collapsed, 5950 classrooms were lost, 11,761 school buildings suffered major to minor damages leading to additional 36,584 classrooms becoming unfit for holding school lessons. Therefore, children and youth suffer physically particularly when they are in structures, such as schools or homes that collapse or are badly damaged or destroyed. One of the earliest examples on record of this was the "Children's Blizzard" in 1888 in the Midwestern United States. The fierce storm engulfed the children as they walked home from school or as they took shelter in poorly constructed schools; many children died or lost their limbs (Laskin, 2004). In the almost 131 years since then, there have been numerous accounts of children losing lives in their poorly constructed schools. The statistics that have emerged from many disasters are staggering. The earthquake in China in 2008, for example, killed 10,000 children, and many of them were in their schools that collapsed, most likely due to poor construction (Wong, 2008).

According to a report titled *Safe Schools: The Hidden Crisis (2018)* within two years, there will be an estimated 550 million children of school and pre-school age (3–18), living across 64 countries, whose education is under threat from war, endemic high violence, or environmental threats. By 2030, this number will rise to 622 million — nearly a third of all children that will be alive at that point. The projections are grim: nearly a quarter of these children (22 per cent) will not complete primary school, over half (54 per cent) will

not complete secondary school, and three-quarters (75 per cent) will fail to meet basic learning outcomes in literacy and maths. This translates to three of every four young people in countries affected by conflict, violence and emergency unequipped with the skills to participate fully in society and the economy.

Disasters also leave children particularly vulnerable to exploitation. Past research has revealed that the morbidity and mortality rates for female children in disaster situations are often higher than for boys in developing countries. This is often the result of discrimination towards females. Children in developing countries, especially the poorest children, appear to be the most vulnerable to death and injury. Children with disabilities are also seen as being more at risk to the physical impacts of disasters as they are unable to take many of the necessary protective actions. Any disruption in a child's education can have a lasting impact and delay development. In the long run, this means a child will struggle to fully realise his or her full potential, which has consequences for the whole of society.

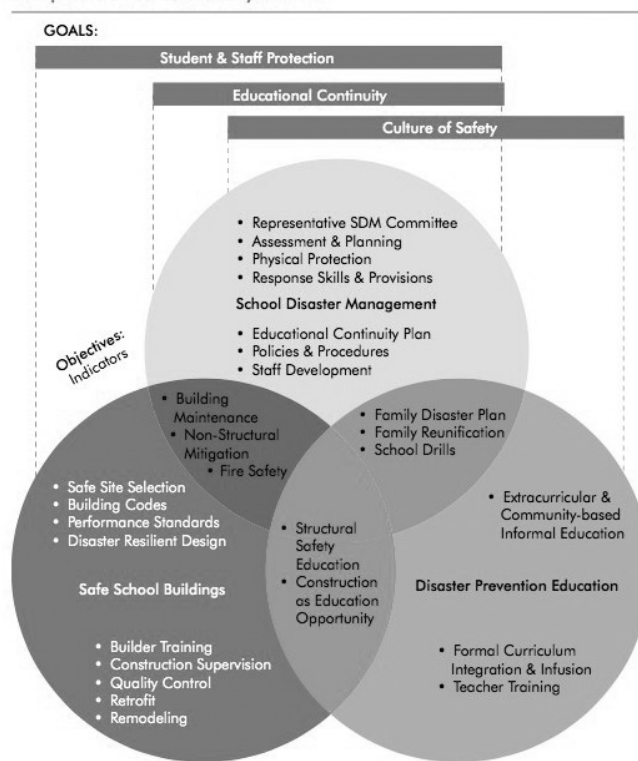
Comprehensive School Safety: A Perspective Watch

There are three cardinal priorities that need attention with respect to making children risk resilient – firstly to ensure survival and safety of children in the aftermath of any disaster, secondly child centred disaster risk reduction and emergency preparedness should be prioritised with development interventions especially the ones on education should integrate elements pertaining to child centric disaster preparedness. Thirdly, children should be involved in the process of disaster risk reduction.

School safety and educational continuity are a dynamic, continuous process which involves students, teachers, school administration, parents, civil administration and the local community. School disaster management involves the familiar cycle of steps: *assess* hazards, vulnerabilities, capacities and resources; *plan and implement* for physical risk reduction, maintenance of safe facilities, standard operating procedures and training for disaster response; *test* mitigation and preparedness plans and

skills regularly, with realistic simulation drills; and *revise* plan based on experience.

Comprehensive School Safety Schema



(Source: Disaster & Emergency Preparedness; Guidance for Schools- IFC, World Bank Group)

The full scope of activities is detailed as follows:

- **Assessment and planning** – establishing or empowering school disaster management committee; assessing risks, hazards, vulnerabilities and capacities; making contingency plans for educational continuity; communicating plan to stakeholders.
- **Physical and environmental protection** – structural safety maintenance including retrofitting, non-structural mitigation; local infrastructure and environmental mitigation; fire safety.
- **Response capacity development** – standard operating procedures; response skills and organisation; response provisions.
- **Practicing, monitoring and improving** – holding simulation drills to practice, reflect upon and update school DM plan; monitoring indicators for school disaster management.

Both the Sustainable Development Goals (SDGs) and Sendai Framework for Disaster Risk Reduction (SFDRR) promote/advocate/focus on risk reduction and risk resilience in the education sector. The task ahead lies in translation of these into action in entirety and timely implementation of focused efforts in this direction.

Education, and in particular formal school education, is a strong foundation enabling individuals to understand disaster risk. Adapted curricula can support a significant improvement in risk awareness. Investments in education, and particularly in female education, have been shown to reduce vulnerability and should therefore be included as a core strategic investment in disaster risk reduction. Recent studies comparing national education levels with mortality risk show that countries with higher education levels, particularly amongst women and girls, exhibit lower mortality from disasters. Therefore, we must integrate and mainstream the disaster and climate risk lens into our formal education system.

Since the last decade, an abundance of educational materials in the form of guidelines, teacher's guides, school safety guides and curriculum reform guides have been produced in various languages. However, the content and quality of educational materials on disaster risk reduction have not been seriously reviewed, and the uptake of the available materials by educational institutions has not been consistently monitored. Therefore, there is an urgent need to review the materials and improvise them from the disaster risk lens most importantly from a practical perspective.

Evidence reflects that preparedness drills and simulation activities in schools make important contributions to risk awareness, particularly amongst children and youth. Children's engagement in school disaster management, including risk assessment and active problem-solving, lays the foundation for critical thinking and promotes an increasing willingness to take on other challenges. Involving children has wider benefits. Children become ambassadors of safety. They take home what they learn in school and ask their parents to take actions to promote safety thus spreading awareness in their communities. Therefore, there should be more and regular investment in capacity building, skill building and preparedness drills in schools and community set ups involving children.

The urban context cannot be overlooked especially with reference to children in disaster situations. A large number of municipal and privately managed schools operate in various urban centres, many of which are built in congested areas and are exposed to various hazards. Inadequacies in the structure and lack of preparedness measures can have disastrous consequences especially in the event of an earthquake. We have witnessed this in Bhuj and Muzaffarabad. Interventions both structural as well as non-structural, to reduce vulnerabilities, thus become very important for schools and should be accorded top priority.

School Safety: The Case of Japan

Nearly 100 per cent of schools in Japan are now earthquake-safe, up from 42.5 per cent in 2002. Strong political will, technical guidance, engineering solutions, financing options and availability of data have made this progress possible. In Japan, making schools earthquake-resistant has been a long-time effort of both the Ministry of Education, Culture, Sports, Science and Technology (MEXT) and local governments. Municipal governments have managerial and financial responsibility for making school facilities safe; but they rely on standardised guidance and financial subsidies from MEXT and prefectural governments. Under the Program for Earthquake-Resistant School Buildings, MEXT sets policies, arranges financial schemes and provides technical guidance in the design phase, while municipalities develop plans for implementing school retrofitting and realise them with the support of prefectural governments and the national government. Safe school sites in Japan are selected through risk assessments geared at ensuring that schools are disaster-proofed and multi-hazard resilient. Students, teachers, parents and communities are involved in learning about disaster risk as well as practicing early warning simulation drills and evacuation for expected and recurring disasters. Japan also deploys varied use of Information, Communication and Technology (ICT) tools and related innovative solutions in disaster education which are focussed on enhancing the learning curve of school children on disaster preparedness and risk reduction.

Example: DRR education and the efforts of the teachers/senior students saved the lives of more than 3000 students in Kamaishi, Japan, when it was hit by a massive tsunami in 2011. Immediately after the magnitude 9.0 earthquake struck, the students of Kamaishi East Junior High School ran out of the school to higher ground. Their quick response prompted the children and teachers of the neighbouring Unosumai Elementary School to follow, and consequently drew in many local residents. As they continued to run, older students supported the younger children, and together they reached a safe location, while behind them the mega-tsunami swallowed their schools and the town. More than 1000 lives in the city were lost due to the disaster, but only five of them were school-age children, and they weren't at school when the quake hit.

Safety of Children: The National Context

India houses more than 15 lakh schools in the country. (15,168,65 as per Educational Statistics at a Glance - MHRD, GOI, 2016). Children represent around 39 per cent of the total population of the country.

We as a nation continue to be at high risk of damage from natural disasters including climate change. Over the last decade, China, USA, Philippines, Indonesia and India constitute together the top five countries that are most frequently hit by natural disasters. As per the estimates from the Centre for Research on Epidemiology of Disaster (CRED), between 2013 and 2015, more than 20 million people in India were affected by various natural disasters in India, such as flood, drought, cyclone and earthquake, causing a damage of approximately 25 million US dollars (approximately 1700 million Rupees). Rapid climate change has also affected the agrarian economy causing agrarian distress which has impacted not only nutrition but also the overall well-being of affected population, especially children. Man-made disasters also pose a serious concern in an already disaster-prone environment. It is estimated that a large proportion of the affected population in the aftermath of disaster would be children as they face multiple protection and health risks. Therefore, they need to be given special

focus in terms of securing their safety, security and well-being (NPAC-2016, MWCD, GOI).

Few past glaring examples of the impact of disasters on children in the country are as summarised below.

A fire led to the death of about 200 children at the prize-giving ceremony at a school in Dabwali, Haryana, in 1995; a total of 31 teachers died and 95 were injured. The 2001 Gujarat earthquake led to destruction/damage of over 11,761 schools; 971 students died and 1051 were injured. The fire at Lord Krishna School in Kumbakonam, Tamil Nadu caused death of 94 children. Huge numbers of students and teachers were impacted in South India in the aftermath of the 2004 Tsunami. Limited awareness and understanding of school safety concept, lack of capacity to deal with emergency situations, poor quality of construction, lack of disaster resilient features and poor maintenance of schools are perhaps some of the major reasons leading to significant impact on children during disaster times in our context. It is important to note that schools are spaces where children and teachers spend a large part of their day. Therefore, the quality of these spaces has a bearing on their vulnerability to disaster risk.

Efforts on School Safety in India

The School Safety Agenda, as visible in the country today, finds its origin in the efforts of different governments in the country to promote the constitutional mandate of providing access to free and compulsory education for all children up to the age of 14 years. This was followed up in the National Policy of Education (NPE) and the Programme of Action (POA) 1992 that led to a number of schemes and programmes including Operation Blackboard (OB); Non Formal Education (NFE); Teacher Education (TE); Mahila Samakhya (MS); State-specific Basic Education Projects and the Sarva Shiksha Abhiyan (SSA). The SSA Framework for Implementation was revised in light of the RTE Act and a dedicated chapter on School Infrastructure was provided. The chapter clearly brought out the need and importance of Disaster Resistance in Schools and also gave norms and codes to be referred. And this continues to feature in the current Samagra Shiksha Abhiyan – an overarching programme for the school education sector extending from pre-school to class

12 prepared with the broader goal of improving school effectiveness measured in terms of equal opportunities for schooling and equitable learning outcomes. It subsumes the three Schemes of Sarva Shiksha Abhiyan (SSA), Rashtriya Madhyamik Shiksha Abhiyan (RMSA) and Teacher Education (TE) (effective 2018).

The GoI-UNDP Disaster Risk Management Programme (DRM) launched in 2002 included a component on school safety; in order to generate awareness among students and teachers on how to respond to disasters. Under this component, school-level disaster management plans were developed and capacity enhancement programmes including mock-drills were conducted for school community. Trainings were conducted for teachers, school managers and education department officials from Central and State Boards of Secondary Education. In total, 125,817 teachers were trained on disaster management at the district level. The programme reached out to 4105 schools with 130,000 enrolled children (Source: UNDP, 2007).

Simultaneously some states have taken forward the school safety agenda by undertaking state-specific school safety programmes like Gujarat, Assam, Tamil Nadu as well as the work of UN Entities and NGOs in the country have provided important insights and lessons in developing the functional aspects of the school safety agenda.

Therefore, school safety agenda has evolved over the years in the country. What initially was seen as a simple provision of (child-friendly) classrooms to protect children from the elements so that their education progresses uninterrupted, expanded to look at structural safety, non-structural mitigation as well as capacity building of the larger school community for promoting safety.

National Policy Instruments

In the national context, our national policy instruments, the Disaster Management Act (2005), the National Policy on Disaster Management (2009), the Right to Education (2009), the National Policy on Children (2013) and the National Plan of Action for Children (2016), reinforce the concept of safe, secure and risk free education. The

2009 Right to Education (RTE) Act of GOI prescribes that each child in India must have access to schooling for 200–220 days in a year. This highlights the urgent need to ensure that schools are less vulnerable to disasters/emergencies and better prepared to bounce back and children return to learning as soon as possible. The National Disaster Management Guidelines on School Safety Policy formulated by NDMA in 2016 presents a detailed perspective into the various safety measures that need to be taken to strengthen school safety and disaster preparedness right from the national level to local levels. These guidelines spell out the roles and responsibilities of different stakeholders for preparing plans, developing capacity, incorporating disaster risk reduction in syllabus and improving coordination and synergy at all levels from a school safety and disaster preparedness lens.

Disaster Management in Curriculum

Disaster Management was introduced as a subject in the Central Board school curriculum, as well as several State Education Boards. National Council of Educational Research and Training (NCERT) has incorporated the contents related to disasters and disaster management in the Social Science and Science textbooks for the classes VI to XII in the form of text and visuals. The National Curriculum Framework (NCF) developed by NCERT sets the guidelines and direction for the development of syllabi and textbooks at all the school stages. State Council of Educational Research and Training (SCERTs) and State Education Boards either adopt or adapt NCERT's model syllabi and textbooks or develop their own syllabi and textbooks based on NCF. Further, Disaster Management has been introduced as a subject in classes VIII-X as a part of Social Sciences syllabus of the Central Board of Secondary Education (CBSE) and as a part of Geography and Sociology in class XI. CBSE has also brought out textbooks on the topics of disaster management for each of the classes VIII, IX, X and XI. The National Policy on Disaster Management 2009 provides, inter alia that the subject of Disaster Management, in the curriculum of CBSE, will be extended to all Schools through their Secondary Education Boards. It further provides that State

Governments will also ensure the inclusion of disaster management curriculum through State School Boards.

National School Safety Programme: A Pilot Initiative of GOI

GOI through National Disaster Management Authority (NDMA) has implemented the “National School Safety Programme (NSSP)” in 8600 schools in each of the selected 43 districts spread over 22 States/UTs of the country falling in seismic zone IV & V which is an endeavour to bring national spotlight on Children’s safety and disaster risk reduction. Under the project, there has been development of Teachers’ Training Module on School Disaster Preparedness as well as generation of standard IEC Material on school safety and risk reduction especially for children. Teachers, School Staff, Officials of District Administration, community members including parents and children have been sensitised on different aspects of safety and disaster preparedness. Teachers have been trained as master trainers in each of the project districts under the project. School disaster management plans have been formulated and mock drills have been conducted in these schools. Nonstructural measures and demonstrative structural retrofitting in one model secondary school in each district are also part of the programme. Following the impactful experience of the pilot project, some of the states have up-scaled the initiative to reach to other districts in their respective jurisdiction as well.

NSSP: Strengths and Lessons Learnt

The strength of the initiative included large scale sensitisation, awareness generation and capacity building on school safety in all the project states and some of these states like HP, Gujarat, Tripura and Bihar have up-scaled the effort to reach to all the districts of the state. Some of the lessons learnt included that as a pilot project, the project implementation period was very less (2 years) to complete all the designated activities. There was lack of flexibility to utilise funds as per the local needs of the target State/district. Funds were not sufficient for certain components. Instructions

were issued late to the schools from the Directorate of School Education for implementation of the project. There was lack of dedicated staff to steer the project milestones at the national and state level. Dedicated training component for children was not included in the pilot project.

Good Practices from the Field – Snapshot from Few States: Assam

- Regular mock drill by schools
- Regular DM Plan preparation and up-dation by schools
- Colour Coded Multi-hazard Risk Index Map of School Buildings for easy visual quantification of risk
- Identification of Retrofitting solutions for highly vulnerable school buildings - both generic & case specific-has led the Administrative Govt. Department to device a roadmap for Risk Reduction in terms of Replacement/Retrofitting of the highly vulnerable school buildings.
- Students follow the earthquake safety procedures in the event of any such tremors (while in school or at home)

Tripura

- NSSP up-scaled to cover all the districts of the State from State’s own resources.
- School Disaster Management Plans (SDMP) are being reviewed and updated annually.
- Policy decision taken to conduct school safety evacuation drills in every school on every 3rd Saturday of every month (notification issued from School Education Department)
- State Government has developed and printed 4 types of training modules in local language as well as 10000 posters, 5000 story books and video documentaries in Bengali language which are regularly being used in schools.
- PWD is undertaking regular structural and non-structural mitigation reviews and measures for the schools.
- School students are being recognised for displaying bravery

Himachal Pradesh

- NSSP - up-scaled to cover all districts by HPSDMA through State Council of Education, Research and Training(SCERT) and Government College of Teacher Education(GCTE) from State Funds.
- Observance of 4th April as State-wide School Safety Day in the wake of Kangra earthquake anniversary
- “SAMARTH” being conducted every year for two weeks in April for conducting mock drills/ awareness campaigns in all Schools of the State

Nagaland

- Conduction of RVS of schools in other districts out of State's own resources.
- Revision of School Curriculum to integrate DRR
- Development of DRR Manual for kindergarten and elementary schools.
- Innovative IEC material on DRM

Sikkim

- Teachers' handbook on disaster management from class IV to VIII prepared & distributed as well as incorporated in school curriculum
- Regular trainings on school safety, disaster management, evacuation and mock drills to teachers through the District Institute of Education and Training, Gangtok
- Training on Rapid Visual Survey and Non Structural Mitigation measures imparted to teachers and students have been beneficial not only for school safety but also for checking the safety of homes/ houses within the community.
- The Disaster Safety Handbook distributed across the State which has raised significant awareness in the community on disaster management and risk preparedness

Uttarakhand

- Rapid visual screening of all lifeline buildings including schools

- Disaster management included in the curriculum of school education till class X.
- June 17 has been declared as Disaster Mitigation and Preparedness Day where awareness and capacity building programmes are organised across the State involving school children.
- SDRF resources are being utilised for the conduct of awareness programmes in the schools
- GIS based inventory of all the schools in the State

Time Bound Implementation of the National Guidelines on School Safety Policy:

The National Disaster Management Guidelines on School Safety Policy were issued and circulated by NDMA in February 2016. The Hon'ble Supreme Court of India has directed time-bound implementation of the said guidelines. The Hon'ble Court has directed for the following:

- District Disaster Management Authority to ensure and monitor compliance of the said Guidelines
- District Education Officer of each District to be a “Nodal officer” with responsibility, liability and obligation as well as powers and functions to ensure strict compliance with the Guidelines within the district of his jurisdiction.
- Quarterly compliance reports from the Chief Secretary to MHRD and NDMA on the actions taken.
- Joint Monitoring Committee consisting of representation of both Department of School Education & Literacy, Ministry of HRD and NDMA

Department of School Education & Literacy, MHRD and NDMA are jointly monitoring the time-bound implementation of the said guidelines by States/UTs through a National Joint Monitoring Committee(NJMC) at the national level.

The set of actions being given prime focus with respect to quarterly monitoring include the following:

- Before granting recognition or affiliation to schools, the State Governments and UTs shall ensure that the buildings are safe and secure and are constructed according to safety norms as per National Building Code.

- Installation and maintenance of fire extinguishers in all existing government and private school buildings needs to be ensured including necessary training to stakeholders to use these equipment.
- Non-structural measures including safe storage of inflammable and toxic material (laboratory purpose)
- Preparation of School Disaster Management Plan
- Conduction of periodic mock drills in the schools
- Safety audits of school buildings including structural and non-structural aspects at periodic intervals. Safety certificate to be issued at regular intervals based on periodic inspection and compliance of the safety measures
- Disaster management to be adequately included in the curriculum
- Capacity building of teachers, staff and students on school safety and disaster preparedness

Way Forward to Strengthen the School Safety Agenda in the Country

Few Recommendations

(a) All-Hazard Approach

School Safety efforts need to take into consideration all kinds of hazards that may affect the well-being of children. These may include natural hazards such as floods and earthquakes as well as manmade hazards. Hazards include structural and nonstructural factors. Safety of children, their teachers and parents needs to be approached in a holistic manner to include visible as well as invisible risks that may be sudden on-set or have built-up slowly over a period of time.

(b) Time -Bound Implementation of National Disaster Management

Guidelines on School Safety Policy

The Hon'ble Supreme Court of India has directed time-bound implementation of the said guidelines and the States have started to send compliance reports on the same. The process has just begun and it would be critical to have constant and consistent monitoring to review the status of implementation on the ground.

(c) Mainstreaming School Safety in Existing Government Schemes & Programmes

Concerted efforts are required in addressing the safety of children in a more inclusive and holistic manner in the policy sphere and school safety needs integration and mainstreaming in the existing government schemes and programmes. Therefore, it is imperative that the existing institutions at the national and local levels are strengthened and capacitated to take responsibility of school safety planning and action. Such a step will not only ensure that development policies and programmes are strengthened but also provide the necessary succour to safety actions. The Nodal Ministries (MHRD, MWCD, MHA) and the nodal DM institutions should integrate efforts to ensure that school safety is mainstreamed in the existing government interventions.

(d) School Safety as an Indicator of Quality for Planning, Execution and Monitoring

School Safety is not a onetime effort but a continuous process. Safety principles need to be incorporated in the day to day functioning of the schools in the country, cutting across the traditional stages of the disaster cycle: preparedness, response and recovery. Thus, institutions involved in providing education in the country need to evolve a methodology and an approach of their own that looks at safety as a continuously monitored indicator of quality.

(e) Leadership of State Education Department

The State Education Authorities need to take the lead in collaboration with State SDMA to ensure that each school in their jurisdiction is safe and risk resilient.

(f) Integrating Disaster Management in Curriculum

Central Board of Secondary Education, State Boards of Secondary Education (SCERT), and other institutions involved in curriculum development need to include age appropriate theoretical as well as practical knowledge on risk of disasters, nationally and specifically about their own state. It would also

be important to strengthen the technical capacities of SCERTs and DIETs on school safety and disaster management which can aide the process of faster dissemination at the grassroots.

Children: Agents of Change

Although we often think of children and youth as vulnerable when disasters strike - and in many places they are - we often ignore their potential to be agents of change. Children have their own perspective on how to reduce the effects of disasters on their communities and are helping to put to practice their ideas on how to solve these problems. Listening to their views and perspectives is an opportunity we can't afford to miss. Today's children and youth are the generation who will inherit the legacy of our actions and so their involvement is a crucial first step to ensure that actions to reduce risks are not only effective but sustainable for years to come. These children in turn can further educate their community and help establish the link between the school and the community thereby ensuring participation of the entire community in better school development planning, community development and effective disaster preparedness and response.

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Resilient Universities for Resilient Communities

Jeremy Collymore^a

ABSTRACT: Globally, and especially in Small Island Developing States where a disaster can impact the whole of economy and society, there is an increasing call for universities to become a more vocal and active player in the development discourse. In particular, there is an urgent need to find solutions for minimising the dislocation and setback to regional economies and societies resulting from hazard impacts and other exogenous shocks. This paper poses two questions to be addressed. What role can the universities play in championing a culture of resilience? What are the institutional processes, practices and policies that need to be changed?

There is a clear role for higher education institutions in adapting to a changing climate. Higher education institutions have a unique and critical role to play in preparing society through the integration of research, teaching, and action. Colleges and Universities are ideal for experimenting with and modelling solutions while also improving knowledge, design, and technology for future applications.

Resilience is the ability of a system or community to survive disruption and to anticipate, adapt, and flourish in the face of change (UNISDR 2009). The important components of this are that it incorporates both short-term disruption and long-term trends; there is understanding and anticipating, as much as we can, the challenges and opportunities, and recognising that resilience is not just about survival and bouncing back, but about being able to thrive. The key concept in resilience is that in an era of change, it is critical to develop adaptive capacity.

This paper examines efforts at the University of the West Indies to embrace a whole of institution resilience initiative and its collaborative efforts to promote this within the Caribbean and beyond within the umbrella of the Association of Commonwealth Universities. It examines the implications for governance, duty of care, minimising of disruption to services and revenue. A reflection on the critical next steps is presented with propositions for a framework and programme for Resilient Universities Championing Resilient Development.

KEYWORDS: resilience, higher education institutions, small island and developing states

Introduction

The role of higher education institutions in informing the development pathways has been the subject of much discussion. The realisation of the consequences of climate change and variability, other environmental and social challenges to our global space (OECD) has reinforced the call for structured and collaborative HEI involvement in providing the academic leadership essential to the delivery of sustainable and resilient

development (Sustainable Universities Declaration; Commonwealth 2018; CARICOM 2015).

In Small Island Developing States (SIDS) and Low Lying Coastal Developing States (LLCDS), like those in the Caribbean, South Pacific and Indian Ocean, HEIs absorb a significant percentage of national budgets. At the same time they are usually the largest single reservoir of researchers and thought leadership that can be centred on the challenges to community and economy posed by climate change and variability (IPCC 2018).

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Indeed, the threat to the SIDS can be characterised as existential (Glasser 2017).

Against the backdrop of the 2017 Hurricanes in the Caribbean and South Pacific this paper proffers a value proposition for HEI leadership and collaboration to avert the existential threat whilst at the same time distilling the key elements of a process already initiated.

Context

- The 2017 Atlantic hurricane season was a highly active, deadly, and extremely destructive season, featuring 17 named storms. 2017 is also one of only six years on record to feature multiple Category 5 hurricanes, and only the second after 2007 to feature two hurricanes making landfall at that intensity. These events, Irma and Maria, occurred in the University of the West Indies membership space.
- Hurricane Maria was the 10th-most intense Atlantic hurricane on record, and one of the most intense tropical cyclones of 2017. A key feature of these systems was rapid intensification and maintenance of strength. Irma became a Category 2 hurricane in 24 hours and had sustained winds of 185 mph (295 km/h) for 37 hours, the only tropical cyclone worldwide to have winds that speed for that long. It also tied as the 2nd strongest Atlantic Hurricane by wind speed, after Allen in 1980. Maria's peak of 175 mph in the Eastern Caribbean made the 3rd strongest maximum winds experienced in this sub-region after Allen 1980 and Irma 2017, (Taylor 2017).
- The impact of these events resulted in extensive disruption and damage to emergency communications, airports, emergency shelters, roads and bridges, schools, hospitals, business facilities and the housing stock. The estimated damage and losses for CARICOM region was estimated at US \$5 billion. In most affected states losses were estimated at more than 100 per cent GDP (Table 1).

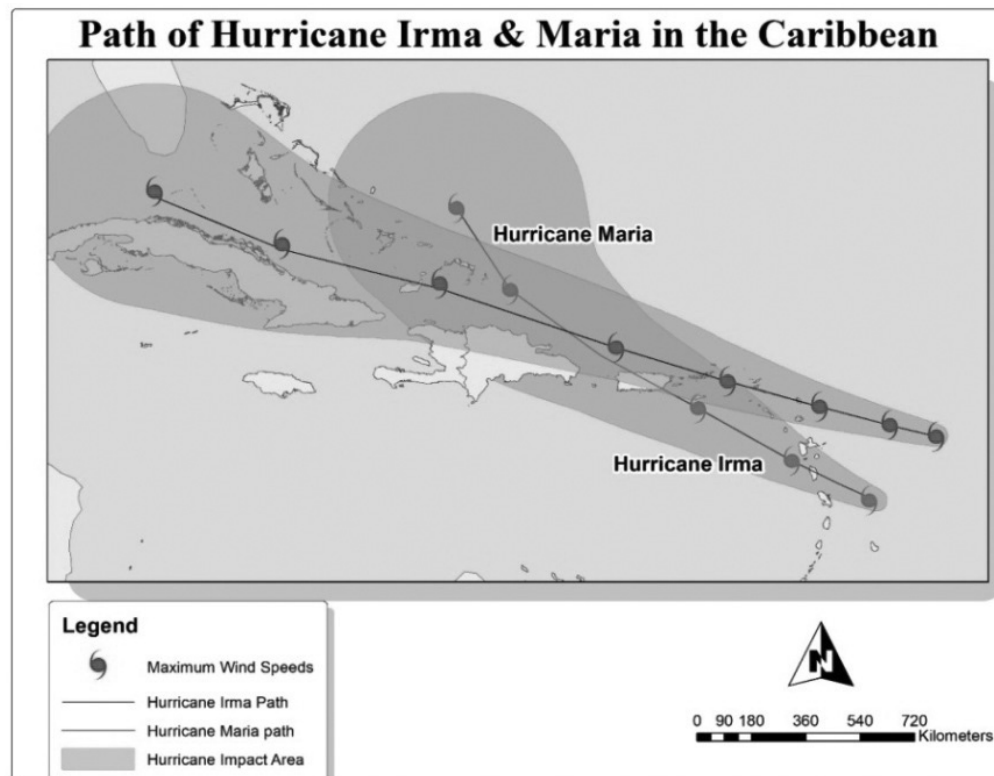


Figure 1: Path of Hurricanes Irma and Maria in the Caribbean

Source: Collymore et al 2018

Table 1: Estimated Damage and Losses for the Rapid Review countries

Sector	Country		
	The Virgin Islands (BVI)	Dominica	Antigua & Barbuda
Infrastructure (\$ Millions USD)	\$296,000,000	\$306,000,000	\$20,465,000
Infrastructure (per cent of GDP)	35	58	1
Social (\$ Millions USD)	\$583,020,000	\$443,910,000	\$54,216,196
Social (per cent of GDP)	363	178	595
Productive(\$ Millions USD)	\$363,390,000	\$177,950,000	\$594,887,000
Productive (per cent of GDP)	43	21	71
Sum of Three (\$ Millions USD)	\$1,242,410,000	\$927,860,000	\$669,568,196
Sum of Three (per cent of GDP)	148	110	80

Source: Collymore et al 2018

- This picture of the unprecedented and unfamiliar is also evident in the South Pacific. In February 2016, Tropical Cyclone Winston, the strongest tropical cyclone on record to make landfall in the Southern Hemisphere caused widespread and severe damage in Fiji and northern Tonga. Winston took 44 lives in Fiji, and significantly impacted around 40 per cent of the population causing an estimated US\$1.38bn of damage.

The UWI was not spared the ravages of these systems as there were direct risks to its personnel, infrastructure, and operations from the impacts of these systems. The University of the West Indies, which has campuses and online learning centres across 17 Caribbean countries and territories, had suffered damage from hurricanes before. But in 2017 three of its locations were inoperable for over 3 months with the facility in Dominica almost totally destroyed by Hurricane Maria. The UWI had an estimated US\$14.5 in direct and indirect losses distributed as follows: revenue \$6 million; repair and interim reconstruction costs \$1 million; equipment replacement \$500,000.00 and medium-term reconstruction cost of Dominica site, \$20 million (Luz 2017).

Continuing Climate Change is likely to have several adverse effects on Small Island Developing States

(SIDS) (IPCC 2014; 2018). Hydro-meteorological events have imposed significant economic tolls on SIDS often resulting in losses in excess of 100 per cent GDP. In 2017 Niue lost 800 per cent of GDP as a result of the impact of Cyclone Heta. In 2017 the Caribbean, hurricanes Irma and Maria resulted in losses to GDP of over 200 per cent in the Commonwealth of Dominica and more than 100 per cent in the British Virgin Islands. Similarly, in 2004 Hurricane Ivan resulted in loss of GDP of over 200 per cent in Grenada and the Cayman Islands.

Climate change is an immediate and significant problem for SIDS. Whether developed countries take action to mitigate climate change or not, tropical countries, including the Caribbean, Pacific SIDS will experience changed climates within the short-term and well in advance of temperate countries¹.

Irma, Maria and Winston were not unique with respect to the magnitude and intensity of their presence in the region or the nature of destruction that is visible. But they have triggered regional consciousness on the need to not only talk about Climate Change but to also look at what it means for the resilience of their development.

Climate change is now seen as existential threat to economies and societies in SIDS and LLCDS, the Caribbean and the Pacific are on the frontline of climate

Defence. The result is need to revisit the assumptions of the architecture which underpins development planning and disaster management systems and the development paradigm on which they are anchored. This has spurred a call for action from stakeholders at the political, professional, academic, community, business and development partners' levels (Collymore 2017).

There is the recognition that new ways of thinking and working are required, fuelled by efforts to apply the directions from science to drive innovation and social transformation. Vice Chancellor of The UWI, Sir Hillary Beckles posits that the Climate Change discourse will reveal the need for this region to address the fundamental issues of inequality, democracy and social justice. All of those big issues come into the fore of the climate change discourse and provide an opportunity to change the narrative about how our communities are built.

The link between disasters and development was long recognised. "Nature is not particularly kind to man. She can overwhelm man with disasters, which man wards off taking thought and action" (Lewis 1955).

UWI believes that Higher Education Institutions have a unique and critical role to play in preparing society through the integration of research, teaching, and action. They are ideal for experimenting with and modelling solutions while also improving knowledge, design, and technology for future applications².

The UWI Role in DRM and Resilience

As CARICOM's largest single reservoir of diverse competences and expertise the UWI is seeking to strategically harness these to contribute to altering the trajectory of increasing loss of critical and scarce resources from hazard impacts internally and externally. It has joined the frontline of the charge to promote resilience, underpinned by new ways of thinking and working.

Its prior longstanding efforts to drive the integration of DRM into the curricula of UWI were led by the pioneering work of the 1981 Pan Caribbean Disaster Preparedness and Prevention Project (PCDPP)

a multi-agency join up partnership UN organisations, CARICOM, IFRC, DFID and CIDA (now GAC).

During this transitional and transformative relationship, the UWI embarked on a diverse set of initiatives which saw disaster management content being incorporated into public health education, nursing, medicine, mass communications, public administration education, engineering, environmental science and resource management, geology, and geography programmes.

The result, a diverse set of research, courses, tools and services that can assist in the championing of the cause of resilient development in the Caribbean need to be better harnessed to support a resilience agenda.

Changing Gear

The impacts of Irma and Maria created an unprecedented situation for the UWI. The message of the need for deliberate attention to mainstreaming resilience into its way of working, thinking and living was clear.

The UWI's response efforts to Irma and Maria, though useful were ad hoc. The embracing of the "whole of institution" approach advocated in its strategic plan was deemed necessary. So too is the embedding of resilience considerations within its governance, research, teaching, management, operations and public outreach.

It is recognised that the UWI was established to please itself but to support the development of societies and communities of its members (UWI Strategic Plan 2017–2022). The recognition of the high stakes in the resilience drive is evident at the political level. Gonsalves, R, Prime Minister of Saint Vincent and the Grenadines characterised Climate Change as the "Single most important environmental issue facing St Vincent and the Grenadines. It is a critical crosscutting issue that touches and concerns a broad range of activities including the economy, physical planning and building codes; disaster preparedness and the environment. In considering action called inventory of our condition that shows the logical interconnections as a fact-based platform upon which to elaborate theories

of explanations, fashioning of practical solutions and the efficacious guiding of corrective policies.

This is the context that framed the upscaled action by the UWI, the leading HEI in the Caribbean Community.

A key element of the UWIs deliberation was how to use the 2017 events as teachable moments in shaping the opportunity for transformation. A number of questions surfaced around this reflection. These included:

- “What do the experiences of these events provide for us to engage in this new way of working and thinking?”
- What are the implications of a major impact on one its landed campuses?
- How does the ‘house in order’ principle of its Strategic Plan 2017–2022, apply in this context.
- “What are its efforts to anchor resilience considerations into its corporate and strategic planning, decision-making, operations and programmes?”
- What are the tools and research within the University that can inform its own resilience actions internally even as it sought to promote these outside?

The reflection spawned a vision for its campus spaces of the university to become laboratories for energy conservation, alternative energy use, lowering the carbon footprint and the valuing of green spaces. It also recognised the necessity to realign to realign its curricula with its championing of a culture of resilience in the region. (Collymore, J. 2018a).

More importantly, there was a recognition that the scale of the problem and the magnitude of the challenge required other HEIs to be on-board.

Resilience the Concept

The UN Special Representative to the Secretary General for Disaster Risk Management characterised the devastation in the Caribbean as the exposure of the resilience of SIDS and suggested that once the Atlantic hurricane season (2017) ends, there must be a reflection on how best to take the resilience agenda

forward to the benefit of the people of these island states (Glasser, 2017).

Several definitions have been offered for the term “Resilience”. These include:

- “... The ability of a system, community or society exposed to hazards to resist, absorb, accommodate to and recover from the effects of a hazard in a timely and efficient manner, including through the preservation and restoration of its essential basic structures and functions (UNISDR, 2009).
- “... The connotation of being able to bounce forward quickly in a manner that reduces susceptibility (increased liability to additional harm) to the impact of the same hazard. Resilience ensures that lives and livelihoods are protected and assets safeguarded (CDEMA 2018).
- “... The ability of communities and households to anticipate and adapt to risks and to absorb, respond and recover from shocks and stresses in a timely and effective manner without compromising their long-term prospects (GOAL 2014, page 6, October).
- “... A mix of dynamic and static dimensions, specifically “the capacity of people, communities, or systems to prepare for and to react to stressors and shocks in ways that limit vulnerability and promote sustainability” (Serfilippi and Ramnath, 2017), which implies the passage of time and not a single fixed or arbitrary point (Committee of Sustainability Assessment (COSA) 2018).

While definitions vary in emphasis they largely converge on the need for multi-level, multi-sectorial and long-term approaches that are sensitive to risk. The aim is to build the capacity to absorb and adapt in the face of shocks and stresses and ultimately achieve transformational change that may end the cycle of increasing humanitarian needs (European Commission 2015, P4).

‘Resilience’ maybe be seen as a platform for thinking about longstanding and important challenges such as sustainable development, food security, linking relief to development, adaptation to climate change and the need to give greater priority to addressing vulnerability. Pasteur and McQuistan 2016 describe this as a V2R Framework: From Vulnerability to Resilience, Figure 2.

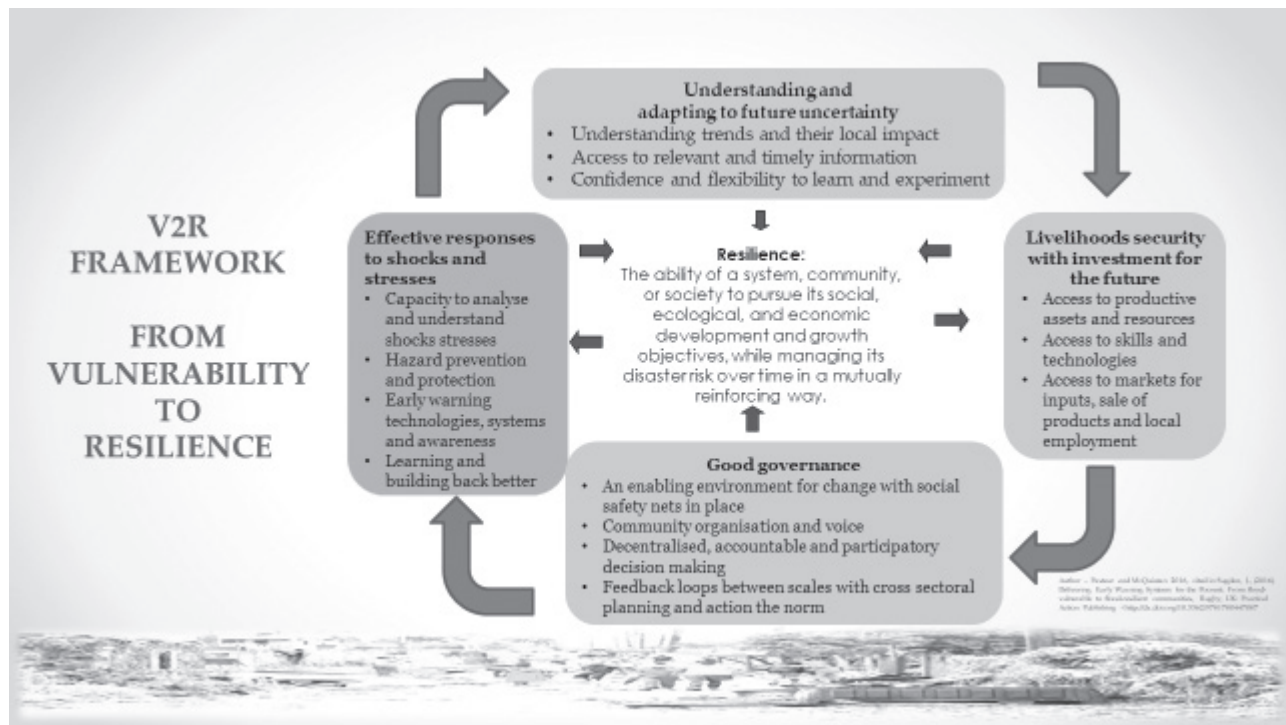


Figure 2

The V2R provides a suite of lenses that can inform resilience policy and practice. It opens up the space for new risk management tools to complement, not replace, the existing ones.

The Global Economic Forum 2018, (page 62) presents three broad categories within which resilience can be viewed for action. Though generally targeted for businesses the elements overlap with the V2R and can be adapted for other forms of organisations.

“Structural resilience” considers the systemic dynamics within the organisation itself. This category encompasses redundancy, modularity and requisite diversity. The focus of structural resilience is on bouncing back faster from a disturbance.

“Integrative resilience” underlines complex interconnections with the external context. This second category also consists of three lenses: multi-scale interactions, thresholds and social cohesion. These elements mainly focus on the context of the organisation and its interconnections.

“Transformative resilience” responds to the fact that mitigating some risks requires transformation. This category emphasises that resilience is not simply about being able to return to the starting point after a shock. In some cases, the organisation needs to

proactively change or it will end up being changed by external circumstances.

Resilience appears to offer a way to bring different disciplines and perspectives under a single conceptual umbrella. It may also have such wide appeal because it both points to a practical agenda, through a political critique of the development policies of governments and aid organisations (i.e. ‘pay more attention to people’s vulnerability to crises’), and opens up new academic space for thinking about old problems, drawing upon such diverse fields as ecology, complexity and system theory and econometrics (COSA 2018).

Resilience portends an opportunity for radical revisit of a development paradigm of inefficient resource use, social inequities and indifference to environmental context.

Charting Our Resilience Action Space

The traditional approach to research design will need a revisit in the context of a resilience agenda. Research outcomes are expected to be more applied and solutions oriented, the products of consultation and collaboration rather than results to be marketed. Recent research (Collymore 2015; UNOCHA 2015)

found that more than 60 per cent of academics in Latin America and the Caribbean undertaking research in DRM felt that their outputs were not being taken up by policy makers and practitioners.

This may be pointing to the absence of inclusive and consultative processes in the framing of the research.

The idea of identifying and engaging under the conceptual umbrella which “resilience” offers academia is shaping the UWI’s action space. It seeks to build on its prior and ongoing work in DRM and engagement in the global climate modelling and adaptation agenda (Webber 2017; Collymore 2017), to:

- Capture and make available data needed to develop and improve existing models of natural hazard systems and their potential impacts on society.
- Infuse a fundamental shift in UWI’s cultural perspective from a focus on mono-hazard preparedness to comprehensive all-hazards disaster risk management.
- Actively advocate for and promote the development and/or revision of codes and standards that inform the engagement with the social and physical systems of our communities.
- Collaborate in the enhancement of intra and inter regional capacity to monitor and model natural hazards processes and the application of the outputs into development planning.
- Create an environment that fosters the use of information and communications technology in the development of innovative products and solutions for a resilient development agenda.
- Encourage the development of strategies to facilitate improved communications between our scientists and researchers and the needs articulated by the policy makers and development practitioners for increased uptake of new knowledge.

Facing up to the Challenge

As an HEI, the UWI is very much aware of the challenges of championing a culture of resilience, in the Caribbean and other regions of the Commonwealth. This goes beyond the complexity of risk assessment process itself

and speaks to a need for sustained partnerships built on shared agendas and trust. In addition, the issue of scaling of the research and solutions for application at national level needs to be at the forefront of HEIs investments and interventions.

The impacts of the 2017 hurricanes/typhoons in the Caribbean and Pacific, set against the backdrop of scientific projections that these may reflect the new norm, dictate that the UWI and other Commonwealth universities face these challenges head on³. Already the notion of climate resilient states and cities are presented as the desired outcomes of the recovery and reconstruction programmes in the Caribbean. This invites a conversation on what this means for elaborating the vision and concept for Resilient Universities.

Educational investment lies at the heart of public policy responses to these challenges and is a primary mechanism to meet the shifting needs of societies in transition (Commonwealth Secretariat 2018, p4). There is an urgent need for educational systems and HEIs programmes to change to promote resilient and sustainable development to prepare new generations to meet the demands of the future.

The UWI embraces the thinking that HEIs must lead, not lag, on education for resilient development through good designs and ecological practices that reduce carbon footprints, protect biodiversity and challenge inefficient pedagogies. It is also buying into the goal that its curricula must promote agreed values and knowledge of the man and environment relationship that encourages resilience and sustainable development (Commonwealth Secretariat 2018).

This is the context in which the UWI has sought to build a global alliance for a Resilient Universities Agenda. Whilst this is initially being pushed within the framework of the Association of Commonwealth Universities it has the potential for elaboration within diversity of collaboration networks.

Underlying Principles of a Resilience Universities Agenda

Whether as an institution, or across HEI collaboratives, shared principles and action shapers will be required. What is shared below feeds off of similar efforts in

HEI collaboration around sustainable development. These are helping to shape the elaboration of a Commonwealth Climate Resilience Network (CCRN) of Commonwealth Universities through the Association of Commonwealth Universities (ACU).

- **House-in-order actions are critical to our resilience championing:** The Championing of Resilient development must be an institutional commitment and be reflected across campus management, curriculum, research and student and community engagement activities.
- **Alignment of Efforts across the higher education system:** As part of a higher education system though we maybe innovating practice we must engaged who influence the funding, regulate and determine the pace and direction of change in the HEI system.
- **Partnerships as Platforms for Resilience:** As players, within a broader social system of diverse stakeholders, the HEIs must seek to foster partnerships for cross sector discussions to facilitate, link and leverage activities, where appropriate, to promote resilient development.
- **Inter- and trans-disciplinary learning and action:** The changing dynamics and complexity of the hazardousness of the Commonwealth states require more investment in multi- and transdisciplinary approaches to learning.

The UWI is working within the mechanism of Commonwealth Association of Universities (ACU) to promote and create opportunities for furthering such approaches.

Commonwealth Buy-in for Resilient Universities

The experience of the SIDS in the Caribbean and the South Pacific where hydro-meteorological hazards are posing existential threat to states and communities leave no doubt about the need for upscaling resilience in the HEIs of the Commonwealth. The proposition for a mechanism to facilitate structured collaboration among ACU members was presented to the 20th Meeting of Conference of Commonwealth

Ministers of Education in February 2018, in Fiji and was endorsed.

To action the commitment a scoping workshop was convened in Suva, Fiji, October 21–23, 2019 to discuss how to advance the accepted proposition by the CCEM for an ACU anchored universities Commonwealth Climate Resilience Network. Among other things, it agreed that:

- There was value in taking forward collaboration in a Commonwealth Climate Resilience Network (CCRN) under the auspices of the ACU.
- The CCRN can play a key role in relation to both supporting the resilience of universities themselves, and supporting universities' role as resilience agents in their communities and economies.
- The CCRN has the potential to be a vehicle for sharing experience and best practice, capturing, evaluating and enhancing current policy & procedures.

A Steering Committee (SC) has been established to oversee the framing of the Workshop outcomes into action and governance programme to be considered at its next meeting, provisionally scheduled to take place at The University of the West Indies in 2019.

Developing a CCRN Work Plan

The SC has drafted a suite of activities designed to advance the establishment of the CCRN, promote member engagement and initiate collaboration that will provide ingredients for a two-year Work Plan (2019–2021).

A set of pilot activities are being designed to elaborate the mechanism whilst at the same time providing proof of concept.

1. Institutional Resilience of Universities

- i. Capturing institutional loss: Given the impact of recent climate related events on communities in which CCRN universities operate there is considered value in assessing the impact of these on HEIs in at least 3 regions. The SC, in collaboration with the ACU, will survey CCRN

universities and a sample of the wider ACU membership to build a picture of institutional loss experienced by universities due to climate events. The findings and recommendations of these coordinated reports, will be used to build both awareness and the business case for HEIs internal resilience initiatives.

- ii. Piloting and sharing of the UWI Contingency Planning Scoping Tool: The tool and the results of its application in the Caribbean will be presented as a good practice to the CCRN with potential for adoption/adaption by the wider CCRN. The ACU will also undertake a survey to benchmark the current status of contingency planning within CCRN universities and a sample of the wider ACU membership.

2. Teaching and Learning

- i. The idea of a mobility scheme for students taking masters' programmes in climate change for targeted operation by 2020 is to be initiated.
- ii. The ACU will develop a website/portal to support the mobility scheme through detailing the master's courses available at each of the member universities, including credits, prerequisites, semester dates, areas of research specialisation, opportunities for field work with affiliated agencies, accommodation options, visa arrangements.
- iii. The ACU will consider a wider survey of its membership to develop a picture of the provision of climate related courses across the CW to inform extension or establishment of other similar partnerships, and assess the feasibility of creating a shared resource/repository of materials.

3. Sharing and Developing of Good Practices & Experiences

- i. A mechanism for good practices identification, documentation and sharing across the CCRN that advance resilience thinking and practice including course development, energy efficiency and conservation, water management, facilities design and management is embraced as a value added.
- ii. The CCRN will seek to develop means to encourage and support the sharing of information, and a

protocol for good practice selection and sharing. The intent is to move towards a regime of recognition of good practices.

The Way Forward

Climate change is increasingly altering the development landscape of small island and developing states. In the case of the Small Island Developing States the threat can be existential if assertive action to accelerate adaption is not embraced.

For Higher Education Institutions (HEIs) operating in these spaces it can no longer be business as usual. The threat to the communities in which operate creates contingent risks for HEIs. New ways of thinking and working are required, fuelled by efforts to apply the directions from our science to drive innovation and social transformation.

The Climate Change discourse is revealing the need for regions and states highly exposed to this threat to address the fundamental issues of inequality, democracy and social justice. It provides an opportunity to change the narrative about how our communities are built (Sir Hilary Beckles, Vice Chancellor, University of the West Indies personal communication).

HEIs will need to grab the conceptual umbrella for interdisciplinary space provided by the unfolding Resilient Development Pathways for a practical agenda and the accommodation for new academic thinking about old problems. A key consideration here is paying more attention to the fuller integration social scientists in the resilience solution exercise. It will also require that HEIs explore regional and global collaborations to scale up the research and intellectual surge capacity required to transform communities from vulnerable to resilience places.

To be able to provide and sustain the academic and thought leadership to the communities they serve, HEIs themselves will need to invest more aggressively in institutional resilience. Continuity of business must become a central plank of the corporate strategy that impacts all dimensions of operations. HEIs must demonstrate, by doing, through the application of practices that promote resilience in their energy use,

water and waste management, facility design, curricula and carbon footprints in their spaces.

The UWI has embarked on a suite of processes designed to enhance its resilience. These are being platformed on improving campus wide contingency planning. The results of a scoping study informed the design and piloting of an internal training course in campus contingency planning, the drafting of operational procedures to guide the institution's involvement and integration into the wider Regional Response Mechanism, the design of a programme to establish and train Campus Emergency Response Teams (CERTS) engaging the student community.

Beyond this, the Vice Chancellor has appointed an Adviser Disaster Resilience and established a Resilience Working Group drawn from its diversity of research programmes, institutes, faculties and centres. These are the initial steps in the inventorying and rationalisation of its teaching, research and thought leadership to champion and inform resilience policy and practice. This is a backdrop of our vision for an HEI Global partnership to deliver on realising the value proposition of a Resilient Caribbean State.

Notes

- ¹ Numerous references including Mora 2013, IPCC and Hawkins et al. 2014 <https://www.nature.com/articles/nature13523.pdf>
- ² Second Nature, 2017. Why Resilience?
- ³ Taylor, Michael. 2017. Predicting the Intensity and Frequency of Hurricanes. Vice Chancellor's Irma and Maria Seminar 1. Relief, Recovery and Reparations. UWI Regional Centre, Jamaica. October 19

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Disaster Education among Children: A Study to Assess Awareness on Disaster Education in Schoolgoing Children in Kashmir (J&K)

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ABSTRACT:

Background: Jammu & Kashmir is a multi-hazard prone State. The state falls in Seismic Zone IV with the districts of Srinagar and Baramulla falling in Zone V (Very High Damage Risk Zone). Kashmir has the history of devastating disasters, Sopore earthquake of 1885, October 8–2005 Quake, Flood Deluge-2014. During Earthquake 2005, 40.3 per cent of the deaths comprised of children below 10 years of age, thereby depicting their vulnerability and significance of school safety. However, in the absence of a reliable record and information, most of the events are either partially reported or exaggerated or sometimes not recorded at all. This makes it imperative to make disaster education part of national & State curricula, fostering awareness and better understanding of the environment in which children and their families live and work.

Research objectives: To assess the extent of awareness about disasters and their management among school going children before and after an educational intervention focusing on disasters and their management.

Methodology: Qualitative research methodology which is more explorative. Educational interventional design is applied, thus adopting Non-probability purposive sampling technique. The Collage High School, affiliated to JK Board of School Education (JKBOSE) was randomly selected, located in Baramulla, district worst effected in Earthquake 1885, 2005 & Flood 2014. Survey method was employed on 105 participants aged between 12 and 16 years using semi-structured questionnaire data sheet.

Results: The results revealed that out of 105 students 45.7 per cent (before intervention) and 77.1 per cent (after intervention) had some sort of disaster education. Out of the total 105 participants 55 comprised of males and 50 were females in the age group of 12 to 16 years. All of the participating children, 100 per cent, responded affirmatively when asked about the personal experience of disaster in life so far.

KEYWORDS: hazard, Zone V, UNISDR, UNICEF, school safety, vulnerable, disaster management

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Introduction

The United Nations International Strategy for Disaster Risk Reduction (UNISDR) defines Disasters as “A serious disruption of the functioning of a community or a society involving widespread human, material, economic or environmental losses and impacts, which exceeds the ability of the affected community or society to cope using its own resources”¹.

The Centre for Research on the Epidemiology of Disaster (CRED) has come up with a modified definition i.e., “A disaster is a situation or event which overwhelms local capacity, necessitating a request to a national or international level of external assistance”².

Disaster prevention education will lay the indispensable foundation of disaster management at school level. Therefore, the United Nations Educational, Scientific and Cultural Organization (UNESCO) and the United Nations International Strategy for Disaster Risk Reduction (UNISDR) have promoted the disaster prevention education at school since 2006 with the goals of incorporating disaster risk reduction knowledge into relevant sections of school curricula. Hyogo Framework for Action 2005–2015 (HFA) calls for “the inclusion of disaster risk reduction knowledge in relevant sections of school curricula at all levels and the use of other formal and informal channels to reach youth and children with information...”³.

The 2nd Session of the Global Platform on Disaster Risk Reduction in 2009 proposed that by 2011 national assessments of the safety of existing education facilities should be undertaken, and that by 2015 concrete action plans for safer schools should be developed and implemented in all disaster-prone countries. A range of initiatives and tools for school safety have been developed since then by a number of partners⁴. Disaster Risk Reduction (DRR) Education shall aim at mobilising Education to include disaster risk reduction as part of school curricula and at strengthening teachers, education institutions in disaster risk reduction and resilience education to allow children to acquire critical thinking and life-saving skills in support of a global culture of prevention

Education can establish the linkages between Indigenous Knowledge and modern technology, Creation of informal education content on Indigenous Knowledge and its applicability under the various

community-based Disaster Risk Reduction initiatives⁵. Indigenous Knowledge of various communities have helped them to survive during natural calamities over decades.

Jammu and Kashmir J&K and Disaster Risk

Jammu and Kashmir (J&K), with fragile mountain ecosystems has unique environment at different altitudes, the high number of hazards faced (earthquakes, forest fires, flash floods, landslides and avalanches), poor accessibility and infrastructure, scarce livelihood opportunities. Further, modern developments have produced factors such as out-migration, children leaving villages to get better education, and the detrimental environmental impacts of ad-hoc development projects, rapid population growth, urbanisation and climate change all of which contribute to increasing vulnerability.

Major disasters which are known to have affected J&K include earthquake, landslides, floods, fires, snow avalanches. Sopore earthquake of 1885, October 8–2005 Quake, Flood Deluge-2014. During Earthquake 2005, 40.3 per cent of the deaths comprised of children below 10 years of age, thereby depicting their vulnerability and significance of school safety.

Kashmir earthquake (2005) where 17,000 students died at school, and 10,000 school buildings destroyed (Petal 2007). 40.3 per cent of the deaths comprised of children below 10 years of age, thereby depicting their vulnerability and significance of school safety.

Prior to Kashmir-quake, Gujarat earthquake (2001) happened where 971 students and 31 teachers were killed, 1,884 schools collapsed. Children continue to lose their lives during their school hours⁶. This shows how vulnerable are our children to disasters and how unsafe are the schools they study in. There is remarkable shift that we find in the perception of the risk in people of J&K. As a result of the 2005 earthquake and subsequent flood in 2014, more people recognised the desperate need for active and participatory disaster risk management, and the significant distinction between “risk” and “danger” became apparent. Yamori (2007) shows that the concept of “risk” was virtually nonexistent until the late 1980s in Japan.

However, in the absence of a reliable record and information, most of the events are either partially reported or exaggerated or sometimes not recorded at all. This makes it imperative to make disaster education part of national & State curricula fostering awareness and better understanding of the environment in which children and their families live and work.

Policy on Disaster Management

The National Policy is, 'to build a safe and disaster-resilient India by developing a holistic, proactive, multi-disaster and technology-driven strategy, through a culture of prevention, mitigation, preparedness and response'⁷. Government of India in its 11th five year plan document, have emphasised the need to enhance knowledge, skill and values to reduce the impact of disasters on the education sector.

The Jammu and Kashmir State DM Policy envisages a pro-active, holistic, comprehensive, multi-hazard approach towards disaster risk reduction and management. The Policy is based on the principles of minimising human suffering during disasters and reduction of financial losses through integration of disaster risk reduction activities into development planning. The Policy has given high priority to capacity-building of all stakeholders, including community, which is the first responder in any disaster situation. Research and documentation in the area of disaster risk mitigation and management has been given due importance in the Policy⁸.

Catch Children Young: From Knowledge to Awareness and Action

The role played by children could not be thought of a few years ago. Children were and still are among the most vulnerable to disasters; they were and still generally are perceived as "passive victims". But it has now been proved that children can play an active part in disaster risk reduction.

Schools are the best venue for disaster information dissemination, awareness and capacity building. Children studying in public schools are particularly

vulnerable group, as they come from middle to lower income group.

Children carry information to the society. Schools are a common asset during disaster acting as a shelter, clinic and a community centre. Schools are the center of social and cultural life of the Community. During any disaster, teachers along with students are needed to take up the duty as rescuer and provide essential first aid care and counselling

'The Campaign to target schools and school going children, therefore can help leapfrog our efforts to sensitise the people with school students and teachers serving as vehicles for building a culture of Prevention'⁹. Prevention begins with awareness which is the first step toward action. Awareness can trigger interest, interest can lead to attention, and attention can prompt action. Students were young children in 2014 floods, so, the experiences at childhood reminiscences and experiences are thought be more influential and permanent.

All these factors emphasise the need of skill based training regarding proper disaster response in schools for students who can serve the communities as well, in later part of their lives through their knowledge. Awareness needs to be spread about various types of disasters, their effects, characteristics and their peculiarities. The role National Organisations, UNESCO, UNISDR and other agencies in disaster management is also needed to be taught in addition to the basics of disaster management measures, giving special attention to communication, planning, co-ordination and risk reduction.

Research Objectives

To assess the extent of awareness about disasters and their management among school going children before and after an educational intervention focusing on disasters and their management. To assess the extent to which Disaster Management Principles are being implemented in public high school curricula. To assess the student's attitudes and behaviour after learning about disaster management. How well each dimension of disaster prevention literacy (i.e., knowledge, attitude, & skills) is inculcated to build a strong foundation of disaster understanding.

Rationale of Study

This study aims to assess the capabilities of learners in applying the Disaster Management

Knowledge within their communities. The results are expected to assist the Department of Education in making recommendations to the curriculum developers to include UNICEF/UNISDR best practices in curriculum. The research will give impulse to efforts aimed at encouraging the integration of Disaster Risk Reduction (DRR) education in school curricula in J&K which is vulnerable to natural hazards. This will make the learners better prepared resulting in them being less vulnerable to any disaster.

Methodology

Qualitative research methodology which is more explorative. Educational interventional design is applied, thus adopting Non-probability purposive sampling technique. The Collagel high School, affiliated to JK Board of School Education (JKBOSE) was randomly selected, located in Baramulla, district worst effected in Earthquake 1885, 2005 & Flood 2014. Survey method was employed, on 105 participants aged between 12 and 16 years using semi-structured questionnaire data sheet in three sections:

1. Perception of Risk among students of various disasters.
2. Disaster Mitigation Knowledge about the possible precautionary measures.
3. Disaster Preparedness and Different agencies working for disaster management.

To begin with, permission was sought from school authority. Purpose and method of the study undertaken was explained to the students to get their consent. At the first joint workshop with the students, the authors explained the main objective of the study by stating that this attempt was aimed at understanding of local disaster awareness. A power point presentation with description of disasters and their management was displayed and properly explained with didactic communication. The same questionnaires were distributed again after the educational intervention, so the data was collected as pre and post interventional

data both during the period of October 2016. The data from the questionnaire was Tabulated and used to analyse the results in order to reach the conclusion.

Results

Preliminary results on the basis of analysis of the collected data for the survey are given in the following sections.

Table 1 shows the demographic data of the participants, with total of 105 children ($n = 105$) who took part in the survey. Out of the total 105 participants 55 comprised of males and 50 were females in the age group of 12 to 16 years. All of the participating children, 100 per cent responded affirmatively when asked about the personal experience of disaster in life so far. This confirms the prevalence and impact of the past disasters viz; Earthquake 2005, Flood Deluge-2014 and other periodic disasters on Physical & Psycho-social well-being of children of Kashmir. The results revealed that out of 105 students 45.7 per cent (before intervention) and 77.1 per cent (after intervention) had some sort of disaster education. The other important findings have been presented in the form of Table 2, 3 & 4 below.

Table 1: Participant Demographics ($n = 105$).

Variable	n	per cent age
School level		
Middle school	63	60
High school	42	40
School location		
Urban area	Urban	
Gender		
Male	55	52
Female	50	48
Age		
12–14	63	60
14–16	42	40
Personal experiences of disasters		
Yes	105	100
No	Nil	0

Table 2: Perception of Risk among Students before and after Intervention (n = 105).

Variable	Before Intervention			After Intervention	
	N	per	cent	N	per cent
Do you know what is a disaster?	Yes	48	46	81	77
	No	57	54	24	23
Did you learn about disaster management at school level?	Yes	45	43	75	71
	No	60	57	30	29
Attended any lecture on disaster management previously?	Yes	20	19	79	75
	No	85	81	26	25
Have you ever faced a disaster?	Yes	105	100	105	100
	No	0	0	0	0
Did you know floods happen due to climate change ?	Yes	63	60	88	84
	No	42	40	17	16
Do you think Disaster effects our economic pursuits?	Yes	54	51	97	92
	No	51	49	8	8

Table 3: Disaster Mitigation among Students Before and After Intervention (n = 105).

Variable	Before Intervention			After Intervention	
	N	per	cent	N	per cent
Do you have an idea what is a disaster plan?	Yes	2	2	95	90
	No	103	98	10	10
Does your school have an emergency plan/DM Plan?	Yes	1	1	88	84
	No	104	99	17	16
Do you know the contents of Family DM Kit(flash light, batteries, water, fruits and vegetables)?	Yes	4	4	92	88
	No	101	96	13	12
Did you ever participate in any mock exercises?	Yes	2	2	99	94
	No	103	98	6	6
Have you taken part in any mock exercise conducted by the district authorities?	Yes	0	0	44	42
	No	105	100	61	58
Have you heard building of code?	Yes	0	0	69	66
	No	105	100	36	34

Table 4: Disaster Preparedness and Agencies Working on DM (n=105).

Variable	Before Intervention			After Intervention	
	N per cent			N per cent	
Do you think there is a need to impart formal training in Disaster Management to the children?	Yes	77	73	105	100
	No	28	27	0	0
Do you think the children know what to do if a disaster occurs today?	Yes	30	29	94	90
	No	75	71	11	10
Do you have Knowledge about fire as a disaster?	Yes	82	78	103	98
	No	23	22	2	2
Is smoke alarm a safe practice to prevent fire disaster at home?	Yes	73	70	96	91
	No	32	30	9	9
Is land misuse one of the most common cause of landslides?	Yes	39	37	95	90
	No	66	63	10	10
Do you agree chairman of national disaster management authority is the Prime minister of India?	Yes	52	50	104	99
	No	53	50	1	1
Do you know the full form NDRF?	Yes	2	2	81	77
	No	103	98	24	23
Is our emergency number for fire in India 101?	Yes	28	27	85	81
	No	77	73	20	19

Table 2 depicts that of all the students who were included in the sample, only about 19 per cent students had attended any lecture on disaster management previously. After intervention 92.3 per cent think Disaster effects our economic pursuits which earlier was just 54.4 per cent, which in turn depicts how students perceive disasters having impact on our livelihood in jammu and kashmir. Our region is at high risk of isolation from rest of the country because it is located in a mountainous area and does not have much access to roads. A landslide caused by an earthquake or by heavy rainfall might cut off the region, thereby having serious economic impact. The present study emphasises that the level of awareness among school going children was not satisfactory initially but substantially improved after educational intervention.

The Table 3 shows disaster mitigation knowledge among the studied sample, of which 99 per cent recorded that their schools do not have a disaster

management plan, only 3.8 per cent have knowledge about contents of safety or emergency kit in school or in their family and after intervention the per cent age rose to 88.8 per cent. Only 1.9 per cent said to have participated in mock drills, and about 69.75 per cent students know what disaster preparedness means.

The Table 4 shows disaster Preparedness among students the children. Before the intervention just 28.5 per cent children know what to do if a disaster occurs today, which is alarming if we extrapolate the findings and scale it up to scenario at the state level. In our study Fire emergency number was correctly known to 26.6 per cent (before) and 80.9 per cent students (after) intervention. Post intervention, 100 per cent children affirmatively think that there is a need to impart formal training in Disaster Management to the children. The implications of the above findings are discussed and the recommendations are also made for future disaster prevention education programmes and research.

Discussion

So, the results reveal not so great scenario about awareness among the school going children. It emphasises that the level of awareness among school going children was not satisfactory initially but substantially improved after educational intervention.

It focuses on the need of imparting knowledge of disaster management in school curriculum in a much practical manner. Education can establish the linkages between Indigenous Knowledge and modern technology which can help use the traditional knowledge with the people. There is urgent need of generating knowledge about emergency supply kit to students and conduct of mock drills by school and civic authorities. School Disaster Management (SDM) component will involve children in enhancing their school preparedness and contingency plans and building safe educational facilities. Activities will include the conduct of evacuation drills, the development of Standard Operating Procedures (SOPs) as well as capacity-building and training exercises.

Safe School Facilities component will aim at integrating structural safety in the construction of new schools and at retrofitting existing vulnerable ones. Ensure that all new schools will be constructed according to building codes that reaffirm they are structurally "safe".

The findings point towards the fact that a lot needs to be done to enrich the students understanding of the various aspects of disaster 'Cause-effect' relationship and their management at all levels. Students can be made aware regarding the impacts of disasters through both formal and informal education. It is not possible to prevent disasters, but it is possible to be prepare them for any such eventuality.

Conclusion and Recommendations

This study shows that disaster education is present within the curriculum framework, but there are still many elements from the UNICEF/UNISDR best practices checklist that are not being fulfilled. Governments, education agencies, and teachers could use this research to determine how to fill these voids.

These findings point towards the fact that the present level of disaster education is yet not empowering children to safeguard their family or community at large and minimise disruption, ensure the continuity of education for all children. Disaster management shall be compulsorily included in academic curriculum for all the students at all the levels. Effective, purposeful training, awareness and capacity building programmes are to be timely conducted.

Based on the outcomes of the study following recommendation are made;

- Schools must have efficient Disaster Risk Reduction (DRR) Education which includes School Disaster Management plan (SDMP).
- Mock drills and evacuation drills should be exercised in all the schools across the state ensuring students active participation in those drills.
- Schools should organise programmes schools to highlight the significance of disaster education like painting competitions, quiz competitions, debates, and other cultural activities on the subject.
- Subject of disaster management should be included in the curriculum and properly trained professional teachers should take the lead in addressing the gaps in DM education.
- Training manuals and booklets on Disaster Awareness should be developed.
- Disaster awareness and preparedness should be popularised by Training manuals and booklets, documentaries and videos.

The study conveys the following signal - a very strong signal: if children can do it, then every one can do it.

Acknowledgements

The authors acknowledge the support of our parent organisations both Jammu and Kashmir State Disaster Management Authority (JKSDMA) and JK Department of School Education for sharing relevant information on the subject. We dedicate this work to the people affected due to J&K earthquake 2005 & those effected in flood deluge of 2014. Also, we are thankful to the children who participated & provided their valuable and useful insights on the subject.

Notes

- ¹ UNISDR Terminology on Disaster Risk Reduction (2009) Available at <https://www.unisdr.org>.
- ² Report of Centre for Research on the Epidemiology of Disaster CRED. Available at www.cred.be
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Integrated and Sustainable Risk Reduction in Education Sector: A Practical Approach towards Home-to-Home Safety of School Children

Nakul Kumar Tarun^a and Tanushree Verma^b

ABSTRACT: School is a place where hundreds/thousands of children of all age groups come for education on a daily basis. Ordinarily, these children stay in the school premises for 6–8 hours. During their stay in the school premises, the safety and security of these children is among the first and foremost responsibilities of the respective Heads of Schools and the staff. Therefore, it is of utmost importance that every school must have a sound Emergency Response Mechanism in place in order to deal effectively with the natural and human induced disasters (such as earthquake, fire, stampedes, terror attacks and gas leaks etc). The World Bank reports that each year countries suffer great tragedy when natural disasters destroy schools and disrupt children's education. In addition to causing immediate harm to children, there is mounting evidence that the direct impact of natural disasters can translate into a series of indirect long-term effects.

Globally, it is evident as there have been major casualties to innocent school children because of the earthquakes and school building collapses. On Dec 7, 1988, in Armenia thousands of school children killed including 400 at an elementary school in Dzhrashen which collapsed, on May 10, 1997; 110 students killed at Ardakul, Iran in Primary school collapsed. In 1999, the Chi-Chi Earthquake completely destroyed 43 Taiwan schools in the Nantou and Taichung area and a total of 700 schools nationwide were damaged. In the 2008 Sichuan Earthquake the rate of child mortality was substantial with the death of 19,000 students and the total destruction of about 7000 schools.

In recent past, schools in India has also witnessed many disasters. To name a few, in 2001, the Gujarat (Bhuj) Earthquake in India caused severe damage to 11,600 schools; a total of 31 teachers died and 95 were injured; 971 students perished and 1,051 were injured. Formal education was disrupted due to widespread damage to physical infrastructure. A more devastating earthquake took place in 2005 in (POK) Jammu & Kashmir in which as per Govt. figures 19,000 children died in the earthquake, most of them in widespread collapses of school buildings. A fire at the Lord Krishna School in Kumbakonam, Tamil Nadu took the lives of 94 children in 2004; thousands of students and teachers were killed, injured or otherwise affected in the 2004 South Asia Tsunami. Over 400 people —about half of them students—at a school's prize giving ceremony in Dabwali, Haryana burnt alive in 1995.

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Keeping in view the fact, various Global and Regional declarations highlighted School Safety programme as one of the most important components of Disaster Risk Reduction (DRR). The Sendai Framework for Disaster Risk Reduction 2015–2030 was adopted at the Third UN World Conference in Sendai, Japan, on March 18, 2015 as the outcome of stakeholder consultations initiated in March 2012 and inter-governmental negotiations from July 2014 to March 2015, supported by the United Nations Office for Disaster Risk Reduction at the request of the UN General Assembly. Sendai Framework, Under Priority 1: Understanding Disaster Risk at global and regional levels 25 (f); it advocates “To develop effective global and regional campaigns as instruments for public awareness and education, building on the existing ones” (for example, the “One million safe schools and hospitals” initiative; the “Making Cities Resilient: My city is getting ready” campaign; the United Nations Sasakawa Award for Disaster Risk Reduction; and the annual United Nations International Day for Disaster Reduction), to promote a culture of disaster prevention, resilience and responsible citizenship, generate understanding of disaster risk, support mutual learning and share experiences; and encourage public and private stakeholders to actively engage in such initiatives and to develop new ones at the local, national, regional and global levels.

In line with the Sendai Framework for DRR, ASEAN Agreement on Disaster Management and Emergency Response (AADMER) came up with a framework “Rollout Manual for Operationalisation of ASEAN Common Framework for Comprehensive School Safety (2015–2030)” elaborating the Operationalisation of the global Comprehensive School Safety Framework for the ASEAN context, and in concurrence with the global efforts for integrating disaster risk reduction in the education sector. The manual is consistent to the Sendai Framework for Disaster Risk Reduction (SFDRR) that broadly articulates intensified actions on DRR in the education sector, as well as highlights the need of a framework for systematic monitoring and evaluation of the impacts upon completion in 2030. In its Milestones for Operationalisation the year 2017 was set for School safety projects/programmes implementations.

KEYWORDS: school safety, evacuation drill, disaster risk reduction, mainstreaming and integration

Introduction

School is a place where hundreds/thousands of children of all age groups come for education on a daily basis. Ordinarily, these children stay in the school premises for 6–8 hours. During their stay in the school premises, the safety and security of these children is among the first and foremost responsibilities of the respective Heads of Schools and the staff. Therefore, it is of utmost importance that every school must have a sound Emergency Response Mechanism in place in order to deal effectively with the natural and human induced disasters (such as earthquake, fire, stampedes, terror attacks and gas leaks etc). The World Bank reports that each year countries suffer great tragedy when natural disasters destroy schools and disrupt children’s education. In addition to causing immediate harm to children, there is mounting evidence that the

direct impact of natural disasters can translate into a series of indirect long-term effects.

Globally, it is evident as there have been major casualties to innocent school children because of the earthquakes and school building collapses. On Dec 7, 1988 in Armenia thousands of school children killed including 400 at an elementary school in Dzhrashen which collapsed, on May 10, 1997; 110 students killed at Ardakul, Iran in Primary school collapsed. In 1999, the Chi-Chi Earthquake completely destroyed 43 Taiwan schools in the Nantou and Taichung area and a total of 700 schools nationwide were damaged. In the 2008 Sichuan Earthquake the rate of child mortality was substantial with the death of 19,000 students and the total destruction of about 7000 schools.

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Disaster and Development

Since time immemorial, disasters have been constant companion of human and recurring phenomena. Natural and man-made hazards continue to strike unabated and without notice turning into disasters due to lack of preparedness. Natural disaster is a high impact phenomenon, which has potential to wipe out years of development in a matter of few minutes or hours or over an extended period. Although occurrence of any natural hazards cannot be prevented but its impact can be certainly reduced with better preparedness, planning and mitigation strategies. That may ultimately save the life and livelihood of the people vulnerable to the risk of disasters. Thousands of people in more than 100 countries are periodically exposed to at least one event of earthquake, tropical cyclone, flood or drought. As a result of disasters triggered by these natural hazards, more than 184 deaths per day are recorded in different parts of the world (CBDRM, ADPC). Natural disasters are perhaps the most “unexpected” and costly overall in terms of loss of human lives and resources. In the last few years, natural disasters have claimed 100,000 lives costing above 140 billion US dollars (EMDAT). Some of the World deadliest disasters in known history are given in the Table 1 as below:

Table 1: World's Ten Deadliest disaster

Sl. No.	Name of Event	Year	Country and Region	Fatalities
1	Earthquake	1556	China, Shaanxi	830000
2	Earthquake	1731	China	100,000
3	Cyclone	1737	Calcutta, India	300000
4	Yellow River flood	1887	China	900,000–2,000,000
5	Messina Earthquake	1908	Italy	123000
6	Earthquake	1920	China, Gansu	235000
7	Great Kanto Earthquake	1923	Japan	142,000
8	Great Chinese Famine	1958–1961	China	15,000,000–43,000,000
9	Bhola Cyclone	1970	West Bengal, India & East Pakistan (now Bangladesh)	500,000
10	Tangshan Earthquake	1976	China	242,419

(Source: *Disaster Management in India, Ministry of Home Affairs Gol, 2011*)

People around the world constantly seek ways to reduce the disaster risks. Disaster Risk Reduction entails measures to curb the disaster losses by addressing hazards and people's vulnerability to them. Good disaster risk reduction happens well before disasters strike, but also continues after a disaster, building resilience to future hazards (DFID). Disaster risk reduction is thus defined as: "The concept and practice of reducing disaster risks through systematic efforts to analyse and manage the causal factors of disasters, including through reduced exposure to hazards, lessened vulnerability of people and property, wise management of land and the environment, and improved preparedness for adverse events" (Turnbull et al, 2013).

With increasing natural and manmade hazards, risk of population exposed to various hazards are also increasing in absence of adequate preparedness that required to be addressed to reduce the vulnerability and enhance the capacity of community to minimise the impact of disaster. "Hazard" is a physical event that can potentially trigger a disaster. If not coped with well, it becomes a disaster. "Vulnerability" is the degree to which communities are susceptible to loss or damage of life or property in the event of a disaster. "Capacity" is the resources/skills of communities to cope with a threat or resist the impact of a hazard and "Risk" is the probability/likelihood of a disaster happening. Thus,

Disaster risk reduction is viewed as the systematic development and application of policies, strategies and practices to minimise vulnerabilities and risks throughout a society to avoid (prevention) or limit (mitigation and preparedness) the adverse impact of hazards, within the broad context of sustainable development (UNISDR 2002). Disaster reduction policies should have a two-fold aim:

- To enable societies to be resilient to natural hazards;
- To ensure that development efforts do not increase vulnerability.

Increasing frequency of Disasters hold back development and progress as disasters are rooted in development failures. This is the core rationale for integrating disaster risk reduction into development. Natural Disaster Risk is intimately connected to processes of Human Development. Disaster losses may setback social investments aiming to ameliorate poverty & hunger, provide access to education, health service, safe housing, drinking water and sanitation or to protect the environment as well as the economic investments that provide employment & income. Disasters do not just happen – largely, they result from failures of development and proper planning which increase vulnerability to hazard events.

Table 2: Symbiotic Relationship between Disaster and Development

Disaster limit or destroy development	<ul style="list-style-type: none"> • Destruction of physical assets and loss of production capacity, market access and input materials. • Damage to infrastructure and erosion of livelihoods and savings. • Destruction of health or education infrastructure and personnel. • Deaths, disablement or migration of productive labour force.
Development causes disaster risk	<ul style="list-style-type: none"> • Unsustainable development practices that create unsafe working conditions and degrade the environment. • Development paths generating inequality, promoting social isolation or political exclusion.
Development reduces disaster risk	<ul style="list-style-type: none"> • Access to safe drinking water and food and secure dwelling places, which increase peoples resilience. • Fair trade and technology can reduce poverty, and social security can reduce vulnerability. • Development can build communities and broaden the provision of opportunities for participation and involvement in decision-making, recognising excluded groups such as women, enhancing education and health capacity.
Disasters creates development opportunities	<ul style="list-style-type: none"> • Favourable environment for advocacy for disaster risk reduction measures. • Decision makers more willing to allocate resources in the wake of a disaster. • Rehabilitation and reconstruction activities create opportunities for integrating disaster risk measures.

(Source: UNISDR 2004)

Non-risk informed Policy for development and institutions governing development can be found at all levels, from local and national institutions weakened by skills shortages increasing the rate of occurrence of disasters. Thus, both disaster management and development are interconnected and there is a symbiotic relationship between disaster and development as indicated in the table given below:

Integrating Disaster Risk Reduction in Development Programme

DRR refers to the measures used to reduce direct, indirect and intangible disaster losses. The measures may be technical, economic or social. DRR encompasses the two aspects of a disaster reduction strategy: 'mitigation' and 'preparedness'. Mitigation refers to measures aimed at reducing the risk, impact or effects of a disaster or threatening disaster situation, whereas, preparedness refers to the measures undertaken to ensure the readiness and ability of a society to forecast and take precautionary

measures in advance of imminent threat, and respond and cope with the effects of a disaster by organising and delivering timely and effective rescue, relief and other post-disaster assistance. 'Mainstreaming DRR' describes a process to fully incorporate the concerns of disaster preparedness, prevention and mitigation into development and post-disaster recovery policy and practice. It means completely institutionalising DRR within the development and recovery agenda.

DRR Integration has Three Purposes

- To make certain that all the development programmes and projects that originate from or funded by the Government are designed with evident consideration for potential disaster risks to resist hazard impact.
- To make certain that all the development programmes and projects that originate from or are funded by the Government do not inadvertently increase vulnerability to disaster in all sectors: social, physical, economic and environment.

- To make certain that all the disaster relief and rehabilitation programmes and projects that originate or are funded by the Government are designed to contribute to development aims and to reduce future disaster risk.

Disaster Management: Indian Scenario

The Disaster Management Act 2005 articulates the need for mainstreaming DRR into development planning. It mandates the Disaster Management Plans at the national and state levels to include measures to be taken for the integration of mitigation measures in the development plans at the respective levels. The Act also mandates every ministry/department at national and state levels to prepare disaster management plans and integrate disaster risk reduction elements in the ongoing development schemes.

The Legal Context

There has been paradigm shift in the approach to disaster management with the enactment of The Disaster Management Act, 2005 from the erstwhile relief centric response to a proactive prevention, mitigation and preparedness-driven approach for conserving development gains and to minimise loss of life, livelihood and property. Subsequently, a three-tiers structure was created to manage disaster at national, state and district level

The Act also prescribes for preparation of State, District and Local Disaster Management Plans and for incorporation of measures, suggesting as to how mitigation shall be integrated into development plans and projects.

The National Policy on Disaster Management 2009 seeks to build a safe and disaster resilient India. It categorically states that the NDMA will ensure the mainstreaming of disaster risk reduction in the development agenda of all existing and new developmental programmes and projects which shall

incorporate disaster resilient specifications in design and construction.

For the first time a separate chapter on disaster management was included in the Tenth Five Year Plan (2002–2007). The Eleventh Plan (2007–2012) as well as Twelfth Plan (2012–2017) reiterated the need for investing in prevention and mitigation which is economically and socially more beneficial than incurring expenditure in relief and rehabilitation.

The Ministry of Finance issued Guidelines in 2009, advising all Ministries/Departments of the central government that if the project involves creation or modification of structural/engineering assets, including land reclamation or changes to existing land use plans, the cost involved in prevention/mitigation of disaster(s), natural and man-made, would need to be included fully in the project cost.

Guidelines have been issued by the Ministry of Finance in January 2014 making provision for 10 per cent flex-funds within Centrally Sponsored Schemes (CSS) to be utilised inter alia for mitigation/restoration activities in the event of natural calamities in accordance with the broad objectives of the CSS in the respective sectors. The purpose of providing flexi-funds is to enable the state governments to address DRR concerns in developing schemes.

The Planning Commission has included DRR in the long-term restoration/recovery in different sectors by bringing the convergence of CSS, central plan and state plan while approving Uttarakhand disaster (June 2013) recovery package.

School Safety for safe learning environment

“School Safety” has been defined as the creation of safe environments for children starting from their homes to their schools and back. This includes safety from large-scale ‘natural’ hazards of geological/climatic origin, human-made risks, pandemics, violence, as well as more frequent and smaller-scale risks like fires, road accidents and other emergencies, and environmental threats that can adversely affect the lives of children (Ahmedabad Action Agenda for School Safety, 2007).

The agenda of school safety, as is visible in India today aligns well with Sarva Shiksha Abhiyan (SSA) which is the current flagship programme of the government, designed to further the Right to Education in the country. The mandate of SSA goes beyond the provision of education per se rather it aims to provide 'useful' and 'quality' elementary education to all children in the 6–14 age group. Besides the much desired efforts to improve the curriculum and provide the necessary training to different stakeholders involved in the process of education, about 33 per cent funds of SSA are spent on civil works including construction of schools, additional classrooms, Block Resource Centres (BRCs) and Cluster Resource Centres (CRCs). SSA actively hinges on community ownership of school based interventions by the involvement of womens' groups, Village Education Committee (VEC) members and members of Panchayati Raj institutions and includes a community-based monitoring system. The programme recognises a 'Habitation as a unit of planning' and is operationalised through the District Elementary Education Plans prepared by the district administration to indicate available funds/resources for various components under schemes like Mahatma Gandhi National Rural Employment Guarantee Act (MGNREGA), Area fund of MPs/MLAs, State Plan, foreign funding and other resources generated in the NGO sector.

In 2011, the National School Safety Programme was launched by the National Disaster Management Authority in partnership with the Ministry of Human Resource Development, covering two districts in each of the 22 seismically vulnerable states of India. The Vision of the programme is "To promote a culture of disaster preparedness in the school" through Policy level changes for ensuring safe school environments and sensitisation and capacity building of children and the school community and other stakeholders on disaster preparedness. The project also includes non-structural mitigation measures as well as demonstrative structural retrofitting in select schools. In parallel, several NGOs and INGOs have been working on school safety initiatives that have provided many useful lessons in developing the substantive aspects of the agenda.

Sarva Siksha Abhiyaan Development of a Policy paper of school safety.

- Introducing school safety as a part of the guidelines of SSA which is currently focusing on inclusive development.
- Developing model structurally safe designs for schools.
- Introducing School Safety in the Teacher's Training Curriculum.
- Training of Rural Engineers appointed under SSA Scheme as well as the SSA State Coordinators.
- Training of masons in rural areas.
- Construction of Technology Demonstration Units.
- Community Awareness.

Other Initiatives

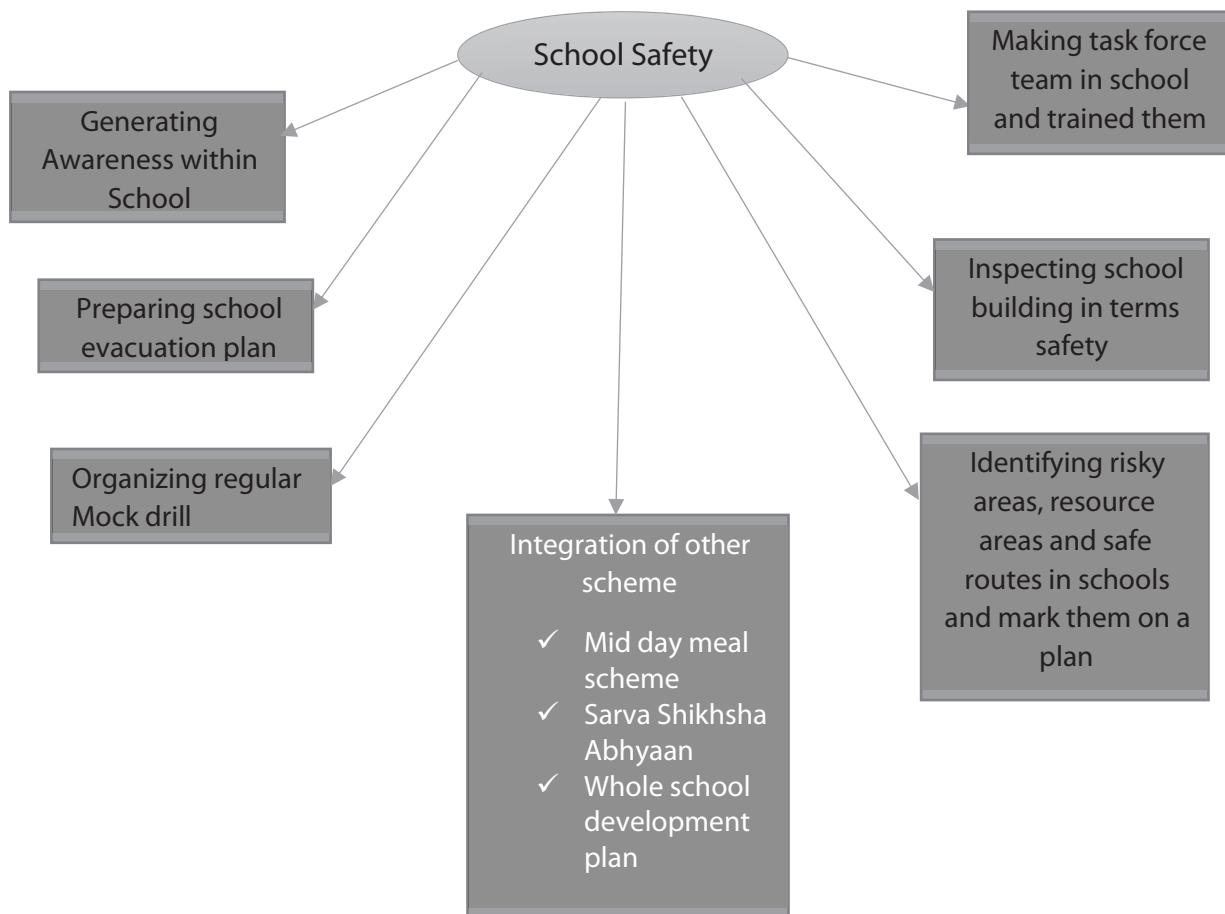
Whole School Development Plan (WSDP) is a document developed by MHRD is a master plan and base document for school educational and infrastructure work as well as its development in phases. Above manual has a chapter on "Ensuring Safety and Reducing Vulnerability" for Structural Mitigation. This manual may be referred for providing more information on structural safety in School.

An order has been issued by Directorate of Education, Delhi to all the schools for obtaining NOC on Fire Safety in School from Fire Department and conducting Mock drill in Schools through prescribed Standard Operating Procedure of Fire Department.

The State Policy on School Safety developed by Government of Haryana on Safety Measures for Government, Private Aided and unaided.

Critical Analysis

Since the enactment of The Disaster Management Act 2005 and initial interventions of UNDP with Government of India under GoI- UNDP Disaster Risk Reduction programme (2002–2008) covering 169 districts of India process of institutionalisation of DRR took shape in India. One of the important area of concerns of that programme was "School Safety". Gradually few of the other INGOs, NGOs, bilateral and multilateral agencies also started joining DRR with school safety an important sector of concerns.



However, it is observed that even though different stakeholders are putting varied efforts for making school safer in India and provide safe learning environment. Cases of children getting affected on daily basis may be noticed from all over the countries because of following reasons:

- Lack of awareness and training among school authority.
- Frequency of training and mockdrill is to be enhanced.
- Poor implementation of Disaster Management Plan at school level.
- Proper safety measures with adequate measures are not taken by the schools.
- An integrated approach for connecting all the measures taken at district administration is not implemented properly.

An integrated approach for school safety may be implemented to ensure safer learning environment for the children from home-school-home.

Best Practices in India School Safety Programme in Delhi NCR

Super Highway Lab, Popularly known for its product Shuttl an Application based office bus in association with Disaster Management Cell (DMC) Noida was organising School Safety programme in Schools of Gautam Budh Nagar District. Initially officials of Shuttl and DMC Noida went schools and tried our best to convince head of institutions to organise the School safety programme. After a long fight, Army public School Noida agreed to organise the programme and thereafter there were flood of request

came from different schools of Noida. (<http://www.thehindu.com/todays-paper/tp-in-school/safety-first-workshop-organised/article8562256.ece>) There after we organised 9 more programmes in different schools District. It was thought that whenever earthquake will strike it will certainly not strike school wise and hence our all schools of a region should be ready to evacuate in case of an earthquake.

Encouraged with the response, need and success of School Safety Programmes/Evacuation Drills, we planned “a Mega School Earthquake Evacuation Drill in 101 Schools in the Noida, Greater Noida & Yamuna Expressway of the Gautam Budhha Nagar district On the Same Day at the Same Time”, simulating that an earthquake of Richter 6.5 scale or above has occurred and how to safely evacuate the classroom. After initial Planning and discussions, on March 14, 2017; a meeting presided by the District Magistrate was held with the school principals and their resource personnel where in the final dates for this mega event was decided to be held on April 27, 2017 at 11:00 AM onwards.

Purpose of this Mega-Event was to send a message across the Country, how important is the School Safety Programmes/Evacuation Drills in DRR activities, to safeguard our future, the children. This was unique, first of its kind, School Evacuation Drill on such a large scale, to be conducted in the Country and probably around the World as well, by a Local Authority.

Objectives of the Mega School Earthquake Evacuation Drill are as below:

- Enable students to safely evacuate the schools/classrooms in case of any emergency and or disaster, especially during the earthquake and fire.
- To initiate policy level changes for ensuring safe school environment.
- To sensitise children and the school community on disaster preparedness and safety measures.
- To motivate direct participation of key stakeholders in activities that would help improving coordination towards a disaster resilient community.
- To promote capacity building of officials, teachers and students.
- To carry out Information, Education and Communication (IEC) activities in schools and associated environment.

- To enhance conceptual understanding of all the stakeholders especially the Children on various aspects of DRR and School Safety from an inclusive perspective.
- To develop competencies of the participants to undertake DRR measures in schools and in day-to-day hazards including road accidents.
- To enable the participants to develop the School Disaster Management Plan as per Govt of India template.

Strategies for Implementation

- Organisers in association with the district authorities listed out 110 schools (both Govt. and private schools) in the Noida, Greater Noida and Yamuna Expressway of Gautam Budhha Nagar District.
- Each school was requested to nominate a coordinating personnel/floor marshals. After finalising the same, a Table-Top Exercise along with small scale mock drills with the school representatives/floor marshals between March 28 to April 3, 2017 to make the processes and methodologies clear to them.
- About 150 number of resource persons/volunteers from various disaster management communities, non-governmental organisations and also some of the best volunteers get trained by organisers through the Table Top Exercises.
- Thereafter the school representatives/floor marshals were advised to do a few rehearsals in their respective schools in association with the resource persons/volunteers pre-trained by the organisers.
- Different whats app groups were created by the Disaster Management Cell, Noida for resource personnel/volunteers, school's resource personnel/floor marshals, principals of the participating schools, core group members to keep flow of information dissemination among teacher.
- Organisers approached (NDRF) to provide 110 competent personnel at least one at each of the

participating school as an observer and also a few personnel at the command and control centre.

- Competent personnel from National Disaster Management Authority (NDMA) & National Institute of Disaster Management (NIDM) were also invited as observers for this Mega School Earthquake Evacuation Drill.
- All emergency services like police, fire, health departments were send advisories prior to be prepared and put on high alert to deal with any eventuality, if occurred, during the final drill.
- For the successful conduct of the drill a command and control centre was established in Emergency Operations Centre (EOC) of Disaster Management Cell, Noida.
- Two-way parallel information management system was established to conduct the final drill and efficiently handle any exigency during the drill. One volunteer/resource personnel of Disaster Management Cell Noida was deployed at each of the participating school and similarly one NDRF personnel was also deployed at each school.
- For each group of 10 volunteers/resource personnel an Area Manager was decided and made responsible to coordinate with them and report to the Incident Commander. Similarly, on each of the 10 NDRF personnel deployed in Schools one Team Commander was made responsible to coordinate with them and report to the Incident Commander at the Command & Control Centre
- After successful completion of Table-Top Exercises and rehearsal drills and setting up of an efficient command and control centre, the Final Mega School Earthquake Evacuation Drill was conducted as per pre-defined processes and methodology on April 27, 2017, at 11:00 hrs in 110 schools in which more than 80,000 people participated including students, teachers, resource personnel, volunteers and observers from NDRF, NDMA & NIDM.

The drill was exactly started at 11:00 AM in all the 110 schools and after 10 minutes of do's and don'ts about various disasters and how to safely evacuate the classroom. Students returned to their classes and routine school life started. At 11:20 AM emergency bell of schools rung indicating that an earthquake has occurred. Students immediately practiced Drop, Cover

and Hold for 10 seconds (as the simulated earthquake was for 10 seconds). After the tremors stopped, students safely evacuated the classroom without any stampede, and assembled in the safe and open area. Head counts were done by the respective class teachers/heads in presence of the resource personnel/volunteers and NDRF personnel.

The Final Drill

Thereafter, emergency team of schools searched for trapped students, if any. After announcement of situation of normalcy by the Principal, students returned to their classes and routine school life began again. The total drill lasted for 45 mins to one hour depending on strength of student in the school. Safe and methodological evacuation taken minimum time and about 4200 students evacuated the school barely in 4 mins in Apeejay School Noida.

The Mega Earthquake School Evacuation Drill conducted successfully on April 27, 2017, on the Same Day and at the Same Time by the Disaster Management Cell, Noida without any eventual mishap in which 110 Schools and more than 80,000 students, teachers, faculty, resource personnel, volunteers and observers of NDRF, NDMA & NIDM participated; claims to be Country's and World's largest School Earthquake Evacuation Drill conducted by any Local Authority towards achieving a disaster resilient regime and safe schools.

Conclusion

The ability of the community to accelerate the safety process for children begins with its efforts from home to school and back to home that includes pre-disaster preparedness, capacity building and mitigation. These efforts result in resilient community including children with an improved ability to withstand respond to and recover from disasters. A successful school safety process can be implemented by understanding of risks and vulnerabilities that might endanger school and accordingly plan for mitigating the risk with an integrated approach of all sectors. School safety provides a platform for multidimensional process guided by development principles and seeks to build

sustainable development opportunity for minimising the risk of children towards various hazards.

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Health and Disaster

India's Response to Healthcare Needs in the Backdrop of Calamities and Outbreaks: Building Resilient Healthcare Systems

Abhijeet Mishra^a and Anuranjika Mishra^b

ABSTRACT: Natural calamities have occurred since antiquity however, they are on a rise in today's world due to high rate of climate change. These calamities have caused widespread damage and disruption not only in India but worldwide. With its geo-climatic conditions and socio-economic vulnerability, India is one of the most disaster-prone countries in the world causing severe damage to life and property. All these disasters either man made or natural lead to loss of life, massive social disruption and collapse of basic services such as health care or education etc.

The risk of outbreaks is often presumed to be very high in the chaos that follows natural disasters. However, the risk factors for outbreaks after disasters are associated primarily with population displacement. The availability of safe water and sanitation facilities, the degree of crowding, the underlying health status of the population, and the availability of healthcare services all interact within the context of the local disease ecology to influence the risk for communicable diseases and death in the affected population.

In the backdrop of the risk of outbreaks due to disaster what is most required is a robust and resilient healthcare system. However, the term resilience has diverse conceptual underpinnings such as environmental disciplines view resilience as the amount of disturbance an ecosystem can absorb and remain stable; policy positions view resilience as the ability to absorb disturbances and thrive. Psychology seeks a multidisciplinary understanding of resilience as an intrinsic force with multiple inputs and drivers. Resilience as defined by these fields points to the value of a wider, inclusive framing that acknowledges complexity and change beyond shock absorption. Resilient health systems are able to protect themselves and human lives from the public health impact of disasters and are critical to achieving good health outcomes before, during, and after disasters.

Traditional resilience-building initiatives have focused on infrastructure and environmental sectors. Although the ultimate goal of these efforts is to protect human life, health, and economic vitality, too often a commensurate focus on the people served by this infrastructure is lacking in preparedness plans and frameworks. Certainly, some traditional preparedness activities remain essential, such as having sufficient supplies to enable survival for 72 hours unaided, having a plan for evacuation, and having a plan for family reunification. Although these actions foster prepared individuals and families, they are necessary but not sufficient to build individual or community resilience. However, a deeper operational integration of resilience will require work specifically in the functional areas of preparedness, response, recovery, and mitigation.

This paper thus explores the development of the concept of resilience and resilient healthcare system. It would then focus on and trace historically India's response to healthcare needs in the backdrop of natural as

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well as man made calamities such as floods, earthquake, droughts, war and outbreaks such as bird flu, Ebola and several others and efforts made to develop a resilient healthcare system in India.

KEYWORDS: resilience, resilient healthcare system, natural calamities and outbreaks building resilient healthcare system in india, healthcare needs

Introduction

Natural calamities such as floods, droughts, cyclones and earthquakes around the world have occurred since antiquity however, they are on a rise in today's world due to high rate of climate change. These calamities have caused widespread damage and disruption not only in India but worldwide. With its geo-climatic conditions and socio-economic vulnerability, India is one of the most disaster-prone countries in the world causing severe damage to life and property. During the last thirty years time span the country has been hit by 431 major disasters resulting into enormous loss to life and property. According to the Prevention Web statistics, 143039 people were killed and about 150 crore were affected by various disasters in the country during these three decades. As per one of the reports, in 2017 India recorded the seventh highest levels on internal displacement caused by disaster and conflicts. India moved to the sixth position in 2018 before the monsoon season which included havoc created by floods in Kerala, Nagaland and Karnataka since July. India also ranked amongst the top ten countries for internal displacement due to conflict. All these disasters either man made or natural lead to loss of life, massive social disruption and collapse of basic services such as health care or education etc. The country is prone to disasters due to number of factors; both natural and human induced, including adverse geo climatic conditions, topographic features, environmental degradation, population growth, urbanisation, industrialisation, non scientific development practices etc. The factors either in original or by accelerating the intensity and frequency of disasters are responsible for heavy toll of human lives and disrupting the life supporting system in the country (GOI, 2011).

This paper thus explores the development of the concept of resilience and resilient healthcare system. It would then focus on and trace historically India's

response to healthcare needs in the backdrop of natural as well as manmade calamities such as floods, earthquake, droughts, war and outbreaks such as bird flu, Ebola and several others and efforts made to develop a resilient healthcare system in India.

Understanding Concepts: Disaster and Epidemics

A disaster is an extreme disruption of the functioning of a society that causes widespread human, material, or environmental losses that exceed the ability of the affected society to cope with its own resources. Disasters are sometimes classified according to whether they are "natural" disasters, or "human-made" disasters. The Disaster Management Act, 2005 defines disaster as "*a catastrophe, mishap, calamity or grave occurrence in any area, arising from natural or man made causes, or by accident or negligence which results in substantial loss of life or human suffering or damage to, and destruction of, property, or damage to, or degradation of, environment, and is of such a nature or magnitude as to be beyond the coping capacity of the community of the affected area*".

The risk of outbreaks is often presumed to be very high in the chaos that follows natural disasters. However, the risk factors for outbreaks after disasters are associated primarily with population displacement. The availability of safe water and sanitation facilities, the degree of crowding, the underlying health status of the population, and the availability of healthcare services all interact within the context of the local disease ecology to influence the risk for communicable diseases and death in the affected population.

Epidemics are public health emergencies which disrupt routine health services and are major drain on resources. Epidemics include viral infections disease (meningitis, measles, dengue, polio, typhoid fever etc.) and Bacterial infectious diseases (cholera, diarrhea etc.) The main causes for epidemic are non-availability

of clean and hygienic drinking water contamination of drinking water sources, lack of awareness about sanitation, unhygienic food, over-crowding, biological conditions in addition to ecological factors. Besides direct costs in epidemic control measures and treatment of patients, the indirect costs due to negative impact on domestic and international tourism and trade can be significant. For example, plague which was not reported from any part of India for almost a quarter of century, caused a major outbreak in Beed district in Maharashtra and Surat in Gujarat in 1994 and resulted in an estimated loss of almost US\$ 1.7 billion (GOI, 2011). Several factors related to microbes, environment and host susceptibility contribute to the occurrence of epidemics. Because of prevalence of these factors, developing countries including India are frequently affected by epidemics/outbreaks which result in high morbidity and mortality and affect the public health and economy adversely. Emerging infectious diseases (EIDs) are diseases of infectious origin whose incidence in humans has increased within the recent past or threatens to increase in the near future. Epidemics or pandemics caused by these emerging and re-emerging infections often take a heavy toll of life and by rapidly spreading across borders are responsible for much concern and panic. Besides health, emerging infections also present a grave economic, developmental and security challenge.

More recently, in March 2009, cases of H1N1 influenza were first reported in Mexico, followed by spread to the United States and then to rest of the world including India. By September, nearly all countries had reported H1N1 virus to the World Health Organization, with more than 17,000 deaths; of which, 12,000 were in the United States alone. In the recent past, India has witnessed many large outbreaks of emerging infections and most of them were of zoonotic origin (Dikid, Jain, Sharma, Kumar, & Narain, 2013).

Defining Resilience and Resilient Healthcare System

In the backdrop of the risk of outbreaks due to disaster what is most required is a robust and resilient healthcare system. *Victoria Haldane, Suan-Ee Ong, Fiona Leh-Hoon Chuah* argue that resilience in the health systems

context has primarily been framed as a health system's capacity to recover and absorb shocks and sustain gains, often measured through health outcomes. However, the term resilience has diverse conceptual underpinnings. Environmental disciplines view resilience as the amount of disturbance an ecosystem can absorb and remain stable; policy positions view resilience as the ability to absorb disturbances and thrive. They further argue that stability and shock absorption are also found in disaster management and engineering; however, resilience engineering strives to anticipate future failures, while recognising that changing landscapes bring complexity requiring agility and novel responses. Psychology seeks a multidisciplinary understanding of resilience as an intrinsic force with multiple inputs and drivers. Resilience as defined by these fields points to the value of a wider, inclusive framing that acknowledges complexity and change beyond shock absorption.

Resilience has become a popular theme across many disciplines and is a term widely used with varying symbolic meaning. At its core, resilience embodies a vision of healthy individuals and thriving communities, and a resilience-centred framework provides concrete actions people, organisations, and institutions can take to promote the sustainable and long-term well-being of communities in the face of adversity and disaster. This concept of resilience is gaining traction in tandem with the recognition that the complexity of human communities, and the challenges they face, is accelerating. At the same time, large, global forces are changing the kinds of challenges human communities face. The frequency, cost, and complexity of both human-caused and natural disasters are increasing. The National Climate Report released in 2014 declares that impacts of climate change are a current concern in addition to being a defining global challenge over the coming decades. Certain types of extreme weather events with links to climate change have become more frequent and/or intense, including prolonged periods of heat, heavy downpours, and, in some regions, floods, fires, and droughts. These trends will increase as climate change progresses over the coming decades, and new challenges will emerge because changes in climate interact with other environmental, economic, and societal factors potentially involving threats to food

production, population shifts, and recurrent physical and psychological exposure to natural disaster (Wulff, Donato, & Lurie, 2015).

Resilience can serve as a galvanising concept for a more sustainable approach that builds the capabilities that foster day-to-day community vitality as well as adaptability in the face of large-scale disaster. Strong interpersonal bonding, bridging social cohesion between individuals and organisations contributes to community resilience. Institutions such as schools or community centres that are the go-to places for those who need help or assistance under normal circumstances can provide a valuable forum where community members can connect under extreme circumstances. Their ability to survive, stay open, and serve people in need is vital. Psychological resilience is a key building block of overall community resilience. Bonnano has demonstrated that the most common reaction among adults exposed to such events is a relatively stable pattern of healthy functioning coupled with the enduring capacity for positive emotion and generative experiences. Although resilience is prevalent, a still significant number of individuals will experience adverse and potentially serious behavioural health effects. In addition to the challenges faced by individuals with access and functional needs, the social determinants of health influence how individuals will fare during and after a disaster or emergency. Individuals at higher risk of health, behavioural health, economic, and social disruption before a disaster are at increased risk when these issues are exacerbated by injury, trauma, or disruption of vital services.

Health system resilience can be defined as the capacity of health actors, institutions, and populations to prepare for and effectively respond to crises; maintain core functions when a crisis hits; and, informed by lessons learned during the crisis, reorganise if conditions require it. Health systems are resilient if they protect human life and produce good health outcomes for all during a crisis and in its aftermath.² Resilient health systems can also deliver everyday benefits and positive health outcomes (Kruk, Myers, Varpilah, & Dahn, 2015). Response to a crisis, be it a disease outbreak or other disruption resulting in a surge of demand for health care (e.g. a natural disaster or a mass casualty event) needs both a vigorous public

health response and a highly proactive and functioning health-care delivery system. Health-care systems are complex adaptive systems and resilience is an emergent property of the health system as a whole rather than a single dimension. Building resilience is thus context-dependent and iterative, needing advance assessments of system capacities and weaknesses, investments in vulnerable components of the system before a crisis, reinforcements during the emergency, and review of performance after a crisis. legal and policy foundation to guide the response and establish accountability. The implementation of International Health Regulations, which call on countries to build core public health capacities and establish a means of coordinating a response to health emergencies with regional and global partners, is a prerequisite for effective emergency response. there is a need for a strong and committed health workforce, characterised by health personnel who show up for work that might be difficult and dangerous. Establishing such a workforce begins with training and deployment of a sufficient number of doctors, nurses, managers, and outreach workers. Just as strong social capital in communities promotes individual psychological resilience after mass trauma, social capital in the health system promotes system-wide recovery from crisis.⁹ In the health system context, social capital has two dimensions: a sense of worth, community, and responsibility among health actors (clinicians, managers, engineers, outreach workers)¹⁰ and an inclusive and robust community engagement with the health system.^{10,11} Health systems that earn the trust and support of the population and local political leaders by reliably providing high-quality services before crisis have a powerful resilience advantage. Strong management of district level health systems is key to gaining that trust. Resilient healthcare system should be aware, diverse, self-regulating, integrated and adaptive. According to Olushayo Olu A resilient health system is one which is able to effectively prepare for, withstand the stress of, and respond to the public health consequences of disasters. Resilient health systems are able to protect themselves and human lives from the public health impact of disasters and are critical to achieving good health outcomes before, during, and after disasters.

Resilient health systems could reduce vulnerability to the public health consequences of disasters. effective measures to address the public health consequences of droughts such as good immunisation coverage, adequate nutrition, and health services delivery including clinical management of severe acute malnutrition, ongoing surveillance of nutrition indicators, and effective risk communication about malnutrition would ensure that such situations do not deteriorate into famines. Similarly, safe and well-sited health facilities, good health sector disaster mitigation, contingency and business continuity planning, adequate essential medicines, and supplies for trauma care, and well-trained health staff would ensure that the consequences of earthquakes do not result in major public health disasters.

Traditional resilience-building initiatives have focused on infrastructure and environmental sectors. Although the ultimate goal of these efforts is to protect human life, health, and economic vitality, too often a commensurate focus on the people served by this infrastructure is lacking in preparedness plans and frameworks. The centrality of health to both societal and individual wellness suggests that a commitment to building human resilience should be at the forefront of any workable model. Certainly, some traditional preparedness activities remain essential, such as having sufficient supplies to enable survival for 72 hours unaided, having a plan for evacuation, and having a plan for family reunification. Although these actions foster prepared individuals and families, they are necessary but not sufficient to build individual or community resilience. However, a deeper operational integration of resilience will require work specifically in the functional areas of preparedness, response, recovery, and mitigation.

In view of this, the WHO has made several recommendations for national strategies including the need to strengthen epidemic preparedness and rapid response, public health infrastructure, risk communication, research and its utilisation, and advocacy for political commitment and partnership building. Several initiatives are underway in the country such as strengthening surveillance and rapid response mechanisms, building capacity in epidemiology etc.

India's Response to Healthcare Needs in the Backdrop of Calamities and Outbreaks

India is vulnerable to both natural as well as manmade disasters and calamities. Over the decade of the 1990s, both the number and severity of such events have increased. Weather events can be classified as extreme on the basis of various factors such as the impact, the socio-economic losses, environmental degradation and long-term damages etc. With more than 70 per cent of India's population relying on agriculture directly or indirectly, the impact of extreme weather on human life and other living beings is critical.

India has been dealing with biological outbreaks including the plague, dengue and chikungunya. Between 1967 and 1993, there were reports of two separate outbreaks of plague, though neither of the incidents was confirmed as plague. In recent decades, plague has simply retreated to rural natural foci of infection, involving mostly wild rodents and fleas with occasional spill overs to commensal hosts and humans in villages and towns. Between August and October 1994, India was struck by two outbreaks of plague in succession- one of suspected bubonic plague in the Beed district of the state of Maharashtra and the other of the suspected pneumonic plague in the Surat city of the state of Gujarat. In the mid August, the first warning signs of ratfall (domestic rats falling from the rafters onto the floors of the dwellings and dying there) and unusually high flea nuisance were reported in Mamla village of Beed district. This was followed by the people turning up to the health centres with tumors in their armpits and groins, a typical symptom of bubonic plague. By mid September, as much as 10 per cent population of the village had developed the symptoms of bubonic plague. Once patients were identified, their family members were given prophylactic dose of tetracycline and their homes and surroundings were dusted with pesticide. The local community were explained about the seriousness of the situation with the request to report any case of suspected fever, blood stained sputum, breathlessness, chest pain, sore throat and persistent cough. Check points were

established at railway stations and airports in large number of cities across India to monitor incoming Surat inhabitants. Hospitals in various cities and towns were also alerted to receive plague infected patients, just in case the disease spread to new areas. In many cities, people rushed to buy surgical masks, tetracycline and other drugs. As a precautionary measure, schools and places of public entertainment were closed by the administration.

The incident of plague caused a huge financial loss to the economy of India. While anxiety was being displayed by the international community, the authorities in India did pretty little to calm the situation. There was clear confusion and lack of communication between the agencies involved in crisis management like health agencies, political leadership, bureaucracy and media. After the outbreak of the plague, India has taken steps to prepare for future plague incidents.

Dengue fever is another disease which has occurred in India several times in India. The first major outbreak of dengue was reported in 1963–64. The largest recorded outbreak of dengue was recorded in Delhi in 1996 then in 2003, 2006 and 2010 during the Commonwealth games. As a result of the dengue scare, despite the preparations by the government, there were serious fallouts in New Delhi. There were at least two primary implications – on the Commonwealth, and second on tourism and economy. The Delhi government pursued the following strategy to handle the dengue threat during the commonwealth games. This includes prevention, creation of awareness, and meeting the challenge. As evident in the case study, outbreaks of dengue fever in India have become a regular feature and in spite of concerted and sincere efforts by the government and the community, we have not been able to prevent occurrence of dengue fever even in the capital of the country, where health care facilities are definitely better compared to many backward regions of the country. Various factors like an ideal climatic condition large and susceptible population and abundant breeding sites for the mosquito provide the backdrop for these outbreaks.

The year 2013 witnessed two major events, the Uttarakhand Flash Floods, mainly affecting the state

of Uttarakhand and the Cyclone “Phailin” affecting two coastal states of Odisha and Andhra Pradesh. In the cyclone Phailin, the preparedness and response of all stakeholders was excellent and it received world-wide appreciation. During the Uttarakhand Flashfloods all the essential supplies like food, drinking water, medicines, kerosene oil, solar lamps, etc. were continuously provided by air dropping as well as by surface means. A total of 69 relief camps were run, where 1,51,629 pilgrims/local residents were looked after. Some camps continued operating beyond the emergency phase for the local residents. Forty-three medical teams comprising of 313 doctors and 4977 para-medical staff, were deployed and essential medicines, bleaching powder and chlorine were regularly supplied. The Health Department of the State coordinated the effort to prevent outbreak of any epidemic. As a result, there was no incidence of outbreak of any epidemic or infectious disease in the State, in spite of the mass cremation of dead bodies and disposal of animal carcasses, or breakdown of potable water supply in some areas (Satendra, Kumar, & Naik, 2014).

Off lately India has seen several natural calamities such as the floods in Kerala and Assam, landslides in Himachal Pradesh and Mizoram in 2018 and outbreaks of diseases such as Nipah virus, Chikungunya, Zika virus and so on. Government of India has taken several steps to control outbreaks of these diseases as well as diseases post natural calamities. In case of Ebola, the Government of India along with the state governments have demonstrated high level commitment and have undertaken preparatory activities such as monitoring and entry screening at airports, contact tracing, setting up pf surveillance system etc.

India has been working towards developing strong and resilient health systems to mitigate any vulnerability to health crisis. It is committed to ensuring quality and affordable healthcare for all and strengthening the health system. R Srinivasan argues that health status of any population is not only the record of mortality and its morbidity profile but also a record of its resilience based on mutual solidarity and indigenous traditions of self-care - assets normally

invisible to the planner and the professional. Such resilience can be enriched with the State retaining a strategic directional role for the good health of all its citizens in accordance with the constitutional mandate. Interdependence between private, public and indigenous health care system will lead to a resilient healthcare system in the Indian scenario. Indigenous health systems must be promoted to the extent possible to become another credible delivery mechanism in which people have faith and away from the vast number of less than fully qualified doctors in rural areas to get skills upgraded. Public programmes in rural and poor urban areas engaging indigenous practitioners and community volunteers can prevent much seasonal and communicable disease using low cost traditional knowledge and based on the balance between food, exercise, medicine and moderate living.

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Disasters and Exemplified Vulnerabilities in a Cramped Public Health Infrastructure in India

Baljeet Kaur^a

ABSTRACT: The varied connotations to the term ‘Development’ have been channeled through perception. The perception of a political stakeholder differs from that of a rich businessman, and again, from those who are lesser endowed. There is a pressing need for the government, to identify and maintain checks and balances between exploitative and responsive governance.

Disasters impede this process of growth, and in some manner, give rise to these perceptive mechanisms. In times of a catastrophe, what might have felt like a milestone in the past may seem as a burden and a liability at present. It is highly likely for income to play a role in determining the parameters for development, i.e. rich countries might enjoy the benefits of spending on a technology that seems like a far-fetched concept for the low-income countries. These conditions thus, predispose certain vulnerabilities to nations with limited resources. Despite of all the challenges that present themselves, there are certain aspects to development that cannot be ignored, primarily, the effective proliferation of education and health sector that constitute a part of the socio-economic component of development. The shift from a purely GDP oriented outlook to growth, to the conception of a rather socially competent nation is an essential turn-around over the years.

Sustainable Development Goals, and Millennial Development Goals have presented to be a trademark in bringing about this change in the global discourse on Development. Human Development Index measures the progress of a country based on parameters that calculate capabilities of their population and acts as a bridge between the notions of achieving economical success to actually creating scenarios of equity based growth.

The extension of the healthcare sector is an integral part of this holistic growth, while the customer base has largely financed the industry; the obligation on the hand of government needs to increase. The out of pocket spending by patients covers the finances of the sector by 64.2 per cent. (NSSO, 2014 report). The lesser amount of government spending in the healthcare system is a drawback and has effects on the Industry in a negative frame in a large manner, only 28.6 per cent of Total Health Expenditure is financed by Govt. of India and therefore, calls for the need for better financing mechanisms in the country in the form of insurance schemes and a smoother flow of the already existing policies and frameworks. The statistics of public and private financing in healthcare all point out towards a lack in quality of services and moreover, a lack of interest in engaging in an efficient manner as a cascading effect of an infrastructural deficiency. The increasing pressure on hospitals to maximise revenues and minimise costs has created a bump in providing efficient and sustained health care to the patients and the situation worsen in times of adverse events (Weismann, et al, 2007). The Institute of Medicine has defined two major goals in redesigning the system by improving patient safety and enhancing the efficiency, which is been contradicted by the large shortage in demand and supply chain.

In India, out of the total 1.37 million hospital beds, only 540,000 beds are available in the public hospitals, out of which only 50 per cent are functional and are concentrated in the top cities. The state of public hospitals

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in India is poor in terms of infrastructure and more so deficient with respect to the staff. In times of disasters, these resources are overwhelmed greatly and are an indication of the amount of pressure it creates on the already vulnerable section. The implications of living in a community with inherent lack of resources, financial and intellectual, and in the shadows of a loosely organised political institutional structure is grave. The paper focuses on the aggravation of such conditions and the factors that cause such intensified vulnerabilities. It further looks into the role of government policies in defining the healthcare structure, both rural and urban and the amount of responsibility that it diversifies within public and private institutional setup.

In the debate of private v/s public hospitals, the paper presents causes that create a barrier on effective utilisation of benefits provided, and further constructs the viewpoint that though expensive, private healthcare services provide more assurance to the population in general. The over-crowding of these public institutions in times of epidemics or otherwise, is a self-indication of the dearth of infrastructure and the kind of impacts the interventions has had in terms of alleviating such grievances. The crises that follows us is to ensure whether the plans initiated are undertaking their objectives seriously or not and whether they remain relevant in the context that they operate in. The identification of privatisation as a quality enhancement process to the healthcare services and understanding the outcomes of a corporatised health sector is also important in the current scenario seeing the amount of investment the government envisages. The role of private sector can be increased but does it again deepens into a capitalist makeover of the institutional setup and gives the state an opportunity to shed responsibility in times of adverse events is a question we need to ask and enquire upon at present, to realise the potential that we see in terms of development in our country.

The several debates that I have tried to analyse and interpret include those of the intersections the individuals of the country and the lawmakers have crossed in terms of developmental projects and whether these promises hold true in terms of concrete reality. The depth of understanding and entering these discussions is only a gateway to more pertinent questions of whether the present infrastructure has dwindled due to disasters in the past? Are we actually moving to building resiliency or is it just a mock-up present on paper only?

The paper reflects qualitatively on several government reports on health and the state of the hospitals presented within various contexts of Disasters in the past. The analysis of the National Rural Health Mission, National Urban Health Mission and various others programmes initiated by the Government of India and the scope that it has to remove the present day struggled faced by an over-crowded and pressurised public sector healthcare structure.

KEYWORDS: disasters, development, healthcare policies, public health infrastructure

Introduction

The ability of a state to provide basic education and healthcare is an important characteristic of a developed nation, as socio-economic parameters have gained vitality in the discussion and discourse on development, and are essential parameters to demarcate the shortcomings and fallouts of a governing regime. In a country that spends only 1.4 per cent of its GDP on healthcare¹, it is important to question the vision that the state structure envisages for their population and the healthcare system. The development of a nation is incomplete without considering the progress of all its components and by constantly making an effort to

improve the quality of service, ensuring equitability and accessibility to all citizens.

There is a growing concern with environment uncertainties, and social vulnerabilities make certain sections susceptible to higher damage than others. Sustainable Development Goals, therefore, focus on eradicating causes of social vulnerability by providing equitable access to basic infrastructure, and thus, a resultant change in the way we perceive development, being an improvement in the holistic human standards, and not just economical gains. The uneven accessibility of resources has been rampant in growing economies, and needs to be altered in order to achieve uniform development. The question therefore, remains of

perceptive understanding. In further section, the paper explores the efficiency of private and public healthcare sector, and questions the exploitation of the already vulnerable. Health is a state subject; therefore, center's contribution in improving the conditions has been conflicting, and rather vague. The following paper, therefore, presents arguments from the angle of policy undertaking and the multi-dimensional nature of social development. It deepens the understanding on the existing vulnerabilities, and questions the resiliency of the systems to disasters.

Healthcare Policies in India: Implications and Challenges

Securing public health and characterisation of the declining health statistics in rural India as the need of the hour, drove the resultant shift in policy planning and implementation in the sector. The governmental schemes have been portrayed as being directed at populations that are devoid of basic health benefits and thus aim at enhancing the reach of these policies as well as the quality of healthcare. However, privatisation of health system structure, as explored in the further sections, has gained momentum in recent times as private entities are considerably better oriented towards quality and performance based service. In the race of gaining economic benefits, and rising above the competing countries, the ideological shift has become a means to an end approach rather than an all-inclusive endeavour.

There are several challenges to the approach as it negates the responsibilities of the state and results in inequitable distribution of services on a global index, it has shown some advantages, thus, bypassing the checks that should be considered while constructing such policies.

Understanding the trajectory of expenditure, the health expenditure had declined from 1.3 per cent of GDP in 1990 to 0.9 per cent of GDP in 1999. The state-central ratio of health expenditure was 85–15 per cent respectively. National Rural Health Mission (NRHM) was launched in 2005, with a vision to improve the health status of rural India, which is predisposed to vulnerabilities due to lack of accessibility to quality healthcare (Gopalakrishnan & Immanuel, 2017).

The aim of NRHM was to also make healthcare affordable, effective, accountable, and reliable, with special focus on 18 states (North Eastern States + Empowered action group states [socioeconomically backward states - Bihar, Chhattisgarh, Jharkhand, Madhya Pradesh, Orissa, Rajasthan, Uttarakhand, and Uttar Pradesh] + 2 hilly states (Himachal Pradesh, Jammu & Kashmir). The National Health Accounts (NHA) 2004–05 data shows that at the State level, 38 per cent of health expenditure is spend on primary health care, 18.67 per cent on secondary health care, 21.84 per cent on tertiary health care and rest on direction and administration and other services. (Gopalakrishnan & Immanuel, 2017)

Studying the reports by World Health Organization report, (2018) suggests that the situation has changed for better, with number of under 5 deaths reducing from 2049 in 2005 to 1139 (thousand) in 2015, the infant mortality rate has reduced to over the course of 10 years, from 60 per cent in 2005 to 35.3 per cent in 2015, though the number still remains large, and there are aspects that do need attention.¹ The presence of ASHA workers in villages, accredited social health activists does make a difference, and has been observed with the changing statistics over the years of Infant Mortality Rate, Maternal Mortality Rate and Under 5 mortality rate, but the broader question remains, as to whether there is a loophole that is concerning when it comes to providing opportunities. Though, there have been cases where the vulnerabilities of the poor has been high-lightened even in the present scenario, in 2016, Dana Majhi, a tribal from Orissa had to carry his wife from the hospital due to the lack of ambulance, in May 2017, a similar incident occurred in Ettawah, Uttar Pradesh to a man who had to carry his deceased son on his shoulders. The cases are many and the fact that these incidents are encountered is a depiction of the stark reality, which should be enough for us to question the kind of policies that have been implemented, and the emergency of bringing a change, in order to be capable of fulfilling the sustainable developmental goals. (Mishra & Agarwal, 2017)

The draft National Health Policy 2015 had emphasised, “universal access to good quality health-care services without anyone having to face financial hardship as a consequence”(Dey, 2018). However,

the 2017 National Health Policy has maneuvered the control to the private entities, by increasing the fund allocation to them. Thus privatisation of health system has become a major focus of the current policy initiatives.

Programs like Janani Suraksha Yojana and Pradhan Mantri Surakshit Matritva Abhiyan (PMSMA) were envisaged to control the increasing maternal mortality rate, though with its implication as well, India could not achieve the Millennium Development Goals (MDGs) significantly in the past. National Urban Health Mission, launched in 2013, a counterpart of NRHM (sub sections of National Health Policy) is coined to require Rs.3, 391crores per year according to the government estimates for it to be effective, though in 2017, the project got an allocation of only Rs.752 crore (Mishra & Agarwal, 2017).

The inability to achieve MDGs was a mirror to showcase the shortcomings of not implementing holistic approaches in the interventions. The challenges with achieving targets set by these policies remain that of, weak infrastructure and lack of human resources in healthcare services. Primary health centres need to be considered essential and thus, improving and strengthening the PHCs has to be one of the initial targets of the government.

The lack of skilled personnel providing sufficient and efficient healthcare is and will continue to be a block in eliminating the gaps. The state of public infrastructure is disappointing, and privatisation of health system has become a major focus of the current policy initiatives, which has implications of its own, and forms the basis of the arguments explored further in this paper.

Private vs. Public Healthcare

Despite of the discussion regarding the importance of social parameters that halt the process of development, it has been difficult to eliminate the economic needs of a country, thus the bias towards private sector is prominent, and is fostered by providing the private players a larger space in the health sector. There are factors that prove to be in favour of privatisation, as it inculcates the attitude of being result driven. The economic sightedness of the private sector makes them a much better option for the government to put

their bets on. The activity of funding private healthcare institutions through various schemes, as described above, is therefore defended by their ability to provide quality, technologically advanced health care services. There are various actors involved in the private sphere of healthcare, including non-profit organisations, which are driven by the need to improve and make efficient healthcare available to all. A study by Basu S, Andrews J, Kishore S, Panjabi R, Stuckler D (2012) has evaluated various secondary sources and have corroborated six factors that influence the argument on public vs. private healthcare options in middle and low- income countries, and describe the preference of one over the other through the lens of a patient. There are multiple factors that affect the choice; the study reviews six themes derived from the WHO framework for health system assessment, including accessibility and responsiveness; quality; outcomes; accountability, transparency and regulation; fairness and equity; and efficiency. The findings are worth to note, as they look at a spectrum of low, middle-income countries. Another study indicates that in 19 of the countries studied, both wealthy and poor families received more care from the private than the public sector, but only when the private sector included private drug shops and similar informal providers (Basu, Andrews, Kishore, Panjabi, & Stuckler, 2012).

This is indicative of the performance criteria of the private sector providers. The 71st round of NSS on health showcases the dwindling trust in the public health system, as it reports of 58 per cent rural population and 68 per cent urban population of preferring private hospitals compared for inpatient care.⁶ Thus, even more patients prefer to be treated in private hospitals, as they trust and feel more secure in the environment, though the study also notes that private institutions do not follow codes and standards, thus also limits their credibility. Being more driven towards, cutting their costs, understaffing and burdening the existing staff is a potential drawback that is prominent in the current scenario of the health sector. Private healthcare sector also runs higher chances to prescribe medicines unnecessarily, as well as suggesting expensive procedures. The exploitation of the patient is impervious and has to be checked in order to increase the efficiency of the private sphere.

In the debate between private and public actors, the ambiguity of what constitutes these actors, also remain a problematic premise, as there are multiple actors, which do not practice legally and are a cause of jeopardy for the vision of creating a sustainable health sector. The accessibility of these services though, is limited, as only few such institutions are affordable and accessible to the weaker sections of the society. As pointed in the previous section, the cases of medical negligence are not fading away, and are significant in highlighting the drawbacks of insufficient funding in the public sector. On the front of equitable services, A World Bank study in Ghana pointed at the lack of evidence noting the difference of user fees in public and private sector; however, the data presents the fact that out of pocket expenditure is highest for private not for profits, minimum for public institutions and intermediate for private self financed organisations (Basu, Andrews, Kishore, Panjabi, & Stuckler, 2012).

Thus, the capacity of the public sector needs to be enhanced looking at the negative factors that make the private sector inaccessible to the vulnerable population. The study also presents the debate on the inclusion of private sector in an efficient manner, though it would also require transparency, which is missing in the present scenario. It is imperative to understand that public private partnerships cannot be biased or directed towards an economic goal, and need to take the perspective of inclusivity. The lack of data to report inefficiencies of programmes is a block in forming a PPP that can be successfully implemented. In contemporary times, the debate has taken the form of a competition. The effect of crowding out has resulted in transfer of public funds to private sector, as envisioned by the Health Policy of 2017, India. There are many shortcomings of the public sector, described in the coming section. Though, its ability to provide to a larger population, and being affordable cannot be disputed. On the account of making private sector more affordable, these steps fail to achieve their goals, while also decreasing the funds for the public sector.

Due to better job opportunities in the private sector, physicians too, find it beneficial to run their private practice, and thus, in turn, deepen the exploitation of the patients, by offering their services at a higher rate. Thus, there are always intricacies in the aspect of

providing care, and ethics and moral codes are tested, and there needs to be a higher ground in analysing the stand of the medical professionals by bettering prospects in the public sphere as well.

Disasters and Health Infrastructure

The health infrastructure of India is a little complex to understand within the dynamic state role in the health system structure. It is of little doubt, that there are huge gaps in providing sufficient care to the patients. The dichotomy of public and private sector is in itself unclear, due to lack of data, as mentioned above, though there are clear discrepancies in their functioning.

The Centre's allocation for health has increased from 38cr in 2016–2017 to 47cr in 2017–2018, but the implications of this remain unclear, as it could possibly be directed towards private health systems, which are increasing the burden of demand on public sector from the weaker section. The budget for Pradhan Mantri Swasthya Suraksha Yojana-the Prime Minister's Health Protection Scheme-increased 103 per cent from Rs 1,953 crore in 2016–17 to Rs 3,975 crore in 2017–18 (D'Cunha, 2017).

As per Rural Health Statistics, 2016 primary and community sub centres are short on human resources by 22 per cent and 30 per cent respectively. The understaffing of health centres is an indication on the rise of inadequacies being suffered by those, who do not have the capability to avail care from technologically, advanced hospitals (D'Cunha, 2017).

The cases of Non-communicable and chronic diseases have significantly increased and have taken a turn on the death tolls. Rural health facilities are devoid of basic infrastructure; facilities fall short of water supply, electricity, and connectivity. In case of emergencies, there is a lack of transportation. The statistics are staggering, 63 per cent of the primary health centres do not have an operation theatre, and while community health centres fall low on specialists, surgeons, gynecologists and pediatricians by 81.5 per cent.

Primary and Secondary care centres are prominently under-staffed and highly insufficient for providing effective solutions, therefore, the tertiary

centres are burdened and are not able to fulfil the overgrowing demand. These fall short on equipment, and labour to cater to the patients.

There is a growing need for enhancing the human resources, building capacities in order to fulfil the demand and cover all aspects of healthcare. In India, out of the total 1.37 million hospital beds, only 540,000 beds are available in the public hospitals, out of which only 50 per cent are functional and are concentrated in the top cities. The state of public hospitals in India is poor in terms of infrastructure and more so deficient with respect to the staff. Disasters have the capacity to overwhelm the existing structures, and therefore, the status of the healthcare structure in India is already predisposed to huge economical and structural setbacks in events of a disaster.

Every year, the spread of dengue, chikunguniya, and malaria showcase the inherent inefficiencies of the health system of the country, and manages to take huge number of lives, due to the inaccessibility and lack of availability of doctors, and space. The question of space is a big one, in an ever-growing economy, notably, second largest we cannot overlook the necessities and adapt to the circumstances, it is essential to grow resiliency, and introspect the implications and the effects of national policies and actions. Despite a history of annual outbreak and spread of vector-borne diseases, these States have not been able to prevent and manage any outbreak.

In the case of earthquakes, floods, and other catastrophes, where the existing hospitals are also affected, and destroyed, the presence of skilled professionals, and an empowered structure is essential in resisting the aftereffects of the disasters. The development of the mental health institutions, and personnel thus also become imperative and a debate that has been rather a part of the long-term

Throughout, the various segments of the paper, the emphasis on the interventions in healthcare have been critiqued through the lens of policy operationalisation, and farsightedness of paper and reality. Therefore, there is a pressing need to acknowledge the gaps, and work towards creating an equitable and accessible healthcare structure that does not overwhelm the capacities of those involved, as well as complies with the SDGs.

Conclusion

The paper attempts to review and combine the various dimensions that are important to be considered in order to strengthen the health care system of India. There are multiple factors that influence the smooth functioning of the healthcare facilities, and more often than not; the implications of policy actions determine the nature and efficiency of care. The current dilemma of private vs. public is crucial to understand and contextualise events that demarcate the preference of one over the other. Though, the problems are clearly defined, the solutions are hardly discussed. The widespread advocacy of Public-Private-Partnership is problematic as it results in higher out of pocket expenditure, and thus, contradicting the aim with which, the programmes have been implemented. The integrated approach to solving such inadequacies is important, as the responsibilities of the state in improving the socio-economic components of the nation has to be the topmost priority as it leads to the generation of a healthy and active service sector. In addition to encountering such situations in times of hazards, the implications of construction more number of AIIMS would not solve the issue at hand, as the existing infrastructure are impaired and need to be improved at a reasonable scale before we can take on more number of institutions. The need to improve data collection, and checks on policy is paramount, as it creates a bigger and better picture for us, to analyse and interpret the lacks of the functioning. The provision of better technology in public institutions thus make an important step in creating a strong and resilient public health system, as it provides better opportunity to the public and helps the vulnerable section of the society rather than burdening them with higher expenditure in a private facility. The component of a competition between the private and public needs to be revisited as the common goal should be welfare. In order to develop economically, one cannot regress socially. Especially, with increasing cases of medical negligence, and disasters that impede the progress, we cannot proceed without working on the following aspects. Epidemics have been on the rise, and with lack of intent on the part of the stakeholders, to expect change is a lost cause; therefore, one needs to revisit the decisions in

the context of the changing environmental conditions, and the uncertainty that it brings along with its nature. In any case, no single effort can be recognised until it involves all those affected by the impeding conditions of our healthcare system.

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Expeditious Response to Epidemics: The Chronicle of Nipah in Kerala

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ABSTRACT: Kerala witnessed a catastrophic outbreak of the Nipah virus in May 2018. With a fatality rate of 40–75 per cent, there is no vaccine or cure for the infection. The Nipah virus is recognised by the World Health Organisation as a major public health concern and is on its list of priority diseases for accelerated R&D due to the severe lack of available countermeasures against it. The people of the state of Kerala showed an exemplary response to the outbreak. This involved rapid and effective dissemination of the necessary precautions to the wider public. Internet social media played a crucial role in spreading these messages. Although the disease claimed 21 lives, it could have been a lot worse if the measures for proper mitigation had not been taken by the people of the state. This work gives a brief overview of the Nipah virus followed by a comprehensive outline of the Kerala outbreak. An incident map has been made based on the cases reported to depict the spread of the virus. Community and individual responses to the outbreak have been analysed to illustrate how various groups and individuals from health care and tourism departments to religious leaders had a role to play in the successful containment of the virus. It is hoped that the Kerala model of emergency response to epidemics will prove to be a roadmap for other states and countries to follow in similar situations.

KEYWORDS: Nipah, epidemic, Kerala, community response

Introduction

According to (WHO) Nipah virus is a zoonotic virus (it is transmitted from animals to humans) and can also be transmitted through contaminated food or directly between people. And currently there are no vaccine for the prevention of Nipah. The first known outbreak of Nipah virus was in Malaysia in 1998. The second outbreak was in Bangladesh in 2001. Kerala witnessed the deadly Nipah outbreak in the month of May 2018 claiming 21 lives out of 23 with a case fatality rate (CFR) of 88.9 per cent (deaths/laboratory-confirmed cases, 16/18)¹. From the second case itself a doctor from Baby Memorial Hospital noticed some similarities with the

death of case 1 & case 2. Hence, they sent the samples to the Manipal Centre for Virus Research (MCVR) Manipal, Karnataka, on May 18. After the confirmation of Nipah, The Government of Kerala's Department of Health and Family Welfare then rapidly initiated public health response measures, including infection prevention and control (IPC), patient isolation and personal protective equipment (PPE) use². Along with the government the expeditious response of the people in Kerala was also a key in successfully containing the Nipah virus. This paper analyses the community response of people in Kozhikode district who were severely affected during the time of outbreak. The main aim of this study is to understand the evolution and changes in attitudes,

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knowledge, and behaviours of Kozhikode residents in response to the Nipah outbreak.

Methodology

The study population of this research include residents from different parts of Kozhikode, aged between 18–58. Online survey has been done with the help of google forms to monitor the community response of people. All the information in this paper are based on the data collected from 100 respondents took part in the online survey. Selected respondents were interviewed again personally or on call to share their experience of Nipah. Questions were asked to understand perceptions of people about Nipah and to analyse their behavioural change during and after one month of Nipah outbreak. The responses were tabulated, then converted to percentage and charts were designed from it.

Findings and Discussion

Out of 100 respondents, 76 per cent of them were males and 24 per cent of them were females. 63 per cent of

the respondents were between the age of 18–28 and remaining 37 per cent were between 29–58. Most of them have a graduate degree (51.1 per cent) and post graduate degree (36 per cent). Respondents were the inhabitants of Mukkam, Nadapuram, Vanimal, Thuneri, Changaroth, Koduvally etc. Case 1 was reported from a place named Sooppikkada in Changaroth village. Most of the patients were the inhabitants of infected area or had close contact with the infected persons. In the initial stage Nipah was not confirmed hence, the patients had close contact with people in and around hospitals (fig.1). Most of the cases are transmitted either from hospital or from patient's home. Once it was confirmed as Nipah Government took immediate actions like ordering schools and other educational institutions to remain closed, implemented travel bans, awareness notices were given to all government and private institutions, Posters were placed in public places and other public gathering places of like hospitals, mosques etc. Awareness was given to people from mosques regarding the safety measures as these areas were Muslim majority region and most of them gather in the mosques on Friday.

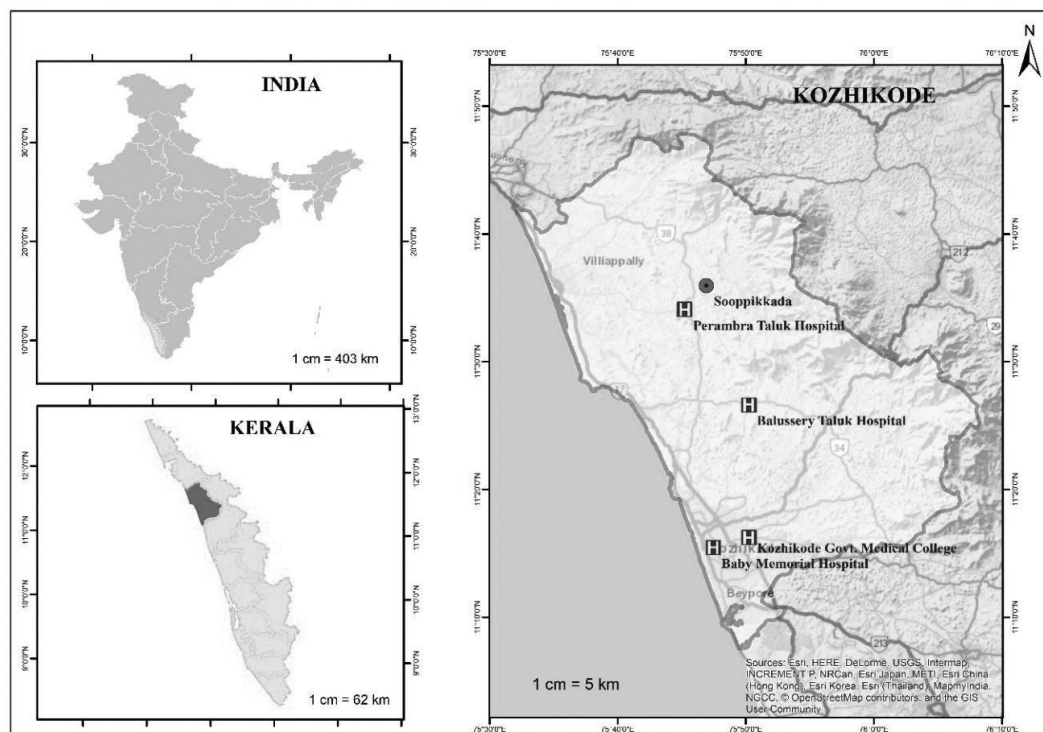


Figure 1

Most of the people get to know about Nipah through social media (43 per cent), newspaper (25 per cent) and T.V/Radio (18 per cent). While some of them (14 per cent) get to know about it from their friends or relatives (fig.2). This shows the role of social media in the present era for disaster mitigation. One thing to be noticed, that the high literacy rate of Kerala helped people be more aware about the outbreak. The lifestyle of people had a very noticeable change in this time. Most of them rarely went outside during the outbreak time (fig.3). Some of them even continued that after containing the disease (fig.4). As Nipah was caused by the fruit eating bats most of the people avoided buying fruits during that time, but later when Nipah was contained people start buying it again (fig.5 & 6). But

the majority of them avoided eating birds or animal bitten foods during Nipah and after Nipah as well (fig.7 & 8).

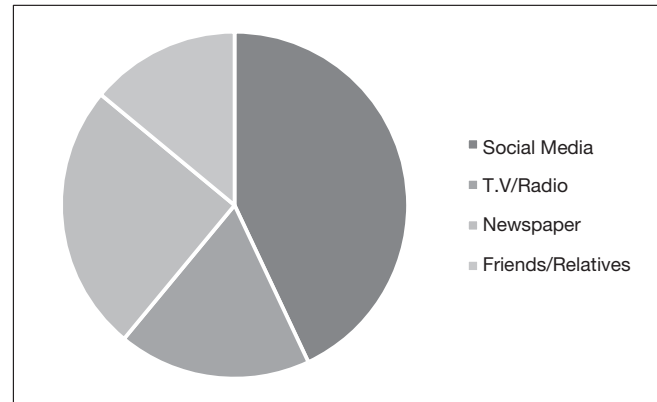


Figure 2

How likely you went outside during Nipah Outbreak?

100 responses

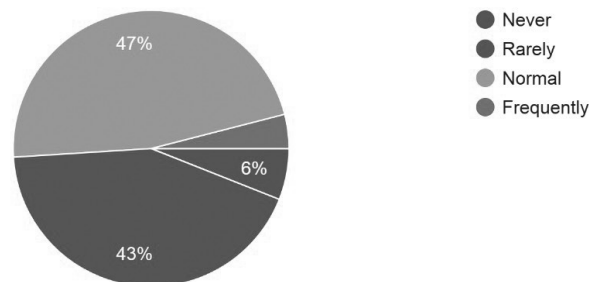


Figure 3

How likely you went outside the first month after Kerala became free from Nipah?

100 responses

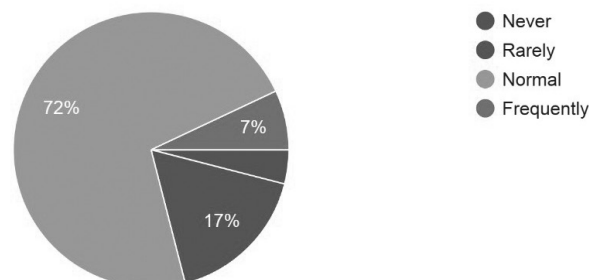


Figure 4

How likely you bought fruits during Nipah outbreak?

100 responses

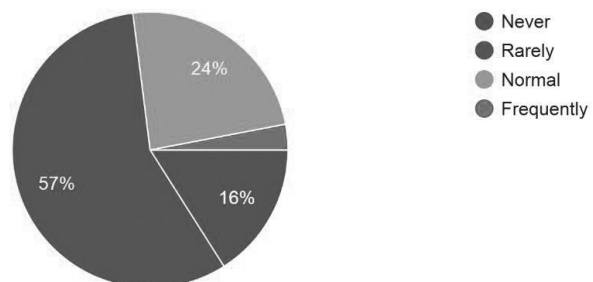


Figure 5

How likely you bought fruits during the first month after Kerala became free from Nipah?

100 responses

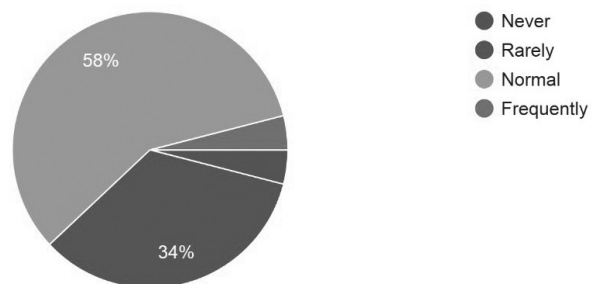


Figure 6

How likely you ate birds/animal bitten fruits during Nipah Outbreak?

100 responses

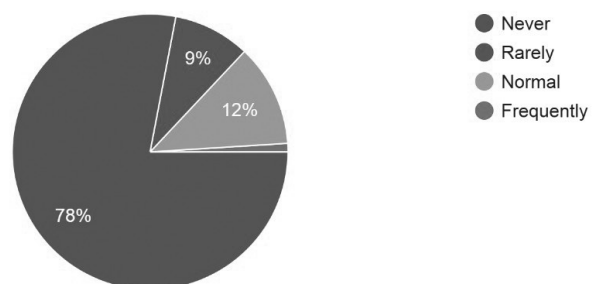


Figure 7

How likely you ate birds/animal bitten fruits during the first month after Kerala became free from Nipah?

100 responses

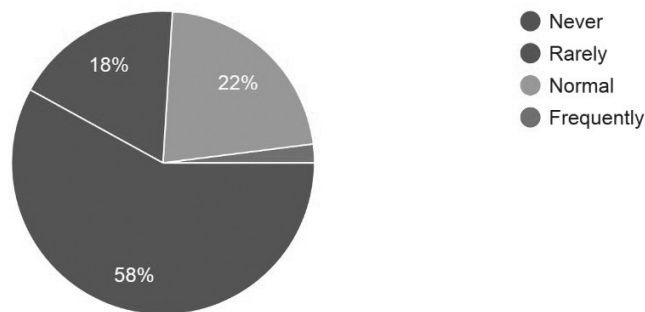


Figure 8

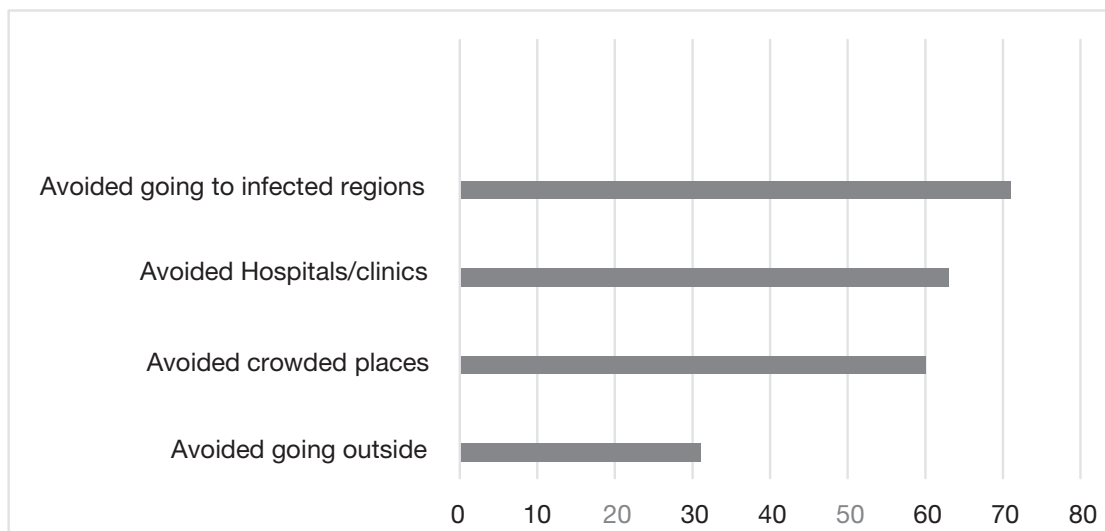


Figure 9

Daily life of people got effected completely. Shops, restaurants, buses, public places, hospitals etc were empty during those days (fig.9). Many people had to cancel their travel plans and other public events (fig.10&11). People preferred travelling in private vehicles rather than public transport (fig.12). A complete change happened to the lifestyle of people. It shows how panicked were

people in those times. Most of them kept checking the updates related to Nipah regularly (fig.13). When the virus got contained people believed that this disease can be cured (fig.13) but most of them know its fatal (fig.14). It took some time for the people of Kerala to restart their normal life even after the containing of Nipah. Most of them are still in fear of a second outbreak.

Did you cancel any public gathering?

100 responses

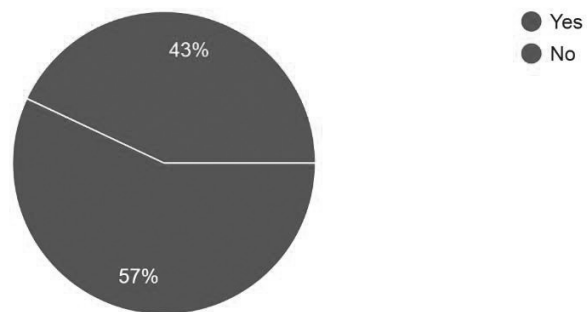


Figure 10

Did you cancel any of your travel plans because of Nipah?

100 responses

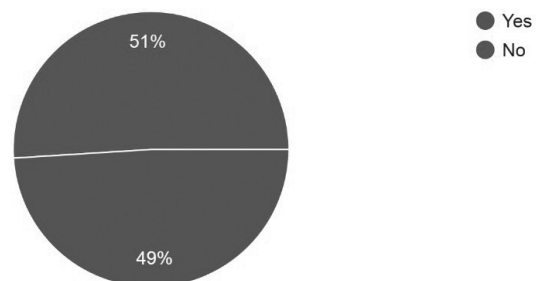


Figure 11

How you preferred to travel during Nipah outbreak?

100 responses

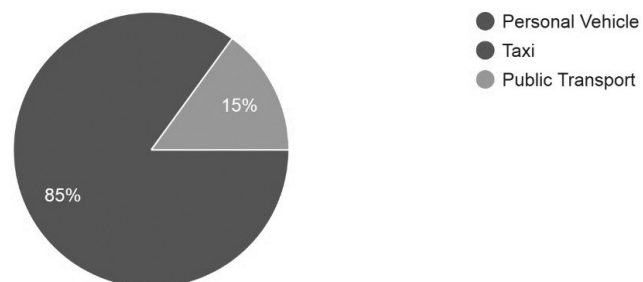


Figure 12

Do you think Nipah is Curable?

100 responses

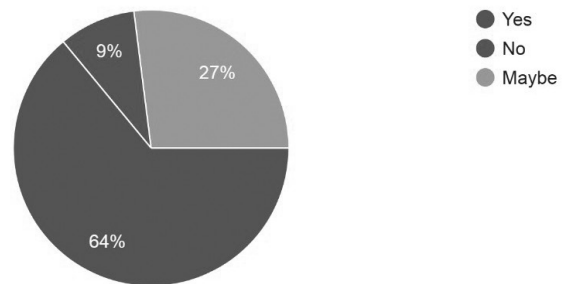


Figure 13

Do you think Nipah is Fatal?

100 responses

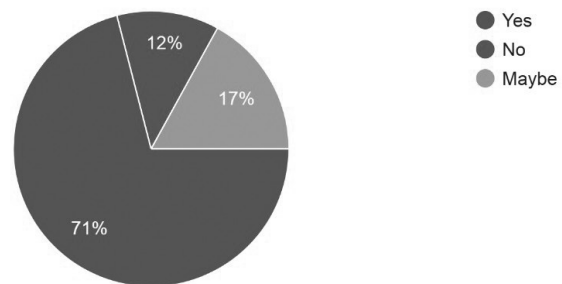


Figure 14

Were you following the updates of Nipah regularly?

100 responses

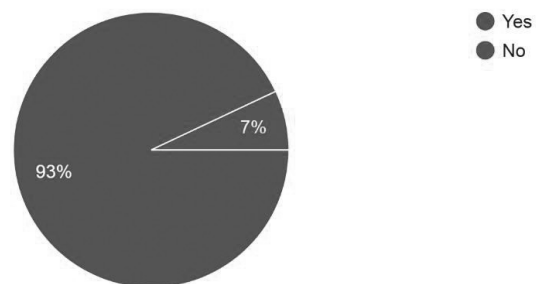


Figure 15

Conclusion

The deadly zoonotic Nipah Virus, which outspread in the state of Kerala (May, 2018) has shown the immense sensible precautions taken by the people. The virus being spread out in the state with the death of comparatively very less number of people is because of the very appreciable response towards the disease, the outbreak of virus made people conscious of their surroundings and mindful of how to take care in that given situation.

The social media played a vital role in spreading awareness about the virus which indeed had a major effect in response and precautions taken by them which actually helped in stopping from spreading of the virus among the massive group of people.

The government, as well took immediate actions by shutting down the institutions, distributing Nipah virus awareness notices, advising less human contact with infected and avoiding the crowded places etc. With regard to all this the life of the people was adversely affected but after the state came out clean everyone continued with their daily life.

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Fighting Preventable Diseases: Vaccination Schemes for Refugees in the 10 Major Host Countries

Julia Steinle^a

ABSTRACT: For the successful eradication of vaccine-preventable diseases a high vaccination rate in the community and accurate booster injections are necessary. Vaccinations prevent 2–3 million deaths from measles, pertussis, diphtheria and tetanus each year.

By the end of 2017, 68.5 million people worldwide have been forcibly displaced. Becoming a refugee often means the loss of regular and appropriate access to health care. Therefore, most refugees cannot adhere to their vaccination schedules during their flight. That is why refugees are especially vulnerable for the contraction of preventable infectious diseases.

Having an appropriate vaccination scheme for newly arrived refugees in host-countries can therefore be an important measure for the improvement of individual health as well as public health outbreak prevention. According to the global statistics from UNHCR, the 10 major host-countries for refugees by the end of 2017 were: Turkey, Pakistan, Uganda, Lebanon, Iran, Germany, Bangladesh, Sudan, Ethiopia and Jordan. Host-countries are requested by the WHO to ensure refugees' access to adequate vaccination. The aim of this study is to compare national vaccination guidelines for refugees in the 10 major host-countries including approaches for children and adults.

A systematic review of literature was conducted using MEDLINE and national schemes for the vaccination of refugees as well as national expert interviews were analysed.

A comparison of the existence of a national approach for the vaccination of refugees in the major host-countries will be presented. A systematic review of the national vaccination schemes will be demonstrated.

This study cannot draw conclusions about the efficiency and quality of national approaches or compare the grade of implementation of these policies. However, this study aims to lay grounds for more research in this field in order to explore the best methods for fighting vaccine-preventable diseases in communities.

KEYWORDS: refugees, immunisation, vaccination, national policies, host-countries, public health, infectious diseases, preventable diseases

Introduction

With the invention of the first vaccine against smallpox in 1796 communities started to prevent the spreading of infectious diseases through immunisation¹. Many vaccines have been developed since and childhood

immunisation has become a routine procedure of paediatric care. However, adequate access to vaccination is not guaranteed worldwide². That is why the World Health Organization (WHO) has published standardised vaccination guidelines for the major vaccine preventable diseases (VPD) and implemented

^a University of Muenster, Germany; UN Major Group for Children and Youth, Disaster Risk Reduction Working Group

the Global Vaccine Action Plan 2011–2020 to achieve sufficient vaccination rates all over the world.

For the successful eradication of vaccine-preventable diseases a high vaccination rate in the community and accurate booster injections are necessary. Known barriers to a sufficient vaccination rate are health system barriers such as cost, storage, supply and staff, provider barriers like communication, missed opportunities and a lack of documentation, and parental barriers such as poor understanding, fear, cost and access³. After safe drinking water, vaccination is the most effective measure for the reduction of mortality⁴. According to the WHO, immunisation prevents 2–3 million deaths from measles, pertussis, diphtheria and tetanus each year⁵. Over the past years, however, many countries have experienced a growing hesitancy towards childhood vaccination which lead to a decreased vaccination rate and the occurrence of outbreaks of vaccine preventable diseases⁶. Among other factors, the immigration of refugees was discussed as a possible cause for outbreak situations in the public debate. However, the WHO reports that there is no systematic association between migration and the import of infectious diseases but describes refugees as a vulnerable group that needs to be protected from the contraction of communicable diseases⁷.

By the end of 2017, 68.5 million people worldwide have been forcibly displaced⁸. Most of their origin countries have experienced months or years of conflict which lead to the deterioration of infrastructure and governmental stability. Therefore, the disposability of health care facilities became insufficient due to a lack of staff or destruction or because the population cannot move freely^{9,10}. During their flight, many refugees are exposed to a variety of health care systems in transit and host countries and experience exhaustive conditions of living. Becoming a refugee often means the loss of regular and appropriate access to health care. Therefore, most refugees cannot adhere to their vaccination schedules. As many refugees have not been vaccinated sufficiently before and during their flight, refugees are especially vulnerable for the contraction of vaccine preventable diseases. Additionally, many refugees live in crowded refugee camps which increases the danger of contraction¹¹.

Having an appropriate vaccination scheme for newly arrived refugees in host countries can therefore be an important measure for the improvement of individual health as well as public health outbreak prevention. To achieve high vaccination rates in newly arrived migrants in all communities, the WHO, UNHCR and UNICEF agreed on a joint guideline for Europe in 2015. The WHO-UNHCR-UNICEF recommendations state that ‘refugees and asylum seekers should have nondiscriminatory and equitable access to health care services, including vaccines, irrespective of their legal status’¹² and emphasise the importance of timely vaccinations against vaccine preventable diseases with a focus on measles and polio. The aim of this study is to examine and compare the existence of national guidelines and procedures for the vaccination of refugees in major host countries. According to the global statistics from UNHCR, the 10 major host-countries for refugees by the end of 2017 were: Turkey, Pakistan, Uganda, Lebanon, Iran, Germany, Bangladesh, Sudan, Ethiopia and Jordan. Other studies have described the national vaccination schemes in different regions of the world but, to our knowledge, this is the first study comparing the countries that take the highest numbers of refugees. As vaccination policies in these nations affect a high number of refugees, collecting knowledge about their guidelines can lead to a global improvement of the resilience of communities on a large scale.

Methods

Information on national policies for the vaccination of refugees for this study was collected from two sources:

- from primary data through a survey for national experts
- from secondary data through the analysis of policy papers and national guidelines

National experts were selected from presenters at national and international conferences, authors of relevant publications and by contacting the affiliated associations of the European Society of Clinical Microbiology and Infectious Diseases (ESCMID)¹³ and the Ministries of Health. Selected persons were contacted

via E-Mail and asked to share national policy papers on the vaccination of refugees, asylum seekers and newly arrived migrants and were sent a questionnaire about national guidelines and procedures. Non-responders were reminded twice. Experts were contacted in the following countries: Bangladesh, Ethiopia, Germany, Iran, Jordan, Lebanon, Pakistan, Sudan, Turkey and Uganda. Experts were contacted starting in October 2018, data collection was completed in January 2019. From all 10 major host countries, experts replied to the inquiry.

The questionnaire included questions about:

- the expert's position (free field)
- the existence of national guidelines for the vaccination of refugees (yes/no/in some parts of the country/for certain groups/other)
- the group of people the national guidelines refer to (all newly arrived migrants, asylum seekers, refugees, other)
- the recommended vaccinations for children below 6 years (multiple select question, list of vaccines)
- the recommended vaccinations for adolescents, 7–18 years (multiple select question, list of vaccines)
- the recommended vaccination for adults above 18 years (multiple select question, list of vaccines)
- the vaccination of migrants at border crossing points (yes, nationwide/yes, regionally/no/for certain groups/no/other)
- if yes, the vaccinations migrants receive at border crossing points (multiple select question, list of vaccines)
- the vaccinations of migrants at refugee camps (yes, nationwide/yes, regionally/no/for certain groups/no/other)
- if yes, the vaccinations migrants receive at refugee camps (multiple select question, list of vaccines)
- the vaccinations of migrants at community level (yes, nationwide/yes, regionally/no/for certain groups/no/other)
- if yes, the vaccinations migrants receive at community level (multiple select question, list of vaccines)
- the existence of vaccination schemes for outbreak situations (yes, nationwide/yes, regionally/no/for certain groups/no/other/free field for specification)
- the existence of mandatory vaccinations for asylum seekers, refugees and newly arrived migrants (yes, nationwide/yes, regionally/no/for certain groups/no/other/free field for specification).

Documents for secondary data analysis were requested from national experts, Ministries of Health and national Public Health institutions or collected through a PUBMED and online search using the following terms: “policy”, “policy paper”, “national”, “guideline”, “recommendation”, “scheme”, “refugees”, “asylum seekers”, “migrants”, “vaccination”, “immunisation” and the name of the country. Secondary data was analysed looking for

- the existence of national policies for the vaccination of refugees, asylum seekers and migrants,
- the vaccinations recommended for children, adolescents and adults,
- vaccination programmes at border entry point, refugee camp or community level
- vaccinations in outbreak situations
- mandatory vaccinations

Frequency analyses were performed in order to compare the 10 major host countries national vaccination schemes for refugees.

Results

Experts from all countries sent a response to the survey (10/10, 100 per cent) and secondary data were collected from 8 countries (8/10, 80 per cent). All countries reported to have guidelines for the vaccination in place at least in some areas (10/10, 100 per cent).

Measles, polio, diphtheria, tetanus, *haemophilus influenza type b*, and pertussis vaccination are recommended for refugee children (<6 years) in all major host countries (10/10, 100 per cent). Vaccination against mumps, rubella and hepatitis B are recommended in 8 countries (8/10, 80 per cent). Hepatitis A and cholera immunisation is only offered in 1 country (1/10, 10 per cent). For adolescents (7 – 18 years), all countries offer less vaccines. 50 per cent recommend vaccination against tetanus (5/10), while only 2 countries offer immunisation against measles, rubella, diphtheria and cholera to adolescents. Only

1 country reported to vaccinate against polio, pertussis, hepatitis A, hepatitis B and influenza. Adult vaccination focuses on tetanus (7/10, 70 per cent). Some countries offer vaccination against diphtheria (2/10, 20 per cent), cholera (2/10), influenza (2/10) especially for high risk individuals. Only 1 country reports to recommend pertussis, hepatitis A and B vaccination for adults (Table 1).

3 countries vaccinate at border entry points (3/10, 30 per cent), focusing on immunisation against polio and measles. 10 of the 10 countries analysed give refugees access to vaccinations at refugee camps (10/10, 100 per cent) and 90 per cent at community level health care facilities (9/10, 90 per cent). Most countries do not require serology testing of vaccination status before vaccination (8/10, 80 per cent). Most countries however check the refugees' vaccination status before vaccination through personal vaccination documents or patient history (9/10, 90 per cent), only 1 country reported that all refugees get vaccinated regardless of their vaccination status. Mandatory vaccinations have been reported from 3 countries (3/10, 30 per cent) focusing on polio vaccine, 2 countries require mandatory vaccinations in case of outbreak situations (2/10, 20 per cent). For outbreaks of vaccine preventable diseases, half of the major host countries report to have vaccination policies in place (5/10, 50 per cent). All countries document the vaccination is some form of record. Most countries (7/10, 70 per cent) use individual vaccination documents. 3 countries additionally store the documentation in local (3/10, 30 per cent) and 2 countries (2/10, 20 per cent) in national databases (Table 2).

In all countries the highest number of vaccines are offered at community level. Polio and measles vaccination is the most common vaccination at refugee camps (10/10, 100 per cent) (Figure 1).

Discussion

This study focused on the comparison of the 10 major host countries in 2017 because large numbers of newly arrived migrants also mean many potentially insufficiently vaccinated people and an immense strain for the local health care system. Therefore, there is a high demand of childhood vaccinations and catch-up

vaccinations in these countries which goes along with high cost and the need for staff and facilities. Major host countries also face the problem of crowded refugee camps leads to an increased danger of the spreading of communicable diseases. Although the 10 major host countries change from year to year due to changes in the political and humanitarian situations both in origin and host countries of refugees, countries which have been major host countries in one year will probably host large numbers of refugees for several years, as most causes for forced displacement are long-term problems (Zit).

This study compared countries with a range of economic status, cultural background and geographical characteristics. The access to adequate health care including vaccination for regular inhabitants also varies between the countries analysed. This fact needs to be considered when interpreting the result.

This study showed that all major host countries have regulations in place for the vaccination of refugee children. Almost all countries analysed give refugee children access to the vaccinations recommended by the WHO. However, there is a difference between the recommended quantity and age of subsequent doses.

Most of the countries analysed in this study focus on childhood vaccination, while there is only limited access to catch-up vaccinations for adolescent and adult refugees. Most of the catch-up vaccinations for adults only focus on immunisation against Measles, Polio and Tetanus.

Most countries provide refugees with the same vaccination scheme used for their citizens and a majority of countries offer their service for free or at low costs. Non-discriminatory access to vaccination as demanded by the WHO is therefore tried to achieve in all countries.

A majority of the analysed countries offer outreach programmes and regular vaccination campaigns for refugee camps in order to ensure the health care of refugees living in remote camps with a focus on immunisation against Measles and Polio. Many countries with limited access to health care especially in remote places also offer services at refugee camps for the local host community, leading to an improvement of access to health care for all inhabitants.

However, most host countries face the problem of a high number of urban refugees. A majority of refugees in most host countries do not live in refugee camps and therefore do not benefit from vaccination campaigns in camps. These refugees mainly use the services offered by community health care facilities. Therefore, education campaigns and vaccination campaigns in urban settings are needed to reach this large number of refugees.

As many refugees have had access to vaccination at some point of their flight, there is a need for standard documentation systems to avoid unnecessary vaccination and missed booster injections. Most countries analysed use individual vaccination cards and some hold national or local vaccination registries.

Only a minority of countries analysed conducts vaccinations at border entry points. The WHO only recommends this measure in outbreak situations. The countries with vaccination points along their borders focus on the vaccination of Polio and are countries with a high danger of outbreaks.

However, this study cannot judge the implementation of national policies for the vaccination of refugees. Having procedures in place is an important step but does not necessarily mean that the services are offered or used. More extensive studies are needed to assess the vaccination status of refugees in host countries. The grade of utilisation of vaccination services offered also depend on the health education provided in order to inform refugees about their rights to get access to vaccination and the value of adequate immunisation for their family. For successful vaccination campaigns, there is a need to find an efficient way to ensure refugees' compliance to the full vaccination schemes. Reminder-systems and documentation processes need to be implemented. Even when refugees are well educated about the benefits of vaccination and decide to use the services offered, barriers have to be overcome at the health care facility itself. In many countries, the majority of refugees do not speak the local language and therefore language barriers complicate the process of vaccination. Some countries report the training and employment of refugee doctors and health care workers to overcome this barrier.

Notes

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Integrated Health, Social and Economic Impacts of Disaster and Assessment and Awareness on Disaster Management in Uttar Pradesh

Sandeep Tiwari^a, Rajeev Misra^a, Surendra Kumar Bharti^a,
Tatheer Fatima^a and Shashi Mala Tiwari^a

ABSTRACT: Disaster is a sudden accident or a natural catastrophe that causes great damage or loss of life. Natural catastrophe may be extreme weather events or natural physical phenomena and it is their interactions human life that makes them disasters. Similarly, accidents are an unfortunate incident that happens unexpectedly and unintentionally, typically resulting in damage or injury. Disaster may be best described as 'serious disruptions of the functioning of a community causing widespread human health, social, economic or environmental losses which exceed the ability of the affected community or society to cope using its own resources'. The classical characterisation of disaster is unfamiliarity, unpredictability, uncertainty, unstable, capricious, vulnerability, urgency, intensity and danger. Apart from causing deaths and severe ill health, disasters also lead to large scale displacement, injuries, mental and physical trauma, epidemics and substantial economic losses to the communities. Though every emergency or disaster has its own characteristics and demands but the basic measures under disaster management include prevention, mitigation, preparedness, response and recovery for which regular training and awareness activities are needed among students and young population of country and especially our Health Professionals, Disaster Response Team and the commoners which act as first respondent or a bystanders. The objective of the study was to assess the extent of awareness about disasters and their management among the population of Uttar Pradesh including the health professionals and the response team.

KEYWORDS: disaster, awareness, training, health system

Introduction

India is vulnerable to varying degrees to a large number of natural as well as manmade disasters, ranging from earthquakes, floods, cyclones, tsunamis, droughts, avalanches, landslides etc. Further, the vulnerability to Nuclear, Biological and Chemical (NBC) disasters and terrorism has also increased manifold¹. Disaster risks in India are further compounded by increasing vulnerabilities due to a variety of factors. These include

population, poverty, rapid urbanisation, increasing industrialisation, development within high-risk zones, environmental degradation, climate change etc. Though it is not possible to control the disaster totally, by adopting suitable structural and non-structural measures the damages can be minimised. A well prepared and trained individual can respond to the disaster skilfully; minimise the loss in every aspect (human & economic). Once a disaster hits an immediate response involving various agencies and communities

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is pivotal, which can control emergencies, and minimise/avoid the aftermaths and help people recover from the effects of the disaster, technically termed as disaster management. Though every emergency or disaster has its own characteristics and demands the basic measures under disaster management include prevention, mitigation, preparedness, response and recovery for which regular training and awareness activities are needed. All these factors emphasise the need for skill-based training concerning proper disaster response by common people as well as health professionals and agencies in disaster management. Awareness needs to be spread about various types of disasters, their effects, characteristics, and their peculiarities. The role of National Organisations, United Nations, NDRF, SDRF, and other agencies in disaster management is also needed to be taught in addition to the basics of disaster management measures. The aim of the present study is to assess the knowledge of people regarding disaster preparedness and its positive impact on disaster management².

Objectives

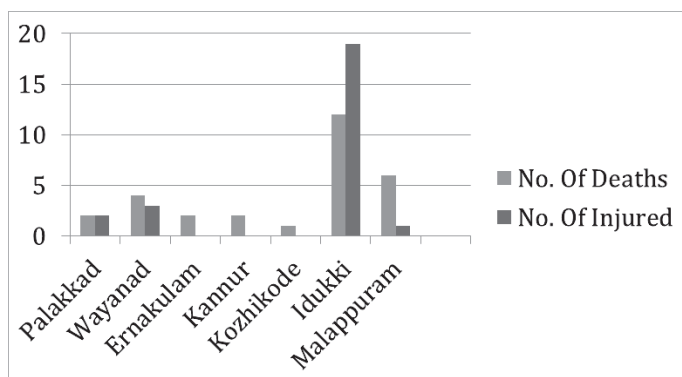
- To assess the knowledge regarding disaster preparedness among people and health professionals includes disaster response team.
- To build a safer and disaster resilient Uttar Pradesh by developing a holistic, proactive, multi-disaster, technology-driven & community-based strategy for Disaster management.
- To promote the effectiveness of the health system response by training/teaching for reducing disaster-related mortality and morbidity.

Prior Art

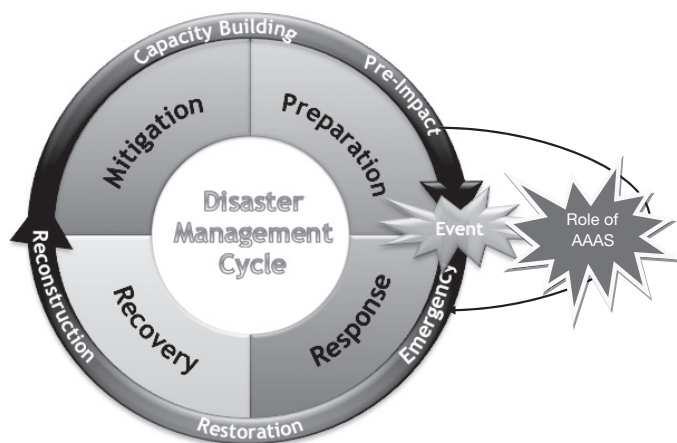
International efforts to reduce or mitigate the impacts of disasters have in the past 20 years become increasingly focused on human vulnerabilities. In 2000, the Millennium Declaration recognised the specific risk to development arising from disasters and called on the global community to “intensify our collective efforts to reduce the number and effects of natural hazards and man-made disasters” (United Nations 2000)³. The Hyogo Framework for Action (UNISDR 2005) developed systems of indicators of disaster risk

and vulnerability at national and sub-national scales to enable decision-makers to assess the impact of disasters on social, economic, and environmental conditions and then to warn others – both officials and the people at risk – of the dangers. Advances have been made in terms of strengthening disaster preparedness, response, and early warning systems. The Sendai Framework was adopted at the Third UN World Conference on Disaster Risk Reduction in Japan in March 2015. It has seven strategic targets and 38 indicators for measuring progress on reducing disaster losses⁴. These indicators align implementation of the Sendai Framework with the UN’s global Sustainable Development Goals (SDGs) and the Paris Agreement on climate change. India has recently been at the forefront in efforts to effectively manage disaster at the national and global level. Community participation and skill-based training of the workforce in this regard shall serve as an important milestone to rise on a global platform. India tops the list of lower-middle-income category countries in terms of absolute losses due to disaster amounting to the US \$ 79.5 billion which is a large chunk of Indian GDP as published in 2017 report of UNISDR. As per reports a large number of deaths are reported due to unavailability of medical aid at the site of disaster or delay in the same. Number on deaths is almost comparably with number of deaths. As can be seen from graph below number of death in different cities was comparable with injured.

Prevention, mitigation, preparedness, and relief are four elements, which add to and gain from the accomplishment of sustainable development policies. The need of the hour is to prepare a multi-branched approach for total disaster management comprising prevention, preparedness, response, and recovery. Evolution of the existing system towards optimisation is needed so as to best utilise the resources present with us. The preparedness and response phase in the Disaster management cycle are critical in reducing the impact of disasters. The involvement of multi-various stakeholders, therefore, need to ensure efficient inter-departmental coordination. It’s time that these agencies should be made to realise their potential and trained to rise to the occasion for service to society. A comprehensive skill-based programme has been designed to serve the purpose⁵⁻⁸.



“AAAS” (Aware-Alert-Action-Survival), A comprehensive skill development programme was developed by KGMU Lucknow U.P., which aims to train professional (Good Samaritans) for disaster management, BLS, & Medical Waste will lead to better management of emergency situations capable of handling disaster risk population professionally. Pre-hospital Training will lead to more specialised treatment within proper time, reducing the morbidity and mortality rate.



Role of Resilient Community & Health Care System

Uttar Pradesh is the largest state of the country having 18 administrative divisions consisting of 75 districts. Uttar Pradesh, with 199.5 million people is the most populous state in India. The growth rate of the population of Uttar Pradesh is about

20 per cent per decade which is alarmingly high growth rate in the country. Dense population and high growth rate further complicates the task of disaster management. Natural disasters that are of significance and have caused drastic consequence in the state of Uttar Pradesh are in Uttar Pradesh are – Floods, Droughts, Fires, and Earthquakes. Loss of life and property from these disasters, especially the former three, are in terms of hundreds of crore of rupees annually.

Through a sequence of literature review and studies, we concluded that there are four categories of disasters that could cause significant illness and injury and for which the Uttar Pradesh should be prepared. The importance of recognising these categories is that they pose different kinds of operational challenges, resource needs, and overall requirements. These categories are:

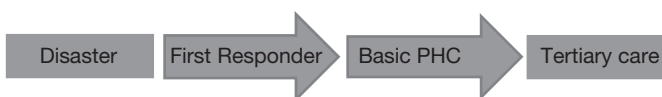
S No	Disaster Type	Scope of Response	Example
a.	Relatively small-scale mass injury/illness events	Local healthcare coalition/s (HCCs): – Local hospitals – Public health	Bus Crash Train Accident RTA multiple shootings,
b.	Large-scale natural disasters	– EMS – Emergency management agency & Disaster response force	earthquake; large-scale flooding & Drought
c.	Complex mass casualty events	Police – Local People	mass casualty burn events, RTA, Chemical incidents
d.	Catastrophic health events		Severe pandemics, Major earthquake

Disasters and other emergencies often result in significant impacts on people's health, including mortality & morbidity. Every new threat reveals the challenges for managing the few hours of post-disaster and its risks. Deaths, injuries, diseases, disabilities problems, and other health impacts can be avoided or reduced by an increase in helping & trained hands.

Whether a community is in the path of a natural disaster, the target of an act of terror, or simply striving to meet the demands of increasingly dense urban populations, a community resilience paradigm can help communities and individuals not just to mitigate damage and heal, but to thrive. This article discusses experiences from recent, large-scale disasters to explore how community & health system resilience might serve as a sustainable paradigm for organising public health and medical preparedness, response, and recovery. By strengthening health systems, meeting the needs of vulnerable populations, and promoting organisational competence, social connectedness, and psychological health, community resilience encourages actions that build preparedness, promote strong day-to-day systems. Thus, resilience resonates with a wide array of stakeholders, particularly those whose work routinely addresses health, wellness, or societal well-being.

Awareness of Disaster Management in Uttar Pradesh (Under "Aaas" (Aware-Alert-Action-Survival), a Comprehensive Skill Development Programmed by Department of Trauma Surgery, KGMU Lucknow U.P.)

The resilient healthcare system shall be an evolution of the present medical infrastructure coordinating with disaster management agencies so as to assist in the role of each other. It aims at training the target workforce in such a way to minimising the delay time in delivery of healthcare services to the victims.



As can be seen, the earliest responder that is the first responder should be trained to deliver basic health care services like first aid etc. Awareness of public is also equally important. Training of hospitals and staff to deal large inflow of patients and priority in treatment is also a matter of great importance. An integrated training programme for the evolution of the present system into Resilient Healthcare system is required.

Tier	Training	PHC Provider	Training Required
a.	Bystander/First responders Include (lay people/ police/SDRF)	<ul style="list-style-type: none"> – Basic lifesaving techniques, disaster response, PHN (lay people) – Advance first aider/life-saving techniques (police/FR/SJAM etc) 	<ul style="list-style-type: none"> – Awareness about disaster preparedness & management – Basic First aid training. – Pre-hospital notification – Basic medicine and life support. – Primary Care
b.	Basic PHC provider & In-hospital care	Healthcare professionals (tertiary care hospital/CHC/PHC)-(Ambulance workers/Guards/Paramedic/Nurse/ EMT-B)	<ul style="list-style-type: none"> – Ground ambulance service (Pre-hospital Notification) – knowledge of the potential detriments – special training to use specific equipment – Adapted to PHC situation – Triage – Biomedical waste management training

Tier	Training	PHC Provider	Training Required
c.	Advance PHC & In-hospital care provider	<ul style="list-style-type: none"> – Doctors (tertiary care hospital/ CHC/PHC) – Trained Paramedic 	<ul style="list-style-type: none"> – Deciding the best option for the patient – take action in the right time frame (triage) – Administration management – Advance lifesaving techniques

I. For SDRF/U.P. Police Personnel

The recent torrential rains, floods, fire & everyday accident cases (whether road traffic accident, train accident etc.) have not only raised questions regarding the efficacy of emergency & disaster management agencies and the civil administration, they have also enhanced curiosity regarding the police's role in such situations. Being protectors of life and property, the police cannot be excused from its universal role.

Though many SOP & articles explain duties of the police when it comes to protection of life and property, and provision of relief to people in distress, mere incorporation into law of these duties is not enough. There is a dire need for synchronised training of the police so that the emergency & disaster management function can be adopted as one of the primary functions of the police.

The question arises: what is the logic of inclusion of the police in the emergency, basic life support, hazardous waste or in disaster management apparatus? Universally, there is an increased realisation that there are logical reasons for the utilisation of manpower and resources of the police in such situations. Since the police have a presence in all areas and are familiar with local terrain, they are in a better position to immediately react as first responders and also guide others for preventing life.

We should remember that since the police denote the visible existence of governance, and police stations are the basic functional apparatus of the state, ordinary citizens expect a lot from the police. The majority of affected persons do not care whether emergency or disaster management comes under the mandate of the police or not. They expect the police to help them out in such situations. Hence, being prepared is an integral component of any emergency/crime or disaster management.

First Responder Training (Police and Disaster Response Force)

S. No.	Training & Aim	Activity
a.	Scene safety/Triage	<ul style="list-style-type: none"> – shifting of the people (including injured people) from the disaster risk areas – following the triage concept (prioritising the injured person and treatment accordingly)
b.	First Aid To prevent further harm being done Pre Hospital Notification (By trained personnel's)	<ul style="list-style-type: none"> – To reassure the victim and make him or her as comfortable as possible. – The ABC of basic life support (Airway, Breathing, and Circulation) are always the first priority. – Notification of major injured patient to the hospital before shifting.

S. No.	Training & Aim	Activity
a.	Advance Life-saving techniques (Training health workers in emergency management)	updating knowledge and skills about hazards and risk reduction, to improving health workers 'leadership role in emergency situations <ul style="list-style-type: none"> – Advance knowledge of emergency medicine – Advance scoring – Triage Future stock maintenance
b.	Training of standard procedures/management during casualty & disaster	training volunteers in emergency aid and administration, as well as having an emergency Rota with a list of extra available health professionals that can work following a disaster

II. Nurses/Para Medical Staff/Doctors/Hospital Administrative Staff of Level2 & Level 3 Hospitals

Except for major/tertiary hospitals like King George's Medical University, disaster preparedness planning, and practice is not prevalent in rural health facilities nor even in urban hospitals. It doesn't really matter how small the facility is, a preparedness plan can reduce the chaos and restore some order even in the most hectic time following a disaster, plus it also ensures the minimum disruption to the healthcare service provision in time of need.

Furthermore, the death and injuries the disasters brought about to health personnel would have a major impact on the service delivery in times of crisis. The effect would be felt more prominently in rural areas of developing and under-developed countries where only a handful of healthcare professionals are in charge of a large number of populations. Replacing the loss of skilled human resources takes time and a considerable amount of financial investments are needed to build up the workforce again. It goes, hand in hand with building safer health facilities, capacity building and awareness raising of health personnel is equally instrumental in imbuing a sense of preparedness and alertness and could save precious lives.

Conclusion

The gap between Indian and developed countries in loss of life in the event of a disaster exist as a result

of the absence of strategies above and beyond the traditional all-hazards approach to improving health sector preparedness. Change is needed, but the change should be evolutionary, not revolutionary. We need to build on the resources we already have. This three-tier preparedness in Disaster Management is a conceptual model towards adopting a better coordinated and inclusive strategy. For each of the tiers in our conceptual model, there are distinct training and research requirements. This model of Disaster Management has various policy requirements like forming a coalition inducing coordination between various agencies. There is the possibility that these goals and policies could be time-consuming in the initial phase of action but an empowered coalition would be far better positioned to manage medical care needs during emergencies of any scale.

Notes

- ¹ UN-ISDR. Terminology: basic terms of disaster risk reduction United Nations International Strategy for Disaster Reduction. 2004. Available from: <http://www.unisdr.org/eng/library/lib-terminology-eng%20home.htm> [cited 2 July 2012].
- ² vide GUHA-SAPIR *et al.*, 2012; NOY, 2010; ALCÁNTARA-AYALA, 2002, p. 109–110)
- ³ Web Link: www.rahaturp.nic.in
- ⁴ ENVIS Centre: Uttar Pradesh Status of Environment and Related Issues. Hosted by Directorate of

Environment, U.P. Sponsored by Ministry of Environment and Forests, Government of India.

⁵ COMMITTEE SECTION (GOVT. ASSURANCES); Retrieved from https://rajyasabha.nic.in/rsnew/annual_report/2017/GovtAssurance.pdf.

⁶ White paper Disaster Management in Japan 2016; Cabinet Office Japan; Retrieved from http://www.bousai.go.jp/kyoiku/panf/pdf/WP2016_DM_Full_Version.pdf

⁷ http://www.unisdr.org/file/58158_finalannex-120162017resultsframework.pdf

⁸ UNISDR strategic framework 2016–2021; Retrieved from UNISDR strategic framework 2016–2021.

Effect of an Intervention on Knowledge among Nurses Regarding Their Role in Disaster Management: A Tertiary Care Centre Study

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ABSTRACT:

Background: Globally, there has been a steady increase in the magnitude and frequency of disasters and public health emergencies in recent years. In the last decade, there has been an estimated 60 per cent increase in disasters worldwide in which an estimated two million people lost their lives, 4.2 million were injured, 33 million were left homeless and three billion were otherwise affected

The number of programmes preparing for nurses in disaster management is still limited, resulting in professional nurses with limited competencies to participate effectively during a disaster. The effectiveness of prior training also ensures the safety and health of healthcare workers and responders during a disaster

Objective of study: To assess knowledge of nurses regarding disaster preparedness and assess effect of an intervention on their knowledge level.

Methodology: The study was conducted at advance trauma centre of a tertiary health centre of north India. The research design used for the present study was one group pre-test post-test design. The data was collected by using a structured questionnaire. The participant's population for the present study were nurses working at advanced trauma centre of tertiary care centre. Sample size was 150 nurses

Ethical consideration

This study was approved by the Institute Ethics Committee and moreover, informed consent from the participants were obtained.

Intervention: Nurses were offered opportunities to learn and practice about disaster nursing in one day workshop that carried out with total of five lectures, mock drill of disaster and triage, group discussion on topics related to disaster nursing were delivered by experts

The data collection tool was the knowledge assessment questionnaire of the participating nurses which was regulated in three parts.

Part A: Socio demographic profile consisted of the demographic data of the subjects/nurses such as name, age, gender, marital status, educational status, occupation, habitat, number of family members.

Part B: Includes total work profile, work experience in neurosurgery unit, duration of working in same unit, previous experience to work on protocol based nursing intervention and having attended any conference, workshop related to cerebral aneurysm care.

Part C: This part included questions about knowledge of disaster nursing including what is concept of Triage. In Triage patients are prioritised by what. According to national disaster management authority, which type of patients will come under green colour coding. Disaster management act was passed in which year. Institute employees strike is a type of disaster or not. PGIMER is highly prone to receive which type of disaster. Which is manmade disaster. Disaster management phases correct order. What is disaster mitigation? Nurses role in disaster preparedness. Nurses are important member of disaster team or not. In triage, red colour code represents which type of patients. Black colour code in Triage means. Disaster management knowledge is important. START stands in disaster management for what. Principles of disaster nursing includes. Role of nurse in response phase of disaster management. A disaster victim has facial injury, which of the triage category should this victim be placed. National Institute of disaster management is located where. Which of the following activities is covered by disaster management before, during or after a disaster.

Results: The mean age of the nurses was 31.23 ± 5.55 with the range of 24–50 years. It was observed in present study that the mean knowledge score of the participants before starting the workshops was 10.01 ± 2.15 , immediate test after the intervention, it improved to 18.67 ± 2.20 and at month post-test was 15.59 ± 2.12 . In the pre-test, majority of nurses (60 per cent) scored between 50–75 per cent followed by 38 per cent between 25–50 per cent.

However immediate post-test, majority of nurses (91.3 per cent) scored between 75–100 per cent, only 8 per cent nurses scored between 50–75 per cent. At one month post-test 69.3 per cent nurses scored between 75 to 100 per cent and 17.6 per cent scored between 50–75 per cent. Only 2 per cent nurses scored between 25–50 per cent at one month.

Discussion: Nursing personnel's needs for education in all contexts and professional domains and various wards are an inevitable and important issue. Continuing education in medical sciences acts as an essential element to preserve graduates' professional skill. Research investigations show that nurses have an undeniable role in promotion of treatment and care through their upmost direct services to the patients

Health systems can improve disaster response by promotion of their nurses' clinical competencies.

Nursing curricula and continuing education programmes should incorporate emergency preparedness information.

Conclusion: The study provide important information regarding incensing role of nurses in disaster management and importance of continue education.

KEYWORDS: healthcare, knowledge management, tertiary care, disaster management

Disaster is anything that disrupt a normal living and system. A disaster is a catastrophic event that often leads to great destruction and loss. Logue defines a disaster as an event that causes excessive morbidity and mortality. It leads to extensive damage to property, roadways, electrical lines, and crucial infrastructures and limits a region's ability to respond.

Effect of disaster could be long lasting and not only limited to physical loss. Disasters also cause a great deal of psychological stress immediately after the event, and these effects may persist after stabilisation of the situation. How a victim or an emergency provider deals with disaster can be influenced by several factors,

including the person's sex, age, marital status, and baseline coping mechanisms. Disasters can be natural or man-made and can range from localised events to large-scale public health emergencies.

Globally, there has been a steady increase in the magnitude and frequency of disasters and public health emergencies in recent years. In the last decade, there has been an estimated 60 per cent increase in disasters worldwide in which an estimated two million people lost their lives, 4.2 million were injured, 33 million were left homeless and three billion were otherwise affected.

The number of undergraduate programmes preparing nurses for disaster management is still limited in many countries, resulting in professional nurses with limited competencies to participate effectively during a disaster.

Rising challenges in nursing practices due to advancement in medical science and increased expectations from health professional requires active and useful training method according to needs of patients, institution and profession. The continue educational interventions can enhance efficiency that are purposeful and based on nurses' educational needs.

Methodology

The study was conducted at a tertiary care centre of north India. The research design used for the present study was one group pre-test post-test design. The structured questionnaire about role of nurses in disaster preparedness was prepared on the basis of the objectives, review of literature and the suggestions of the expert regarding disaster. The participants (150) for the present study were nurses working at a tertiary care teaching centre.

The questionnaire had 3 parts which consisted of Socio demographic profile, experience & work profile and knowledge about disaster & its management.

Socio demographic profile consisted of the demographic data of the participants/nurses such as name, age, gender, marital status, educational status, occupation, habitat, number of family members.

The work profile, work experience in nursing, duration of working in same unit, previous experience to work in disaster units.

The knowledge about disaster & its management was assessed with the help of questions regarding concept of Triage, colour coding as per National Disaster Management Authority, National Institute of disaster management, Disaster Management, Disaster Management Act, Types of disaster, Disaster management phases, types of disaster patients received in the Institute, Nurses role in disaster preparedness.

Ethical Consideration

This study was approved by the Institute Ethics Committee and moreover, informed consent from the

participants were obtained. Furthermore, the participants remained anonymous with the right to withdraw from the study at any stage and none of the results of test were disclosed to maintain the confidentiality of the data. The participation of nurses was purely voluntary.

Intervention

A one day workshop was organised for nurses in the month of August 2018 which included lectures, mock drill of disaster and triage and group discussion on topics related to disaster nursing. The importance of disaster nursing was also discussed during the workshop. Pre-test was taken at the beginning of workshop and post-test was taken immediately after workshop and repeated after one month of intervention by approaching the participants at their working places. Identification numbers for nurses were used to maintain anonymity and match pre-/post questionnaire responses. The data obtained from the three stages baseline, after workshop and one month after the end of the training workshop were converted to digital codes and entered in the SPSS 20.0 computer software.

Results

Table 1: Socio-demographic Variable among Participants Nurses

Socio-demographic Variable	n (per cent) 150
Age(years)*	
21–30	83(55.33)
31–40	57(38)
41–50	10(6.66)
	Mean age: 31.23±5.55
Gender	
Male	48(32.0)
Female	102(66.0)
Background	
Rural	69(46.0)
Urban	82(54.66)

(Continued)

Table 1: (Continued)

Socio-demographic Variable	n (per cent) 150
Education	
Diploma in Nursing	47(39.2)
Graduation in Nursing	67(55.8)
Post-graduation in Nursing	06(05.0)
Religion	
Hindu	91(60.66)
Sikh	52(34.66)
Others (Muslim, Christian)	07(4.66)
Type of family	
Nuclear	76(50.6)
Joint	44(29.33)

Table 2: Work Profile of Participant Nurses

Work Profile	n (per cent) 150
Designation	126(84.0)
Nursing Officer Senior Nursing Officer	24(16.0)
Total experience in working [#](years)	
1–5	77(51.33)
6–10	38(27.5)
10 years and above	35(23.33)

Total experience in working at this Institution

Table 3: Final Mean Knowledge Score of Nurses
N- 150

Knowledge Score	Mean±Std. Deviation	F value (df),P value
BASELINE	10.01 ±2.15	504.226 (2, 264),
POST TEST	18.07±2.20	0.0001*
ONE MONTH POSTTEST	15.59±2.12	

Table 4: Category Wise Results of Knowledge Score

Knowledge Score (per cent)	Pre-test (per cent) (N=150)	Posttest (N=150)	Posttest after 1 month (N=137)
>75	03(2.0)	137(91.3)	104(69.3)
50–75	90(60.0)	12 (8.0)	26(17.30)
25–50	57(38)	01((0.7)	03(2.0)
Repeated measure	1. 1.974(4)0.741		
An nova	2. 0.592(4)0.964		
	3. 0.545(4)0.969		

Table 5: Knowledge of Nurses Regarding Disaster Nursing

Knowledge of Nurses Regarding Disaster Nursing		n ₁ (per cent)		p value*
		Correct Response		
		Baseline	Post Test	
1.	The concept of Triageis sicker patient will be given most priority	65(43.3)	131(87.3)	<0.001
2.	In triage patients are prioritised according to severity of life threatening injury	69(46.0) 132(90.8) <0.001		
3.	According to national disaster management authority, green colour coding patient is little injured but can wait for few time to get care.	85(56.6)	139(92.6)	<0.001
4.	Disaster management act was passed in year 2005	85(56.6)	139(92.6)	<0.001

(Continued)

Table 5: (Continued)

Knowledge of Nurses Regarding Disaster Nursing		n ₁ (per cent)		p value*
		Correct Response		
		Baseline	Post Test	
5.	Institute employees strike is also a type of disaster	98(65.3)	146(97.3)	<0.001
6.	PGIMER is highly prone to receive disaster of nature made	78(52.0)	146(97.3)	<0.001
7.	Fire Accident is man-made disaster.	68(45.3)	133(88.6)	<0.001
8.	Arrange disaster management phases in correct order is Preparedness, Response, Mitigation Recovery	91(60.6)	143(95.3)	<0.001
9.	Planning before disaster is mitigation	53(35.3)	130(86.6)	<0.001
10.	The nurses role in disaster preparedness is getting prepare before disaster strike	46(30.6)	125(83.3)	<0.001
11.	Nurses are important member of disaster team	67(44.6)	135(90.0)	<0.001
12.	In triage, red colour code represents, highest priority- Immediate resuscitation in next 6 hours	84(56.0)	139(92.6)	<0.001
13.	Black colour code in triage means least priority- Dead or moribund patients.	83(55.3)	128(85.3)	<0.001
14.	Disaster management knowledge is important for all team.	86(57.33)	140(93.3)	<0.001
15.	The START stands in disaster management, simple Triage And Rapid Treatment	93(62.0)	140(93.3)	<0.001
16.	Principles of disaster nursing includes, rapid assessment of the situation and of nursing care needs.	54(36.0)	128(85.3)	<0.001
17.	Role of nurse in response phase of disaster management, Immediate post-disaster intervention, Utilisation of available resources. Management of infection control	56(37.3)	135(90.0)	<0.001
18.	Disaster victim has facial injury, should this victim be placed, highest priority (Red)	82(54.6)	135(90.0)	<0.001
19.	National Institute of disaster management is located at New Delhi	57(38.0)	131(87.33)	<0.001
20.	Which of the following activities is covered by disaster management before, during or after a disaster, Reconstruction and Rehabilitation, Mitigation, Emergency response	107(71.33)	138(92.0)	<0.001
Knowledge of nurses regarding disaster nursing		n ₁ (per cent)		p value*
		Correct Response		
		Baseline	One month	

(Continued)

Table 5: (Continued)

Knowledge of Nurses Regarding Disaster Nursing	n ₁ (per cent)		p value*
	Correct Response		
	Baseline	Post Test	
1 The concept of Triage is sicker patient will be given most priority	60(45.1)	110(75.18)	<0.001
2. In triage patients are prioritised according to severity of life threatening injury	59(39.33)	47(35.33)	<0.001
3. According to national disaster management authority, green colour coding patient is little injured but can wait for few time to get care.	75(50.0)	104(78.19)	<0.001
4. Disaster management act was passed in year 2005	74(49.33)	120(80.0)	<0.001
5. Institute employees strike is also a type of disaster	87(58.3)	93(69.0)	<0.001
6. PGIMER is highly prone to receive disaster of nature made	66(44.0)	112(84.21)	<0.001
7. Fire Accident is man-made disaster.	60(40.0)	92(69.17)	<0.001
8. Arrange disaster management phases in correct order is Preparedness, Response, Mitigation Recovery	81(54.0)	117(87.3)	<0.001
9. Planning before disaster is mitigation	49(32.66)	104(78.9)	<0.001
10. The nurses role in disaster preparedness is getting prepare before disaster strike	40(26.6)	95(71.42)	<0.001
11. Nurses are important member of disaster team	60(40.0)	108(81.20)	<0.001
12. In triage, red colour code represents, highest priority- Immediate resuscitation in next 6 hours	125(83.33)	89(66.91)	<0.001
13. Black colour code in triage means least priority- Dead or moribund patients.	73(61.73)	118(88.72)	<0.001
14. Disaster management knowledge is important for all team.	73(61.73)	118(88.72)	<0.001
15. The START stands in disaster management, simple Triage And Rapid Treatment	83(53.16)	106(79.69)	<0.001
16. Principles of disaster nursing includes, rapid assessment of the situation and of nursing care needs.	48(32.0)	104(78.19)	<0.001
17. Role of nurse in response phase of disaster management, Immediate post-disaster intervention, Utilisation of available resources. Management of infection control	50(33.3)	114(85.71)	<0.001

(Continued)

Table 5: (Continued)

Knowledge of Nurses Regarding Disaster Nursing		n ₁ (per cent)		p value*
		Correct Response		
		Baseline	Post Test	
18.	Disaster victim has facial injury, should this victim be placed, highest priority (Red)	74(49.33)	107(80.45)	<0.001
19.	National Institute of disaster management is located at New Delhi	50(33.33)	108(87.33)	<0.001
20.	Which of the following activities is covered by disaster management before, during or after a disaster, Reconstruction and Rehabilitation, Mitigation, Emergency response	95(63.33)	108(87.33)	<0.001

Table 6: (A) Comparison of Difference in Mean Score from Baseline to Post-test, Baseline to One Month Among Demographic Variables of Study Participants

Variables		N	Mean Difference (Baseline VS Posttest)	P value	N	Mean Difference (Baseline VS 1month)	P value
Gender	Male	48	7.75±3.18	0.318	45	5.66±3.43	0.157
	Female	102	8.24±2.63		88	5.84±2.70	

Table 6: (B) Comparison of Difference in Mean Score from Baseline to Post-test, Base Line to One Month Among Demographic Variables of Study Participants

Variables		N	Mean Difference (Baseline VS Post-test)	P value	N	Mean Difference (Baseline VS 1month)	P value
Education	Diploma	46	8.21±2.15	0.92	38	4.84±3.38	0.83
	Graduation	98	8.02±3.05		89	5.97±2.80	
	Post.	06	8.08±2.82		06	4.33±1.75	
	Graduation						

Table 6: (C) Comparison of Difference in Mean Score from Baseline to Post-test, Base Line to One Month Among Demographic Variables of Study Participants

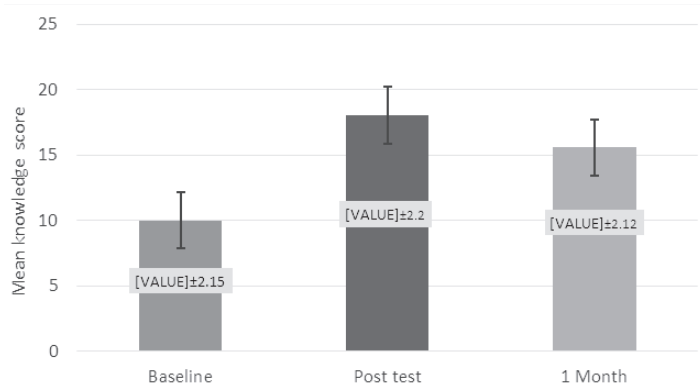
Variables		N	Mean Difference (Baseline VS Post-test)	P value	N	Mean Difference (Baseline VS 1month)	P value
Age category	22–35	83	8.18±2.68	0.95	77	5.66±3.38	0.75
	36–45	57	8.01±3.10		46	5.58±3.30	
	45-above	10	8.30±2.82		10	4.90±3.24	

Table 6: (D) Comparison of Difference in Mean Score from Baseline to Post-test, Baseline to One Month Among Demographic Variables of Study Participants

Variables		N	Mean Difference (Baseline VS Post test)	P value	N	Mean Difference (Baseline VS 1month)	P value
Working experience	0–5 years	79	8.06±2.76	0.96	73	5.41±3.02	0.60
	06–10 years	37	8.02±2.75		33	6.03±2.73	
	11years and above	34	8.20±2.05		27	5.48±3.21	

Table 6: (E) Comparison of Difference in Mean Score from Baseline to Post-test, Baseline to One Month among Demographic Variables of Study Participants

Variables		N	Mean Difference (Baseline VS Post test)	P value	N	Mean Difference (Baseline VS 1month)	P value
Marital status	Married	47	7.72±2.66	0.28	43	5.09±2.77	0.195
	Single	103	8.25±2.88		90	5.80±3.60	

**Figure 1:** Mean Knowledge Score At Baseline, Posttest, 1 Month

The results shows interesting relationship between variables. The mean age of the nurses was 31.23±5.55 with the range of 24 -50 years. Majority of the nurses (66 per cent) were female and from urban area 82(54.66). Total 60.6 per cent were Hindu by religion and had nuclear family. More than half of nurses (51.33 per cent) nurses were having less than 5 years of working experience. It was observed in present study that the mean knowledge score of the participants before starting the workshops was 10.01±2.15, immediate test after the intervention, it improved to 18.67±2.20 and at month post-test was 15.59±2.12. In the pre-test, majority

of nurses (60 per cent) scored between 50–75 per cent followed by 38 per cent between 25–50 per cent.

However immediate post-test, majority of nurses (91.3 per cent) scored between 75– 100 per cent, only 8 per cent nurses scored between 50–75 per cent. At one month post-test 69.3 per cent nurses scored between 75 to 100 per cent and 17.6 per cent scored between 50–75 per cent. Only 2 per cent nurses scored between 25–50 per cent at one month. Educational status of nurses had significant relationship with knowledge as graduate nurses had better score than diploma nurses. The mean knowledge score of all the participants improved significantly after attending the workshop irrespective of age. Although there was decrease in mean knowledge score in post-test one month i.e. Even then it was significantly better than the pre-test score. There was statistically significant difference in category-wise knowledge score of nurses in pre-test and post- test. ($p < 0.05$). Although after one month post-test, out of 150 nurses who participated in workshop total 17 participants did not respond to month post-test. 133 participants responded in 1 month post-test. Knowledge scores less than or equal to 50 per cent of total score (0–10) assumed as average knowledge, scores between 51 per cent to 75 per cent (11–15) of total scores assumed as good knowledge; and score 75

per cent (16–20) of total score assumed as very good knowledge.

Discussion

The study was conducted to evaluate the effectiveness of an intervention on nurse's knowledge regarding their role in disaster management. Many researchers believe that among education or training leads to learning but the depth and stability of learning differs in various training methods.

In recent years large number of studies have investigated the effectiveness of various training programmes in the field of creation of sustainable learning for nurses working in clinical areas.

The obtained results showed the impact of sustainability of information was well maintained even up to one month after intervention.

The mean knowledge score of the participants before starting the workshops was 10.01 ± 2.15 , immediate test after the intervention, it improved to 18.67 ± 2.20 and at month post-test was 15.59 ± 2.12 . Number of studies showed that nurse's knowledge is weak in context of nursing cares as well as lack of fulfilment of determinant and important needs concerning administration of professional duties.

Various studies reveals that the effect of educational programmes on nurse's knowledge improve in quality of practices. In recent years, much attention has been given to disaster planning, and particularly evidence-based disaster planning. Disaster research may help planners to avoid common management pitfalls, thereby improving disaster response planning.

Hospitals often have a prominent but also vulnerable role in disaster management. In general, they receive disaster victims in addition to their normal patient inflow. Recently, much attention has been focused on the principles of 'surge capacity', that is, the ability to provide acute care to critical and non-critical mass casualties simultaneously.

The objective of disaster preparedness for nurses is to ensure that appropriate systems, procedures and resources provided timely effective assistance to disaster victims thus, facilitating relief measures and rehabilitation of services. The health care workers are responsible for maintaining their wellbeing and community members, resources organisations and

administration, should be the cornerstone of an emergency preparedness programme.

The International Council of Nurses (ICN) recognised an accelerated need to build capacities of nurses at all levels in order to safeguard populations, limit injuries, mortality and maintain health system.

The Association of Women's Health, Obstetric and Neonatal Nurses (AWHONN) also encourages nurses to participate actively in all phases of disaster preparedness and response within their institutions, communities and planning prior to a disaster, response during crisis and assist with mitigating throughout the recovery phase.

Fundamentals of Nursing: Human Health and Function said that the standard of clinical nursing practice provides a holistic framework for the practice of nursing. Today's nurses are faced with the challenges of responding to natural man-made and technological disasters.

National Population Commission of Nigeria also said that nurses hold a major role in providing healthcare management and assistance, and allocating care during time of disaster.

Research shows that different types of human resources improvement programme including continuing education fulfil the needs of nursing community to some extent and repetition of these workshops in regular time intervals, at most biannually, seems essential.

Abbaszadeh et al. showed the continue education programmes resulted in an increased in nurses knowledge about documentation. Another study by Karimi et al. reported that holding educational workshop had high positive impact over nurse's knowledge about communication skills. The results of another study conducted to assess effect of an intervention on nurses knowledge and practices on drug dose calculation found, educational programmes based on nurses need assessment can notably affect nurse's knowledge and practices. Designing an efficient pattern for nursing personnel's educational programmes and provision of the possibility for their performance with regard to existing conditions in such tertiary care hospitals seems essential for fulfilment of nurses' educational needs. Promotion of nursing care quality to achieve this goal, application of appropriate methods in planning nurses' refreshing educational courses, and continuing education as well as consideration of their educational

needs are among the essential and crucial issues to be considered in this regard. Numerous studies, conducted on the effect of continuing education on nurses' efficacy, self-confidence, knowledge and skills, all show positive effects. Frequent studies, conducted by various researchers, show that continuing education is effective on promotion of cares quality.

Nursing personnel's needs for education in all contexts and professional domains and various wards are an inevitable and important issue. Continuing education in medical sciences acts as an essential element to preserve graduates' professional skill. Research investigations show that nurses have an undeniable role in promotion of treatment and care through their upmost direct services to the patients.

Health systems can improve disaster response by promotion of their nurses' clinical competencies.

Nursing curricula and continuing education programmes should incorporate emergency preparedness information.

Conclusion

The study provide important information regarding incensing role of nurses in disaster management and importance of continue education.

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Knowledge among Nursing Students on Zika Preparedness

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ABSTRACT: In 2015, ZIKV captured global attention when Brazil had a major outbreak and worrying increase in microcephaly, a condition in which a baby is born with a small head or the head stops growing after birth, and a possible link to the Guillain-Barré syndrome (GBS). an acute neuropathy that affects the nerves that control muscle strength and transmit pain, temperature and sensations of touch (WHO, 2017).

Almost 1.3 million people are affected in Brazil alone, and 20 countries or territories have reported local transmission of the virus (Plourde & Bloch, 2016).

With the epidemic likely to hit the country very soon, a robust and multifaceted response is needed to reduce psychosocial stress and improve the preparedness of the population.

Psychiatrists involved in the psychoeducation process of the patient and/or family members must learn to understand and address ZIKA problems as part of their intervention.

When evaluating the conditions in relation to the reviewed articles, it is assumed that ZIKA represents a biological risk with a severe physical, psychological, social, economic and political burden that can subsequently affect the well-being and quality of life of vulnerable population groups. in a small area Macro level.

The review points out that there are no studies that focus on the training of mental health professionals and/or health professionals to improve the preparation of those who are the first stop for relief at the primary, secondary or tertiary level and medical emergencies.

There is, therefore, an urgent need to explore these areas and assess the level of knowledge.

Need for a current study: The review establishes that there are no studies that focus on training mental health and/or health professionals to improve the preparation of those who are the first port of call in primary, secondary or they will be tertiary for relief. and medical emergencies.

There is, therefore, an urgent need to explore these areas and assess the level of knowledge and the possibilities of imparting it. Therefore, it is best to examine the WHO ZIKA virus toolkit available to healthcare professionals to determine its adaptability to the Indian environment.

KEYWORDS: ZIKA virus, knowledge management, health care professionals

Introduction

ZIKA virus (ZIKV) was originally discovered in a sentinel rhesus macaque in Uganda in 1947 and is endemic in Africa and Asia. The first large outbreak was in 2007, from the Island of Yap (Federated States of Micronesia), followed by French Polynesia in 2013 (WHO, 2017). ZIKV infection is typically self-limiting and manifests as

fever, rash, conjunctivitis, arthralgia, (Brasil et al., 2016) and, uncommonly, neurologic syndromes such as the Guillain-Barré syndrome (Parra, Lizarazo, & Jimenez-Arango, 2016).

ZIKV infection in an otherwise healthy person is typically asymptomatic, and for those who do experience them, the symptoms tend to be mild. Symptoms last 2–7 days and consist of a combination

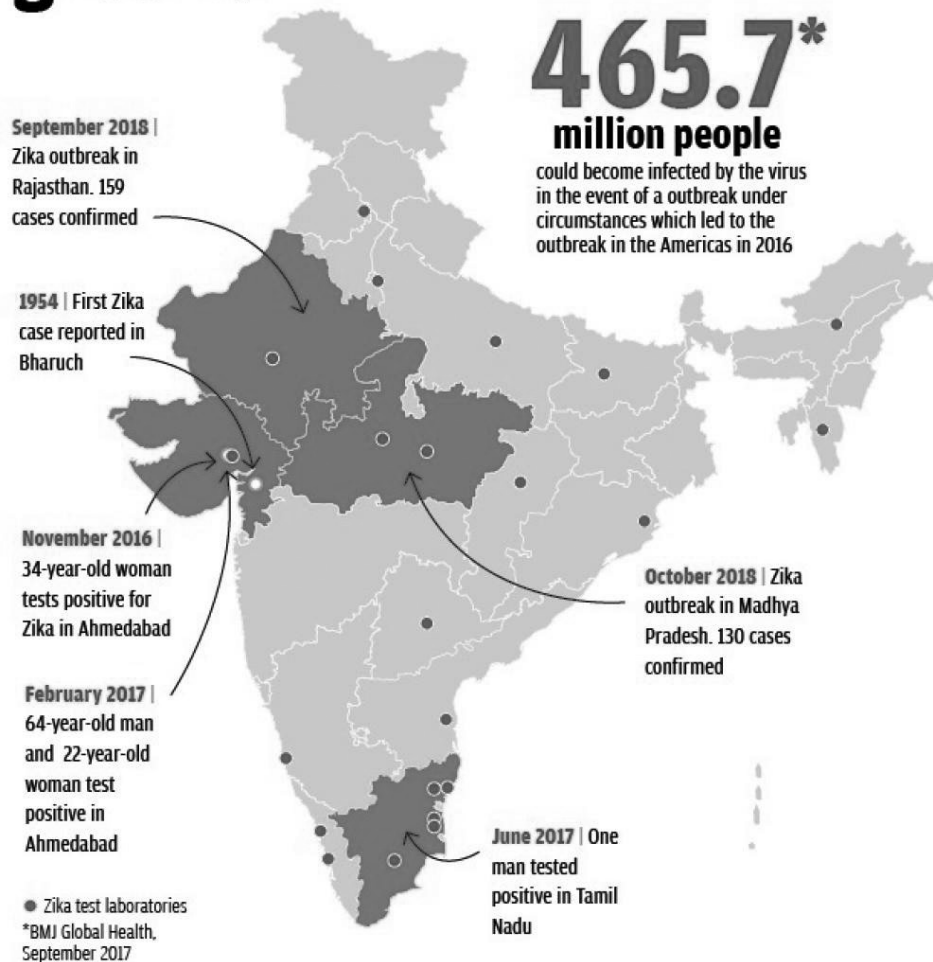
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of fever, skin rash, conjunctivitis, muscle and joint pain, malaise and headache (WHO, 2017). In 2015, ZIKV gained global attention when Brazil reported a large outbreak and a concerning increase of both microcephaly, a condition where a baby is born with a small head or the head stops growing after birth, and possible association with Guillain-Barré Syndrome (GBS), an acute neuropathy that affects the nerves controlling muscle strength, transmitting pain, temperature, and touch sensations (WHO, 2017).

Mosquito acquisition of the virus likely occurs during a blood meal; after uptake, the virus replicates and is transmitted to a reservoir animal at the next blood meal (loos, Mallet, Leparç, Gauthier, Cardoso, & Herida, 2014). Other non-vector modes of ZIKA virus transmission include congenital, perinatal, and sexual (Plourde & Bloch, 2016). ZIKA virus has been declared a public health emergency. Nearly 1.3 million persons have been affected in Brazil alone and 20 countries or territories have reported local transmission of the virus (Plourde & Bloch, 2016).

Breeding ground

India has the largest Zika-exposed population in Asia. The country has had 289 Zika cases in 2018, up from four in 2016-17



(Down To Earth, 2018)

Modes of travel are faster, due to which there is a strong chance for further spread into Asian countries. Methods of transmission can be through different methods, be it through *Aedes* mosquitos' bite, conjugal relation between two individuals or during pregnancy from mother to the child. As the chances of the epidemic hitting the country are expected very soon, a robust, multifaceted response is required to reduce the psychosocial burden and to improve the preparedness among the people.

The most vulnerable sections would be women and children during the ZIKA epidemic as they may face fear and distress about their pregnancy in the background of misconceptions. This will have a positive correlation with the emotional and psychosocial wellbeing in these populations. This may lead to other socioeconomic problems for parents and families, reducing their access to care and support and impacting on their livelihoods. Misconceptions about transmission, the cause of the disability, and blaming of the parents may exist, thus compounding feelings of isolation, guilt, stress, and depression that may be felt by the family of the child and child as he/she gets older (WHO, 2017).

The mental health professionals who are involved in the process of psycho-educating the patient and/or family members need to learn to understand and address the issues about ZIKA as a part of their intervention. The ZIKA Toolkit that is produced by the WHO is a cumulative and comprehensive module which brings into light the method of intervening in the situation. But as this epidemic is one of its first kinds in the country the knowledge about the illness is very limited.

Assessing the conditions with respect to the reviewed articles, it is understood that ZIKA is a biological hazard with a severe physical, psychological, social, economic and political burden which later can affect the well-being and quality of life of vulnerable populations at a micro and macro level. The review states that there are no studies emphasising on educating the Mental Health professionals and/or Health Care Professionals to improve preparedness among individuals who will be the first point of contact on the primary, secondary or tertiary level for mitigation and medical emergency. Hence there is a strong need to explore these areas and assess the level of knowledge.

As per the Down To Earth's report of 2018, India has the largest ZIKA-exposed population in Asia. The country has had 289 Zika cases in 2018, up to from four in 2016–17.

Theorisation

Improving mental health literacy is a significant component of mental health promotion (Francis et al., 2002). The concept of health was traditionally seen from a pathogenesis perspective. The pathogenesis approach just looks into the origin of illness and it was found to be not beneficial by the researchers. As opposite to pathogenesis approach, Aaron Antonovsky, a medical sociologist has introduced the theory of salutogenesis (Gloeckler, 2001). It aims at finding and examining factors which are responsible for the formation and the maintaining of health. The two core concepts of the salutogenesis theory are the Sense of Coherence (SOC) and the Generalised Resistance Resources (GRRs). The sense of coherence is a combination of people's ability to assess and understand the situation they are in, find meaning to move in a health-promoting direction and having the capacity to do so. On the other hand, general resistance is any character in a person, group or environment that can facilitate effective tension management.

Need for the Current Study

The review states that there are no studies emphasising on educating the Mental Health professionals and/or Health Care Professionals to improve preparedness among individuals who will be the first point of contact on the primary, secondary or tertiary level for mitigation and medical emergency. Hence there is a strong need to explore these areas and assess the level of knowledge and ways of imparting the same. Hence, it is better to explore the available WHO Toolkit for ZIKA Virus for Health Care Professionals (Section 2) for its adaptability in the Indian settings. The scope of the study extends to the health care workers in primary, secondary and tertiary care settings dealing with women and public health issues. Theoretically, it will bring in a preparedness module in the health and mental health care field to combat a biological disaster.

Methods

The study sample considered was the 285 Undergraduate Nursing students at NIMHANS using the Survey method. This population was considered as the Nursing population are the ones who are present at the primary, secondary and tertiary levels and are the first point of contact in any hospital setting.

The sample was assessed across various parameters. An individualised semi-structured interview method was utilised to collect the information. The WHO-KAP semi-structured schedule for ZIKA was used for the study which had 90 questions varying across Knowledge, Attitudes, and Practices of individuals towards ZIKA.

Statistical Analysis

A statistical analysis of the data was done using SPSS 14.0. Descriptive statistics were utilised to describe the data for the study. Wherever relevant, the data has been described further.

Results

The sample (n=285) predominantly consisted of females (89.82 per cent) in the age range of 18–22 years with mean age 19 years in which 78 per cent were following Hinduism. 82 per cent belonged to Nuclear family and had nearest health facility situated within 2.5 km.

Sl #	Characteristic Domain	per cent
1	Risk expected by the individual about the strike of ZIKA in next 6 months	22
2	Belief that the local healer, traditional birth attendant or a midwife's responsibility to protect self, household and community from ZIKA	47
3	Confused about ZIKA being a problem	51
4	Women should avoid getting pregnant during the time of ZIKA-Not known	37

Sl #	Characteristic Domain	per cent
5	All women who get ZIKA during pregnancy to have access to safe and legal abortion – Not known	49
6	Do not know if they would be discriminated or stigmatised because of ZIKA	38
7	Disagree that a woman having a child with Microcephaly or any other disability	47
8	When somebody in the family gets ZIKA should it remain private/a secret	38

Discussion

The current study focused on assessing the level of knowledge among the undergraduate nursing trainees under the College of Nursing, in NIMHANS. Majority of the respondents were female and were contacted through proper channel. The sample consisted of students across the first, second, third and fourth year of Nursing.

During a period of an epidemic, especially in the context of a biological disaster, an individuals' initial instinct is to come to a clinic for a consultation and the first point of contact are the nurses. *Gould* in the article "Outbreaks of infection in community settings: The nursing implications" stated that nurses are in a stature where they are able to identify the early signs and symptoms of an infection and help in early treatment intervention. As the symptoms of ZIKA start at mild symptoms with no specific treatment, awareness among the first point of contact becomes important. The same has been concluded by the studies regarding the importance of involving nurses for the awareness and education aspect of ZIKA.

Assessing the conditions with respect to the reviewed articles, it is understood that ZIKA is a biological hazard with a severe physical, psychological, social, economic and political burden which later can affect the well-being and quality of life of vulnerable populations at a micro and macro level. Hence, it

is understood also from the study that the level of knowledge among the health professionals hereby being the nursing students who work across the primary, secondary and tertiary centres was limited, thereby increasing risk in the time of an epidemic.

At the same time, this being the first study assessing the knowledge of the health professionals in a health care facility gave us the results wherein it was found that 2 out of 3 respondents considered ZIKA to be a problem which correlates with WHO declaring it as a Global Health Emergency (WHO, 2017). Of the fact that 1 out of 4 thought that ZIKA could strike in another 6 months, it correlates with report that the regions of the country where ZIKA was expected.

Though it is considered that during a national health emergency, it is supposed to be the government's responsibility to protect the individual from the epidemic, majority of the respondents believed that they themselves, their families and other organisations namely the non-funded organisation would be the ones who should take up the responsibility of protecting during the period of a ZIKA outbreak. Self-efficacy increases the effectiveness of oral communication and promotes civic participation (Verba, Norman, & Jae-on, 1979).

However, 1 out of 4 believed "God has the responsibility to protect us", which correlates with the traditional pathways of care that individuals always believe in. A similar biological disaster which had created a furore in the country was that of HIV/AIDS wherein it was found that 50 per cent-60 per cent of paramedical had misconceptions on HIV/AIDS resulting in maladaptive pathways of care (Dobe, 1995). Triangulating the information, it becomes more important to help spread proper knowledge through knowledge which shall help in the better attitudes and practices that health care professionals have towards the epidemic.

Stigma and Discrimination as defined by Goffman (Goffman, 2009) as the differential treatment provided to individuals during an epidemic or an illness thereby negatively impacting the lives of individuals was endorsed by only 1 out of every 6 respondents, thereby stating that there maybe a reduced stigma level among individuals and thereby not reducing the quality of life of the affected population. This

result contradicts the previous results with respect to biological disaster wherein there was a signification relationship established between the attitude of health care providers and social stigmatised attitude (Zarei, Joulaei, Darabi, & Fararouei, 2015).

Understanding the fact that the condition has co-morbid conditions of Microcephaly and Guillain-Barré syndrome, a quarter of the respondents believed that women need to have safe and legal permission for choosing abortion in the condition where they are diagnosed with ZIKA Virus infection. The Medical Termination of Pregnancy Act of 1971 with the amendments of 2002 and 2003 does approve medical abortion and is aimed at providing safe services but the problems of the poor awareness of the law, the linked contraceptive targets and the lack of good clinical practice to provide safe access to safe abortion care still remain making it a policy level decision and implementation to ponder upon at the time of the epidemics (Hirve, 2004).

Limitations

The current study focused on understanding the knowledge among the nursing trainees regarding ZIKA, based on their descriptive reports. While providing a descriptive status of the findings, certain methodological limitations may prevail thus. Similarly, the study is based on data collected from the sample only on a single-contact basis. Further contact could have proved helpful in understanding their attitude and practices status better.

Conclusion

The ZIKA Virus being the first of its kind in the country with the co-morbid conditions has no vaccine or cure as of now. It is tough understood that the health professionals have information regarding how the virus is spread, the prevention strategies and method of management. The socio-cultural aspects increasing the risk behaviour is also understood and the effect on the functionality at biological, social and occupational levels can be perceived. The poor understanding and preparedness among the health care population will have higher chances of increasing the Disability-

adjusted Life years here and thereby increasing the Global Burden affecting the government and the international organisations. Health Knowledge, awareness and lifestyle modification is the current need of the day. The Nursing profession being the first point of contact, it would be helpful if the section on the current epidemics being of biological origin is included in the curriculum as a section in Microbiology subject. Thereby, making it imperative for the healthcare professionals to increase their knowledge towards the epidemic as a lack of adequate disaster preparedness and facilities for medical and psychiatric care is imminent.

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Economy and Disaster

Disaster Preparedness for Standing Crops and Irrigation Water during Drought Spells

Rajiv Gupta^a and Soumya Kar^a

ABSTRACT: Disasters can vary from sudden earthquake to the slow creeping droughts to unforeseen rainfall. These are events which disrupt the normal functioning of the society and people. Apart from material damages, losses to life are very common. It takes a long time for people to overcome these effects of the disaster. Many times it is very difficult with the available resources and policies. This necessitates the needs for effective preparedness and mitigation measure which will reduce the damages to a great extent thereby accelerating the recovery. In our study, we have developed a disaster management system for reducing damage to standing crops. The system consists of two parts: (1) Inverted umbrella structures placed above the ground surface and (2) a well-connected water conveyance underground system. The umbrella structures protect the crops from the damaging effect of rainfall, hailstones and high temperatures during daytime while the conveyance system is used to transfer excess water to the storage pit. Effective rainwater harvesting helps to keep a check on droughts. Policies are effective in managing droughts for a short duration but technological developments and advancements are essential in the long run.

KEYWORDS: disasters, preparedness and mitigation, rainwater harvesting, an inverted umbrella structure

Introduction

Being an agrarian country, India has been facing a lot of trouble due to the scarcity of water and unseasonal and unpredictable rainfall in recent years. Massive amounts of crops get damaged leading to food insecurity. The most-hard hit is the farmers who even go to the extent of suicide or give up their jobs for other menial jobs. In 2014, the National Crime Records Bureau of India reported 5,650 farmer suicides and the farmer's suicide rate in India has ranged between 1.4 and

1.8 per 100,000 total population, over a 10-year period through 2005 (Gruère and Sengupta 2011).

Disasters are adverse events which disrupt the normal functioning of the society by destroying basic infrastructures like roadways, railways, waterways and

healthcare facilities and the severity of which depends upon the affected population's ability to recover. A lot of difficulties lies in assessing and supervising risks which leads to extreme situations that emphasise the need for clarity in communicating how principles are applied in preventing and responding to disasters thereby improving our preparedness (Bankoff et al. 2004; Vallero and Letcher 2012).

Current disaster management practices are mostly based on crisis management, i.e. measures undertaken are mostly responsive that treat only the symptoms rather than the cause (Wilhite et al. 2014). This necessitates the development and implementation of preparedness and mitigation measures.

Of the many disasters, drought has been defined to have a creeping phenomenon because of its nature to

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accumulate slowly over a considerable amount of time varying from few to several years and also being a region or impact specific (Gillette 1950; Wilhite and Glantz 1985). The event of drought has been the result of the occurrence of persistent large-scale interferences in the global pattern of atmosphere (Nicholls et al. 2005). Drought ranked first because of its creeping nature among various hazards and has been described to have both a natural and social dimension, where the social dimension turns it into a disaster (Bryant 1991; Blaikie et al. 1994). Droughts have been described as extended periods of dryness forming an integral part of the environment of almost all countries which reduces the productivity of the affected lands drastically. They stay for long periods of time and affect the nation by rippling through the economy (Wilhite et al. 2007). As much as 57 per cent of India's agricultural land is rain-fed with large shares in arid and semi-arid regions vulnerable to droughts. But till date drought mitigation policies are responsive like providing compensation and seeds as reported by National Academy of Agricultural Sciences, New Delhi in 2011. This calls for implementing drought preparedness and mitigation measures.

Climate is one of the main factors responsible for agricultural production and any change in it directly affects crop production (Dinar et al. 1998; Cline 2007; Seo and Mendelsohn 2008). Unforeseen precipitation and flooding events due to climate changes have caused great damages to crop production (Rosenzweig et al. 2002). Rainfall is the most important climatic factor responsible for crop production. In many instances, the effects of low rainfall can be minimised by irrigation but damages due to heavy precipitation cannot be prevented. Storms accompanied by heavy rain, hail, and gale many times cause agricultural losses worth millions of dollars. Many hectares of damage have been reported regularly. These damages lead to huge losses for farmers who then opt for crop insurances to recover the losses (Schoubroeck 1997). Apart from unforeseen rainfall, an ever-increasing temperature due to global warming is predicted to have a generally negative effect on the growth of plants. This can lead to significant loss in crop productivity and aggravate the situation of drought (Bitá and Gerats 2013).

Although there are several policies which can be adopted in the short run, technological advancement is necessary to curb the problem in the long run (Alam et al. 2011). One of the effective measures to reduce the instances of drought is by efficient management of water, predominantly rainwater. Rainwater harvesting is an age-old technique which deals with collecting excess precipitation and storing in tanks which can be used later for irrigation purposes and other uses. Since most of the rainfall events are concentrated over certain months there arises a need to capture the water (Myers 1975; Oweis et al. 1999). Here rainwater harvesting plays an important role. In India, we can witness several structures, both new and old constructed for rainwater harvesting. The main aim of rainwater harvesting is to mitigate the effects of time-based scarcities providing a steady water supply for several purposes (Oweis et al. 1999).

To reduce the effects of heavy and untimely precipitation and high temperatures on crops, some sort of cover can be placed to protect the crops. Inverted umbrella structures can be used for the same which operates with the same principle as an umbrella. The umbrella is a transformable kinetic structure that adapted to human needs since time immemorial. It meets meteorological changes with two opposite states, one closed and passive, one open and active. Transformable or deployable structures are the ones which have the ability to change their configuration from closed and small configuration to open and large configuration (Jensen 2004).

Transformable structures have been classified on the basis of their architectural and functional characteristics into reconfigurable structures and deployable structures where reconfigurable structures are permanent in nature and firmly attached to the ground and can change shape and form to adapt to different functions and climatic conditions; and deployable structures define the category of structures that can be transformed from a closed compact configuration to a predetermined expanded form in which they are stable and can carry loads (Liapi 2001; Gantes et al. 1991). Joints form an integral part of transformable structures and are designed so as

to carry the loads imposed on the structure in all configurations, reduce friction between connected members and avoid fatigue (Gantes et al. 1989).

The idea of a new architectural umbrella consisting of symmetric spatial one-degree of freedom platform mechanism, a flexible covering with struts and a hollow cylindrical mast with the rotational movement was developed where the most distinguishing features of the structure were the expansion process and input application (Korkmaz 2005). There are several existing deployable structures having varied usage but common ones are used for the purpose of protection against sun and rain in its varied configurations like the movable cover of the swimming pool in Seville, Spain (Escrig et al. 1996). Such transformable structures have been used for rainwater collection but have not been implied in agricultural fields for protection of crops (managing unpredicted precipitation and severe temperatures) and further assisting in rainwater harvesting.

Equipping these umbrella structures with strategically placed solar panels will aid in the generation of clean solar energy. Climatic changes, over-exploitation of resources and energy insecurity are problems which plague several sections of society. The energy generated will reduce dependence on main grids and ensure the supply of energy to be used in the agricultural field for running equipment and motor.

Method Summary

Figure 1 gives a systematic representation of the proposed methodology. Each inverted umbrella structure consisted of 1 supporting pole, 4 spokes, and 4 panes. The pole and spokes were fabricated from mild steel pipes and the panes of water-resistant cloth. Assuming that the load (due to raindrop and wind) on each pane was carried by the adjoining spokes, the load was equally divided among two consecutive spokes by calculating the total load on each pane. Further, by calculating the forces, the same principle of force distribution was applied to each pane and adjoining spoke for the analysis. The self-weight of the spokes was also included.

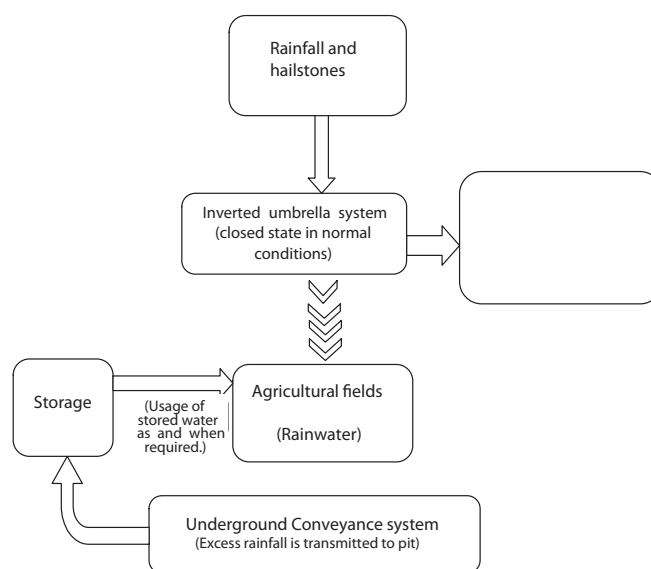


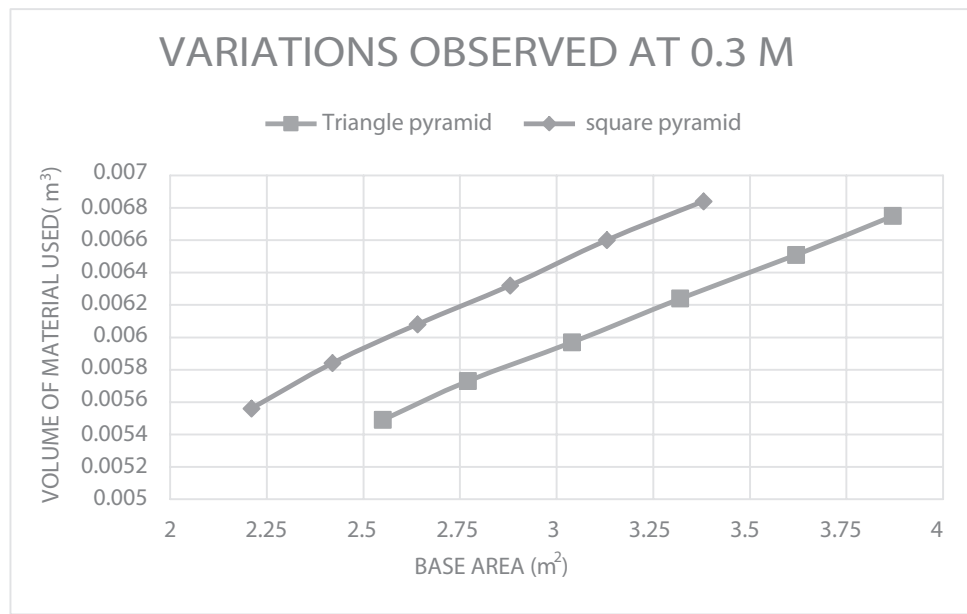
Figure 1: Systematic representation of the proposed method

The structural analysis of the inverted umbrella structure was carried out by using STAAD Pro 2006 software. The forces considered were the impact force of raindrops, the forces due to wind and self-weight of the structure. The force of a raindrop was determined by calculating the change of kinetic energy of the striking drop.

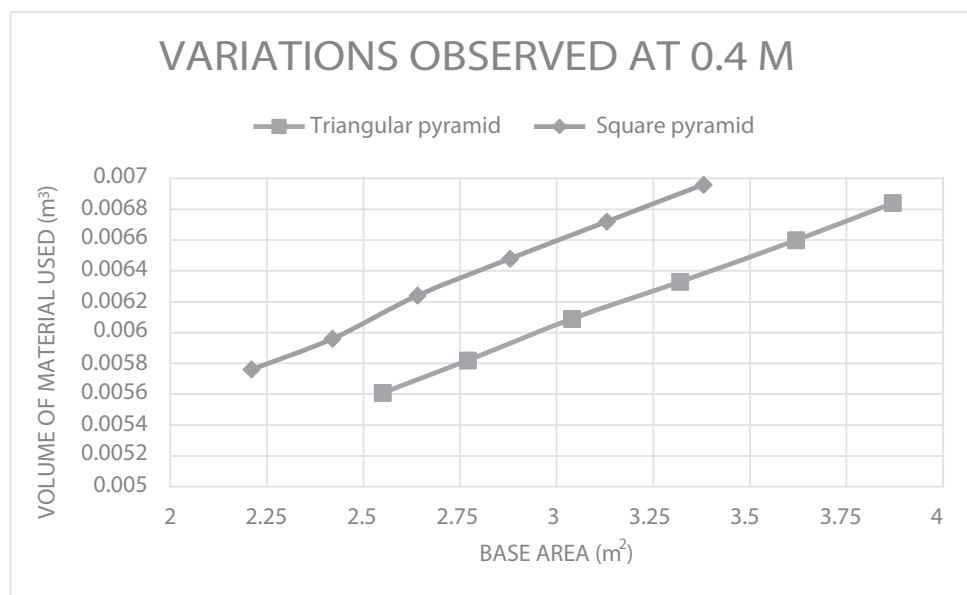
The initial shape of the structure adopted was an inverted pyramid with square and triangular bases. By varying the diagonal distance of the square base and altitude of the triangular base, and keeping the depth of the pyramid at a constant value of 0.3 m, a graph was plotted between the base area and volume of material required for the triangular and square pyramid structures (Fig 2(a)). A similar graph was plotted by fixing the depth at a constant value of 0.4m (Fig 2(b)).

Eventually, the triangular structure was discarded because of the complexity involved in placing the structures in the field in a compact pattern. Therefore only square pyramids were adopted.

By analysing the structures and optimising their performance under the applied loads, the square pyramid with a diagonal dimension of 2.6 m was selected for fabrication for both the depths i.e. 0.3m and 0.4m.



(a)



(b)

Figure 2: (a) variations at depth 0.3m; (b) variations at depth 0.4 m

Three types of structures of below-mentioned dimensions were fabricated and installed for field verification. The first two types of structures were fabricated for a depth of 0.4 m and the third type was fabricated for a depth of 0.3 m. For the first and second type, the poles and spokes were of mild steel pipes of diameter 2.5" and 1.25". For the third, galvanised iron

pipe of diameter 1.5" was used for the pole while the spokes were of mild steel of diameter 1.25" from an economic point of view and weight of the structure. For the joints, hoop iron strips of size 0.125" * 1" were used. After cutting all the material into their desired lengths and drilling at required positions, all the sections were welded together and fastened with nuts and bolts to

obtain the final structure. The mechanical device was provided with a manual lock and key arrangement to facilitate its opening and closing to meet its functional requirement.

Fabrication and On-Field Installation

All the structures fabricated, were installed in the fields to test their performance. A well-connected

conveyance system was laid down and the structures were vertically connected to it (Fig 3). The conveyance system was connected to a rainwater harvesting reservoir for storing excess water. The structures were optimally designed and the distance between the two structures was maintained throughout. The closed configuration (Fig 3(b and c)) and open configuration (Fig 4(a and b)) of the structures on the field are illustrated.

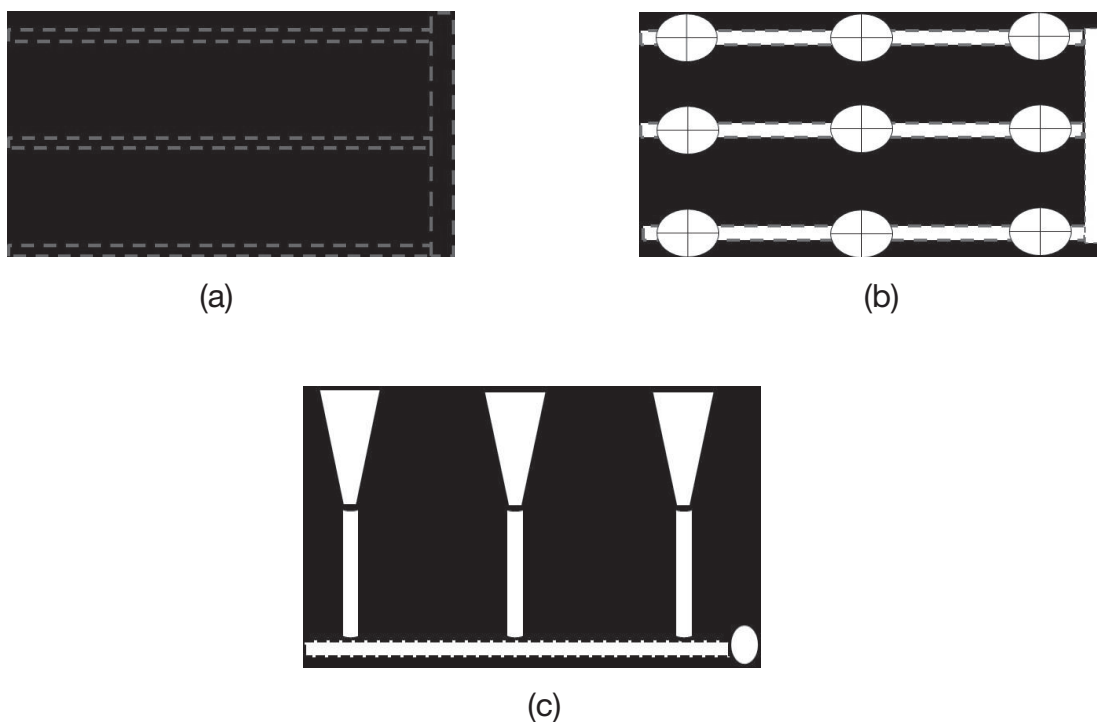


Figure 3: (a) Water conveyance system for collection of rainwater; (b) and (c) Top view and the cross-sectional elevation of inverted umbrella structures in a closed configuration.

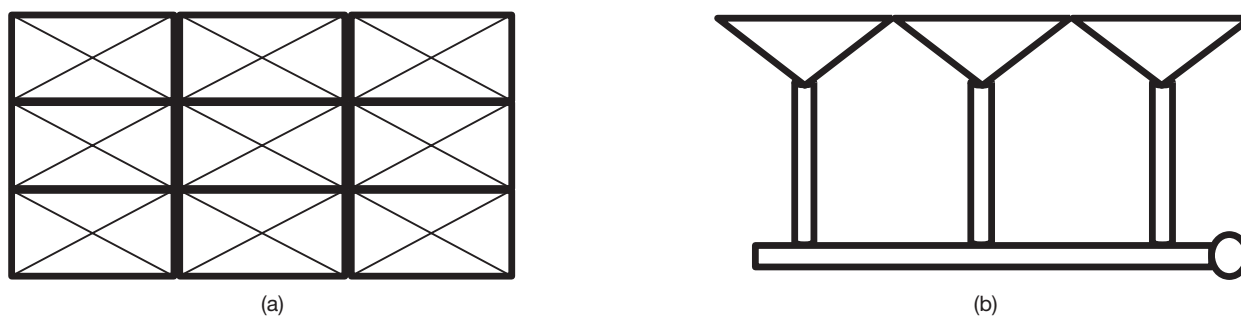


Figure 4: (a) and (b) Top view and the cross-sectional elevation of inverted umbrella structures in an open configuration.

Results and Discussions

The study area considered for the proposed methodology was Pilani (28.37°N, 75.6°E), Rajasthan. The area lies in the northwest region of India suffering from low rainfall resulting in uninterrupted drought-like conditions for successive years. Also, the region witnesses the sudden outburst of rainfall accompanied with hailstones several times during non-monsoon periods. Such environmental situations lead to substantial setbacks to the agricultural community. Inverted umbrella structures developed and analysed in this study can be adapted to protect the crops and encourage and facilitate rainwater harvesting.

The structure consisted of two parts: first is the pole or supporting pipe and the second upper section comprising of spokes and panels which open and close to meet the functional requirement of the structure. Two graphs (Figure 2(a) and 2(b)) were plotted by calculating the base area of the structure in the open state and the volume of material used in the upper section for both the triangular and square pyramidal structure. The depth of the pyramid is varied at 0.3 m and 0.4 m.

The functional requirement of the inverted umbrella structure was to protect the crops in times of disaster, which in the present study is defined by unseasonal rainfall and hail which destroys standing crops. The structures will also be useful in protecting the crops during high temperatures and prevent crops from wilting and have a check on excessive evapo-transmission. Apart from protecting the crops, the other main function of the structure is to collect the rainwater and store them in on-site rainwater harvesting reservoirs for use during dry periods, addressing the problem of scarcity of water and drought conditions.

The system performed well in the fields meeting their expected outcomes. Hence the system can be used as a preparedness measure against rain and drought. This will help in reducing crop damage and also in aiding water supply during dry periods.

Economic Analysis

An economic analysis of the structures was carried out using the Net Present Value and Benefit to Cost ratio Methods. Two scenarios were considered for the

analysis. A disaster situation without the proposed structures (scene 1) and a situation with the proposed structures and an effective system of rainwater harvesting in place (scene 2). Several factors like the cost of cultivating an acre of land, returns obtained from specific crops, losses, and damages to the crops due to disaster in monetary terms, were considered for performing the analysis.

The benefit to cost ratio for scene 1 was obtained at 0.091, while the benefit to cost ratio for scene

2 was obtained at 0.55, advocating the importance of the proposed disaster management system where the losses were minimised and the cultivation increased because of effective rain-water harvesting.

The structure and its implementation proved to be an investment in the initial year but can be overcome over a period of 25 years. These structures are a one-time investment the benefits of which can be reaped for a greater duration. Further, the cost of these structures cannot be compared with the cost of the life of the farmers.

Conclusion

Whenever struck, disasters have always created havoc. It practically becomes very difficult for the country and its affected population to rebuild their lives from scratches. Once disaster strikes, the authorities come up with responsive measures and policies to overcome the initial damages and prevent any further harms.

But damages can be significantly controlled and reduced by enforcing preparedness and mitigation measures, structures and policies. This study dealt with the development of a system as an effective preparedness measure. It can help to simultaneously address two disasters i.e. unpredicted rainfall and droughts. One function of the umbrella will be to protect the crops from the high-intensity rainfall. The water falling on the umbrella is collected through the conveyance system and stored in a reservoir. This stored water is then effectively reused for irrigation as and when required. Along with preparedness, the system substantiates the age-old concept of rainwater harvesting.

There is scope for development to the proposed methodology, which is at its basic stage. The material used can be varied to make the structure more economical, environment-friendly and durable. Solar

cell strips or panels can be added to the structure to harvest the abundant solar energy available.

These preparedness measures ensure further technological advancement in the field of agriculture. These ensure the security of food and migration of youth towards agriculture. Heavy damages are reduced significantly and the lives of helpless farmers are saved.

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Impact of Wastewater from Outfalls of River Ganga on Germination Percentage and Growth Parameters of Bitter Gourd (*Momordica Charantia* L.): A Slow Onset Disaster

Sayanti Kar^a, Amitava Ghosh^b, Pritam Aitch^a and Gupinath Bhandari^a

ABSTRACT: Water related natural disasters are very common in India. Drought, flood, landslide, tsunami are much known among them. The study concentrated on slow onset disaster. The river pollution with respect to its pollution loads and its effect on selected edible plants had been highlighted in this study.

An extensive seasonal analysis of wastewater had been done from outfalls of river Ganga in Howrah, Hooghly, 24 PGS (N) District, West Bengal, India during 2017. The physico-chemical parameters like pH, temperature, DO, BOD, hardness, conductivity, nitrate nitrogen, chloride, phosphate etc. were measured along with heavy metals like lead, total arsenic and mercury. A significant amount of presence of Total and Fecal Coliform had been reported. The morphological parameters of *Bitter gourd* (*Momordica charantia* L.) were estimated under waste water treatment.

Considering both wastewater treated and tap water treated plants, an approach to study the activity within the range of low molecular weight peptide 3–0.5 kDa were taken through its extraction and purification by ion exchange resin column, cation and anion exchanger. HPLC analysis had been done for both sets. The antioxidant activity by using DPPH and germination percentage in control and treated plants were also determined in relation to wastewater effect. The inhibition of growth and its parameters were maximum in pre monsoon in comparing to post monsoon and monsoon season.

The role of small or low molecular weight biomolecules were studied in details, large molecules were not taken into consideration in this study and such documentation is very scanty in references. So the effort was to isolate and characterise the small biomolecules like peptide was the main goal in this aspect.

The study helped to explore the effect of waste water on the peptidome of *Bitter gourd* (*Momordica charantia* L.). Expression of particular peptide(s) or absence of some peptide(s) in chromatogram indicated the adverse effects on plants which may be the indication of stressful condition. All these peptides profile (No. of Peak) counted to the appearance of number of peak counted to the appearance of number of peak and compare with control. The appearance and disappearance of the peaks will definitely signify the participation and relationship of those peptides with the waste water treated plants. Pre monsoon waste water was found to create more impact than other two.

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KEYWORDS: bitter gourd (*Momordica charantia* L.), coliforms, low molecular weight peptide, physico-chemical parameters, waste water

Introduction

A sudden natural incident which can cause the significant damage to the society, can be termed as a disaster. When it is slow, it takes time to cause harm. River pollution can be considered as a slow onset disaster.

One of the major point source of the river pollution is municipal waste water. The untreated municipal waste is released in the river Ganga in different part of the city Kolkata, West Bengal. A huge amount of pollution load in River Ganga in West Bengal is reported by a large group of scientists. Kar et al. (2008) reported the presence of high concentration of Fe, Zn, and Cu in Palta region and Ni in Berhampur region during 2004–2005 (Kar et al. 2008). The situation was not found to be changed after two years near Kolkata. Similar kind of result had been found by Aktar et al. (2010). They highlighted that the presence of heavy metal changed season wise. During monsoon Cu, Mn and Ni were reported the highest (Aktar et al. 2010). During 2011, a study by Central Pollution Control Board (CPCB) showed for many cases, water quality criteria do not meet its BOD, DO and Total Coliform and Fecal Coliform level in West Bengal (STATUS OF WATER QUALITY IN INDIA- 2011). Another interesting study during the period 2012–2013 in three different aquatic environment including the stretch of river Hooghly in between Dakshineswar and Nazirgunj, Kolkata reported a high level of Cadmium as well as antibiotic. The untreated waste water discharge from agricultural runoff was a highlighted source for antibiotic (Mohanta et al. 2014).

The need for wastewater reuse come from the demand of more water for agricultural purposes. The negative effect of waste water on biota had been reported by many scientists. The seeds of *Cicer arietium* L. treated with waste water shows low germination percentage. Distillery waste water hamper its growth and development too (Waisel, 1958; Bhumbra et al., 1968). Again seed germination and seedling growth in wheat, garden pea, black gram and mustard are

adversely affected by the reutilisation and recycling strategy of industrial effluents, treated distillery and sugar factory mixed effluent (Nath et al. 2007). Biochemical parameters of *Brassica oleracea*, *Spinacia oleracea* were affected by the use of wastewater severally and it also damage soil properties when used for irrigation (Bamniya et al. 2010). Mansoor et al., (2014) worked on morpho-biochemical evaluation of Mung Bean under textile industrial wastewater stress which shows the decrease of seedling length as compared to control (Mansoor et al., 2014).

The study aim to analyse the water quality of waste water releasing into river Ganga in Ballykhal, Howrah and Dakhineswar, North 24 PGS region. The use of this water for agricultural purpose may create significant damage to the selected edible plant *Bitter gourd* (*Momordica charantia* L.) and enter into the ecosystem.

Study Area

One outfall (22°39'08.75" N 88°21'27.60"E) had been selected next to the popular bathing ghat of Dakhineswar temple adjacent to slum area in North 24 Parganas (N) District, West Bengal. Another outfall was Ballykhal, Howrah (22°39'18.33"N 88°20'58.75"E) just opposite to Dakhineswar Kali Temple. The selected outfall carry a large amount of domestic untreated waste water to river Ganga on daily basis. A large number of people were found to live next to these two outfalls and use them for their daily water needs.

Materials and Methods

Collection and Analysis of Waste Water

The analysis of physical, chemical and biological parameters of wastewater had been done by following the standard methods of APHA 21st Edition (2005). The samples were collected from each two sites during 2017 considering every three seasons. The time of sampling was preferred in between 8–10 am during low tide. pH (4500-H⁺B. Electrometric Method), Temperature

(Digital Thermometer), DO (Azide Modification Method) were analysed on spot. Samples were preserved and carried to laboratory in sterilised container for BOD (5210 B. 5-Day BOD Test), Total Hardness (2340 C. EDTA Titrimetric Method), Conductivity (2510 B. Laboratory Method; EQUIP-TRONICS Conductivity Meter Model No EQ-660A), Nitrate Nitrogen (4500-NO₃ B. Ultraviolet Spectrophotometric Screening Method; ELICO SL 159 UV-VIS Spectrophotometer), Chloride (4500-Cl B. Argentometric Method), Phosphate (4500-P D. Stannous Chloride Method) along with Lead (Pb), Mercury (Hg) and Arsenic (As) analysis (Model No. Perkin Elmer AAS (Lamp AAnalyst 400, Auto Sampler AS 800, Graphic Furnace HGA 900). Total Coliform and Fecal Coliform were analysed as well (MPN Test).

Study of Morphological and Biochemical Parameters of Waste Water Treated and Untreated Plants

The morphological parameters like stem length, leaf length, leaf width, petiole length, and internodal distance were recorded of *Bitter gourd* (*Momordica charantia* L.) were measured at three days interval up to 15 days. Garden soil was used for experimental purposes and for each season a set of twenty seedlings were selected. Ten of them were selected as Control and were treated with tap water. Other set was treated with sample water (Waste Water collected near Dakhineswar) and considered as Test. Three replica was maintained for each season. The method of Lichtenthaler and Wellburn (1983) was followed to determine total Chlorophyll content for control and test set and the estimation of protein was done by Lowry et al. (1955).

Isolation and purification of low molecular Weight Peptide(s)

Two set of plants were washed properly and clean with 0.2 per cent Sodium hypochlorite solution which help to avoid contamination. The plants were crushed separately and presence of Liq. N₂ by a grinder for

peptide isolation. The centrifugation at 10,000 rpm for 30 minutes in presence of protease inhibitor PMSF at 4 °C help to remove the unwanted materials. Hormonal impurities, fats, lipids and oil as impurities were removed by ether wash followed by Ion exchange chromatography. Ultra-filtration with Amicon filters 10 kDa (YM 10), 3 kDa (YM3) and 0.5 kDa (YC 05) help to screen low molecular weight peptide (3–0.5 kDa). Then the samples were analysed with C18 HPLC and peak were analysed (Jha et al. 2016)

Results and Discussions

The result of waste water analysis shows the quality of water deteriorated during premonsoon season compared to other two seasons for each two sampling sites. DO value comes zero for every three seasons in Dakhineswar site. For Biological Oxygen Demand (BOD), the value crossed beyond its CPCB standard for outdoor bathing, that is 3 mg/L for each two sites. Again for every analysed sample, nitrate nitrogen and dissolved phosphate crossed its standard limit [Nitrate Nitrogen (10 mg/L) and Phosphate (5 mg/L)]. In case of Pb (0.1 mg/L) and As (0.2 mg/L), the values were within standard. But the concentration of Hg (0.01 mg/L) was little higher in case of Dakhineswar site during premonsoon. According to Central Pollution Control Board (CPCB), the number of total coliform (MPN/100 ml) may not exceed 500 for outdoor bathing. A significant amount of total coliform and fecal Coliform was found at two sites.

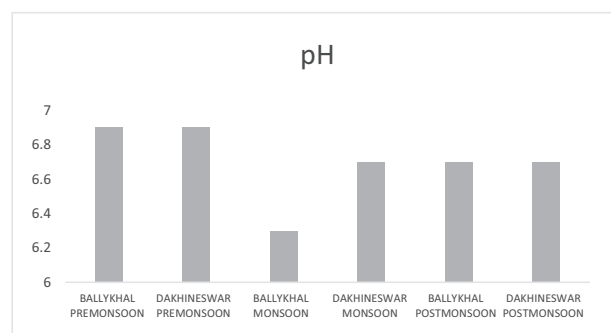


Figure 1: Season wise changes of pH in Ballykhal and Dakhineswar

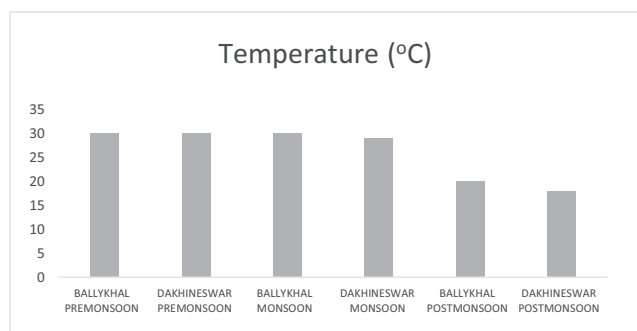


Figure 2: Season wise changes of Temperature in Ballykhal and Dakhineswar

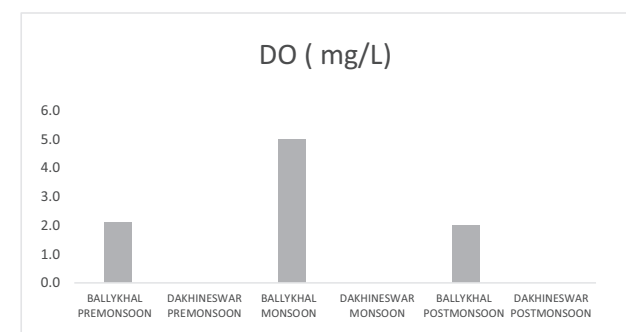


Figure 3: Season wise changes of DO in Ballykhal and Dakhineswar

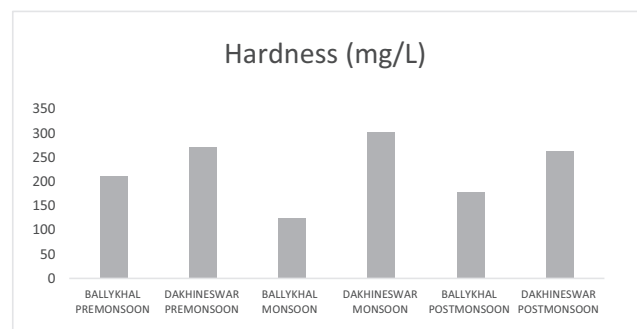


Figure 4: Season wise changes of Hardness in Ballykhal and Dakhineswar

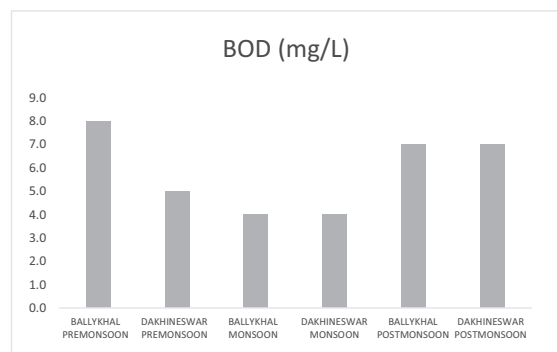


Figure 5: Season wise changes of BOD in Ballykhal

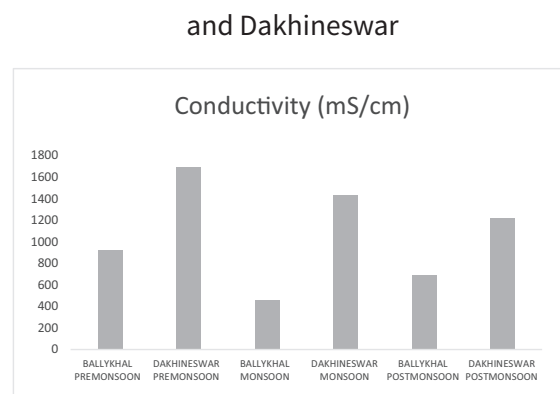


Figure 6: Season wise changes of Conductivity in Ballykhal and Dakhineswar

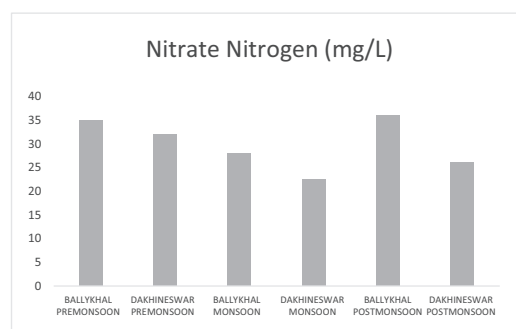


Figure 7: Season wise changes of Nitrate Nitrogen in Ballykhal and Dakhineswar

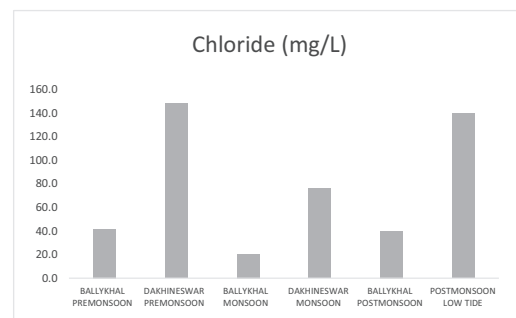


Figure 8: Season wise changes of Chloride in Ballykhal and Dakhineswar

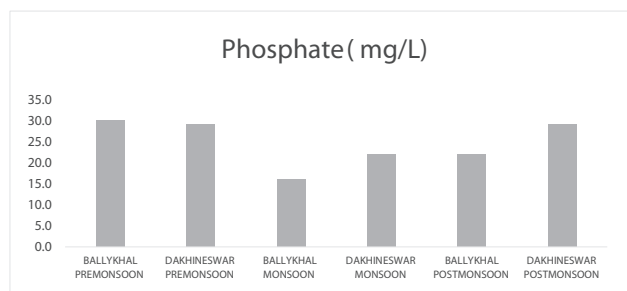


Figure 9: Season wise changes of Phosphate in Ballykhal and Dakhineswar

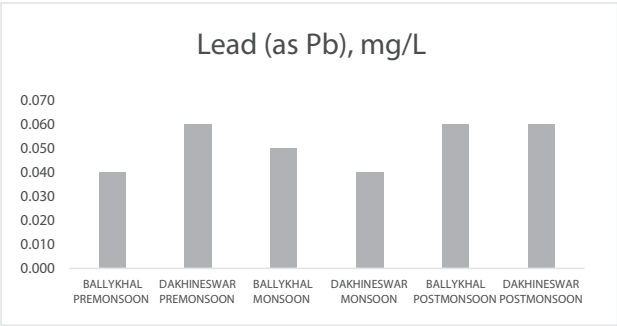


Figure 10: Season wise changes of Lead in Ballykhal and Dakhineswar

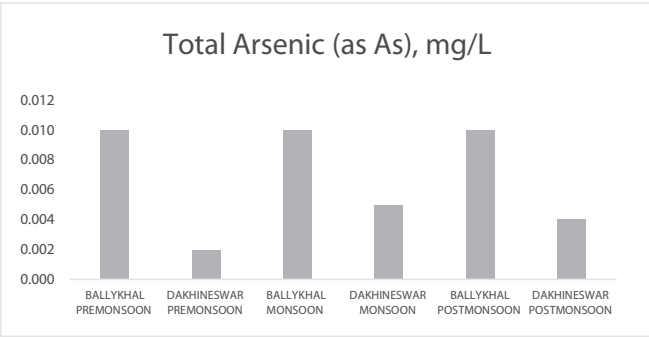


Figure 11: Season wise changes of Total Arsenic in Ballykhal and Dakhineswar

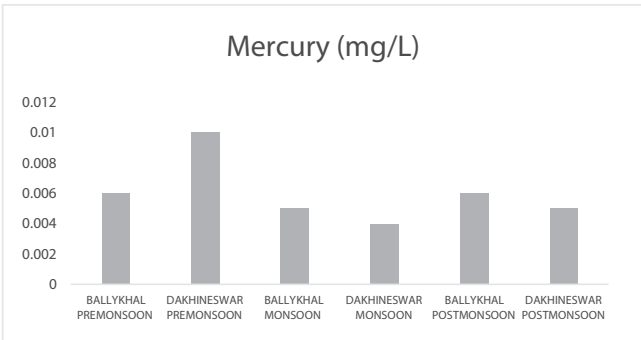


Figure 12: Season wise changes of Mercury in

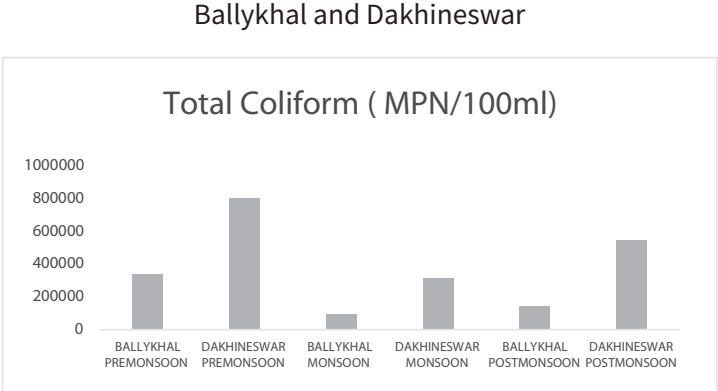


Figure 13: Season wise changes of Total Coliform in Ballykhal and Dakhineswar

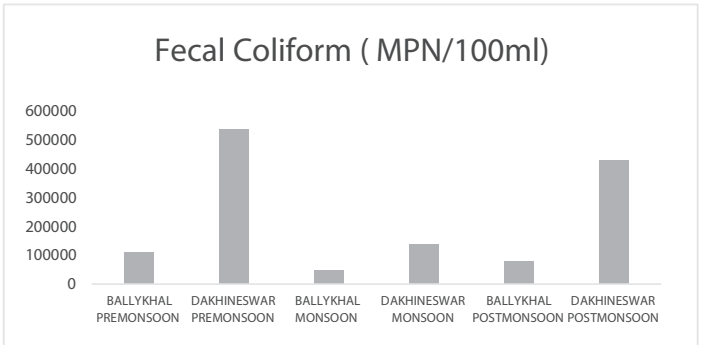


Figure 14: Season wise changes of Fecal Coliform in Ballykhal and Dakhineswar

By comparing the analysed report, it was found Dakhineswar outfall gave more significant result than Ballykhal. The heavy metal content was also high for Dakhineswar site. So waste water had been used for plant growth from Dakhineswar outfall due to its severity. The growth of plant was inhibited due to waste water use. The reduction of chlorophyll and protein content was also observed.

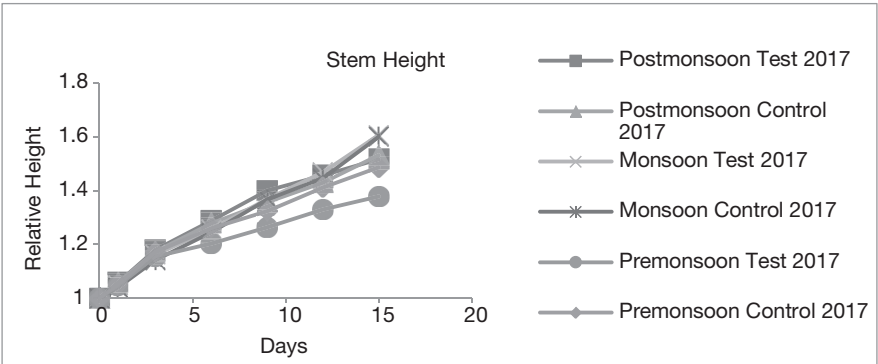


Figure 15: Day wise changes of Stem height for *Momordica charantia* L.

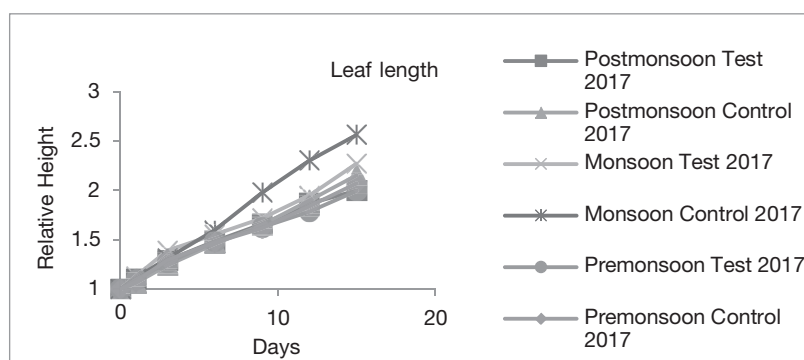


Figure 16: Day wise changes of Leaf length for *Momordica charantia* L.

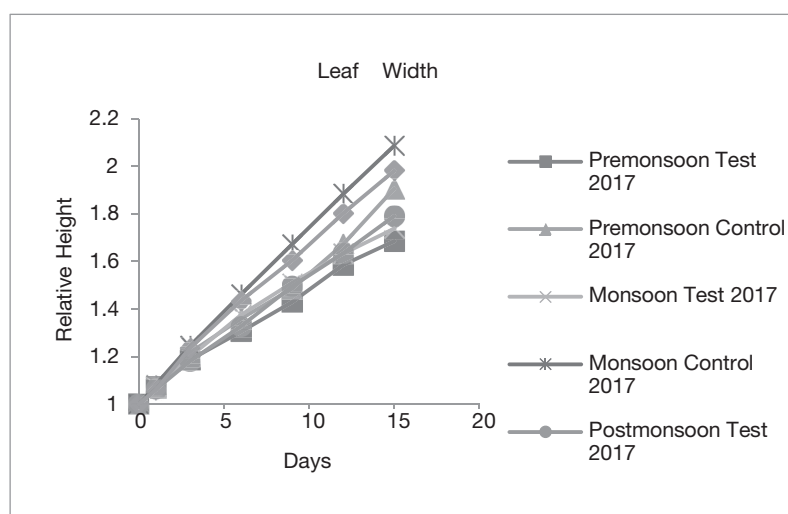


Figure 17: Day wise changes of Leaf Width for *Momordica charantia* L.

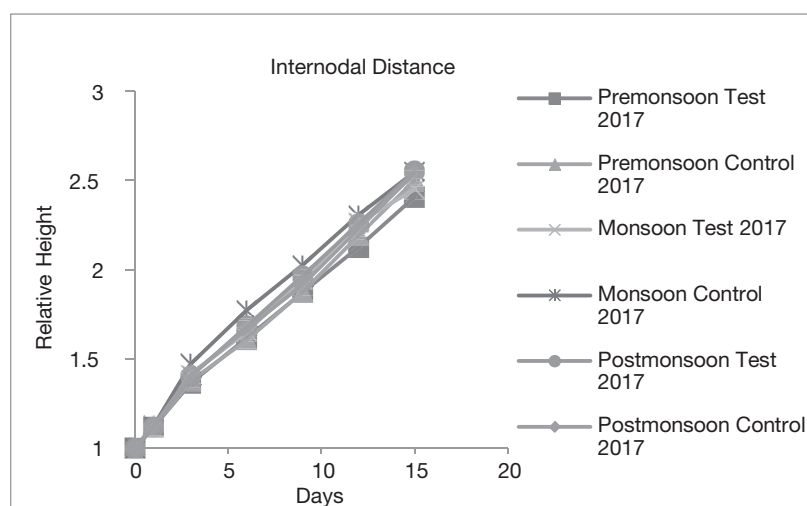


Figure 18: Day wise changes of Internodal Distance for *Momordica charantia* L.

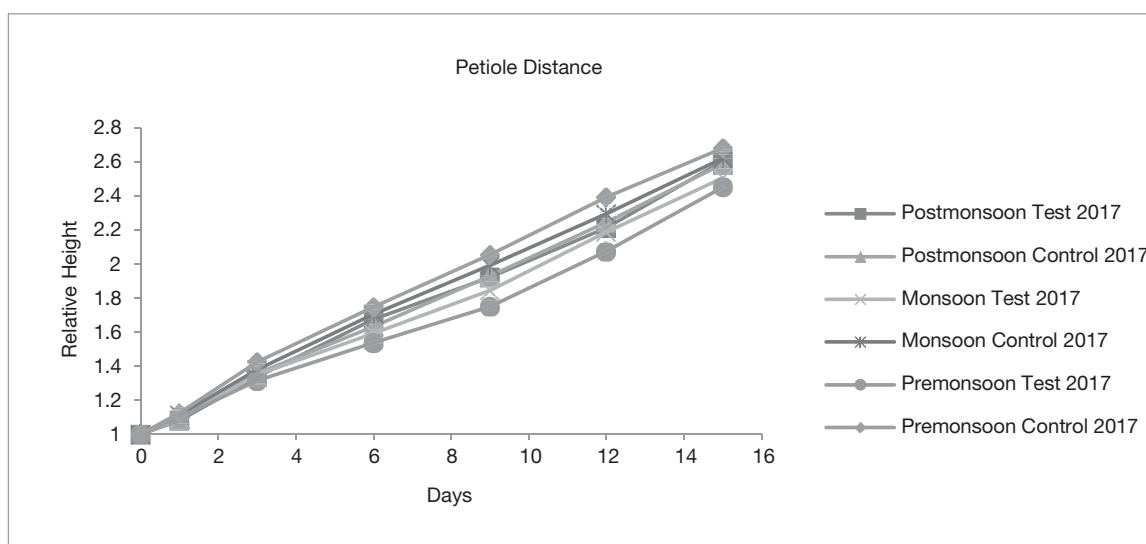


Figure 19: Day wise changes of Petiole Distance for *Momordica charantia* L.

Table 1: Chlorophyll a, Chlorophyll b and Total Chlorophyll Content in Waste Water and Tap Water Treated *Momordica charantia* L.

Year 2017	Plants Details	Chlorophyll a (mg/g Tissue)	Chlorophyll b (mg/g tissue)	Total Chlorophyll (mg/g tissue)
Premonsoon	Tap Water Treated Plant (15Days)	2.48	0.85	2.25
	Waste Water Treated Plant (15 Days)	1.40	0.85	2.25
	15 Days Old plant before Treatment	2.69	1.40	3.44
Monsoon	Tap Water Treated Plant (15 Days)	2.32	1.58	3.90
	Waste Water Treated Plant (15 Days)	1.78	1.66	4.49
	15 Days Old plant before Treatment	2.83	1.66	4.49
Postmonsoon	Tap Water Treated Plant (15 Days)	2.64	1.30	3.35
	Waste Water Treated Plant (15 Days)	2.05	1.30	3.35
	15 Days Old plant before Treatment	2.49	0.79	2.91

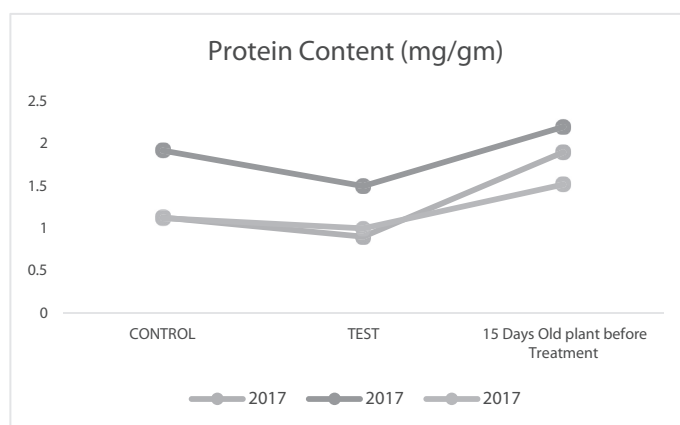


Figure 20: Protein content in waste water and tap water treated *Momordica charantia* L.

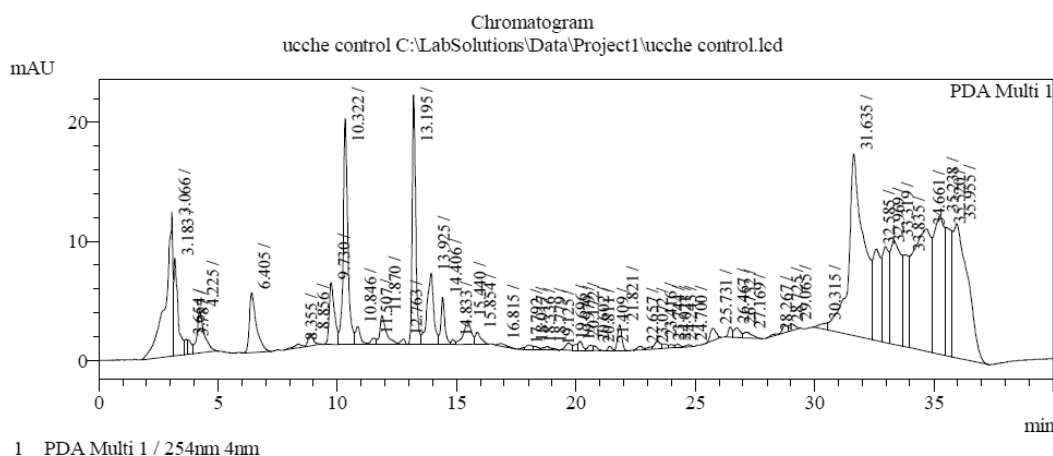


Figure 21: HPLC analysis data of control set of *Momordica charantia* L.

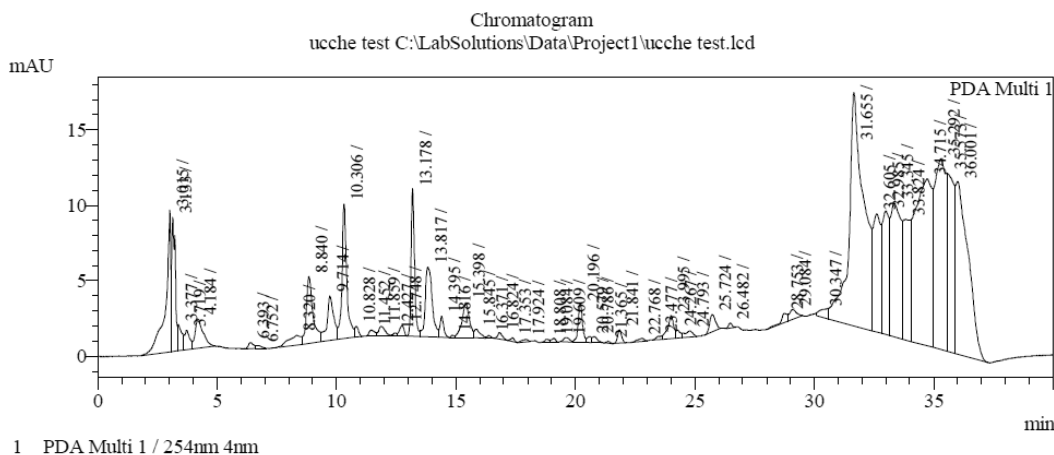


Figure 22: HPLC analysis data of test set of *Momordica charantia* L.

A similar kind of result obtained for *Momordica charantia* L. as well as for Mung Bean plant. The analysis of *Momordica charantia* L. plant extract for both waste water and tap water treated plant shows the appearance of low molecular weight peptide in case waste water treated plants. At retention time 10.322 mins for tap water treated plant extract, the area of the peak was 5.508 and in case of waste water use it was reduced to 2.998 at 10.306 mins. The height of the peak was obtained 18977 and 8907 respectively.

Conclusion

The release of untreated waste in daily basis in river Ganga is one of the major causes of river pollution in West Bengal region. The level of heavy metals like Hg,

a matter of great concern in Dakshineswar area. The presence of coliform was above the standard limit. The changes of its morphological parameters, low molecular weight peptide (3–0.5 kDa) synthesis were found maximum during premonsoon season. The percentage of reduction was least during monsoon period. The detrimental effect of waste water which are directly released into river Ganga is very much highlighted from the result part. A large number of people dependent on the river Ganga surrounding the two sampling sites can be the major victims of the slow onset disaster.

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Effect of Temperature Dynamics and Subsequent Changes of Vegetation Coverage on the Vulnerability of Indian Sundarban Region

Papia Guha^a, Pritam Aitch^a and Gupinath Bhandari^a

ABSTRACT: Sundarban, the grand symphony of nature at the confluence of Bay of Bengal covering an area of about 25,500 sq km comprise of both India and Bangladesh. Present study is on Indian part of Sundarban only; currently designated as Indian Sundarban Delta (ISD).with an area of 9630 sq km. ISD is known for its biological diversity, which helps to maintain the ecological balance for the masses to thrive in. The mangrove forest in this deltaic system acts as a natural protective barrier from any kind of hazards to the state of West Bengal. But with the advent of time the constant changes in climatic structure specifically the atmospheric temperature content imposed serious threat to ecosystem structure of the region.

This study primarily focuses on ascertaining the temperature analysis by statistical means over the span of 15 years. Vegetation coverage count is being scooped out by “Normalized Difference Vegetation Index (NDVI)” method of Remote sensing. The correlation analysis between the said climatic parameter and the vegetation coverage indicated to the adversity of temperature change. In the process to depict whether such disparity is impacting the vulnerability of hazards of the region, some statistical analysis have been made accounting the impacts of natural hazards over time. Lastly, a qualitative relationship structure have been tried to make with temperature, vegetation and hazard impacts to frame how vulnerability can worsen over time.

Such will also help to depict the socio-economic condition of the region as changing hazard conditions and climatic conditions directly impacts the agriculture of the region.

KEYWORDS: sundarban delta, temperature change, vegetation coverage, hazard vulnerability, geoinformatic analysis

Introduction

The awe-inspiring adobe of nature “Sundarban” is covering an area of 25,500 sq km spanning across both India and Bangladesh. 9,630 sq km out of these is designated as Indian Sundarban Region. Situated at the confluence of Bay of Bengal, it is a part of largest Ganga-Brahmaputra Delta. Delineated between 21° 32' - 22° 40'N

and 88° 05' - 89° 00'E Indian Sundarban comprises with the most balanced ecological scenario which in turn balances the ecological structure of entire state of West Bengal. In this respect it is needed to be mentioned that Indian Sundarban in total comprises of 19 blocks – with 13 from South 24 parganas district of West Bengal and 6 from the North 24 Praganas district of West Bengal. Fig. 1 – herewith is representing the study area.

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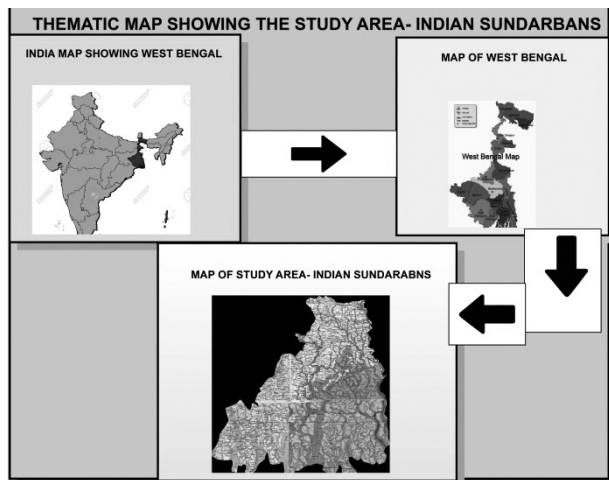


Figure 1: Study Area

The region is majorly characterised by the low, flat, alluvial plains covered by natural mangrove swamps and marshes. Declared as the World heritage site by UNESCO in 1987 and global biosphere reserve in 1989 the government of India endorsed the deltaic complex as the Biosphere reserve to ensure protection to this unique gene pool of the planet earth that spreads over 102 islands (Raha et al. 2012). This huge intertidal area consists of islands that are about 102 in number with 42 lakh inhabitants (Das 2011). Indian Sundarbans is highly enriched in biodiversity -The biodiversity includes about 350 species of vascular plants, 250 fishes and 300 birds, besides numerous species of phytoplankton, fungi, bacteria, zooplankton, benthic invertebrates, molluscs, reptiles, amphibians and mammals (Gopal and Chauhan 2006). Hence, it maintains a harmony in between nature and human life so as to summarise a proper ecological balance. Economically also this area is of immense importance as its mangrove trees to water resources provides an occupational option along with tourism for the inhabitants. Apart from all these the region is at the verge of climatic disparity. Climate of the region is tropical oceanic and always a dynamic in nature. But with the due course of time as global warming jailed the nature, the climate of the region started behaving in a most unhealthy way. With the view to this the present research work engaged itself in identifying the temperature condition of the region.

Alongside with this in order to identify the vulnerability scenario of the region the vegetation coverage analysis with the aid of Geoinformatics have been done in this case.

Remote Sensing or RS now a days plays a vital role in ascertaining the vegetation cover change. The percentage of vegetation is estimated from vegetation indices such as NDVI, SAVI, MSAVI, and TSAVI and other indices, by using the spectral reflectance of various vegetation covers from satellite data using RS software support (Ibrahim and Al-Mashagbah 2016). Here NDVI procedure have been utilised to identify the vegetation count over years.

The region is hazard prone. Sundarban with its largest adobe of mangroves which is counting at about 140,000 hectares (Centre n.d) actually act as a barrier to the entire state of West Bengal from the adverse impacts of the hazards. But along with the changing climatic condition and changing vegetation coverage the hazard vulnerability is also changing. In order to identify the complete vulnerability scenario of the region the hazard condition under the adverse temperature condition have been analysed, on the basis of the impacts on both North and South 24 parganas.

Methodology

Present research work has been concentrated on "Indian Sundarban Region or ISD". Atmospheric temperature been an indispensable section of climate deciding factor is being concentrated here upon its dynamics. Vegetation Coverage is the main natural barrier for Sundarban against any hazard and hence protects the entire state. In order to ascertain the vulnerability of the Sundarban region thus the vegetation coverage change as well as the hazard impact change have been taken into account in this research work. And it is being tried to ascertain that if the temperature dynamics impacts the vulnerability of the region. For the better assessment of hazard impact scenario both "North And South 24 parganas" are accounted specifically from 2002–2014. The work has been categorised into following:

- Vegetation Coverage analysis using Geoinformatic Technology (Remote Sensing and GIS).
- Temperature Analysis (2002–2015).
- Impact and correlation analysis between temperature and vegetation coverage.
- Hazard Impact Analysis for final scenario of Vulnerability of ISD.

Vegetation Coverage Analysis Using Geoinformatic Technology (Remote Sensing and GIS)

Cloud free images of Landsat TM and Landsat ETM+ (path-138, rows- 44 & 45) has been taken in this case for analysis from Landsat USGS (Earth Explorer). Sundarban is a part of the tidal dominated deltaic plain (lower).Henceforth, to minimise the tidal impact on the image analysis section, the working satellite derived images are mainly taken on January and February with a tidal height equivalent to or not more than 0.49 metres. Tidal heights are taken from India Tide chart (Tides.mobilegeographics.com 2017).

Landsat images of 2005, 2007, 2008, 2009, 2010 and 2011 are being analysed. For the accurate coverage analysis the present work have chosen-“NORMALIZED DIFFERENCE VEGATATION INDEX – NDVI” as the working procedure in ERDAS IMAGINE 14 software of Remote Sensing. The technology of remote sensing offers a practical and economical means to study vegetation cover changes, especially over large areas (Xie et al. 2008).Source of the mentioned images are from Earth Explorer of Landsat USGS (Survey 2017). The images are firstly pre-processed through the following steps:

- “Layer Stacking”- After the images are sourced, all the layers of each individual images of respective years, under rows = 44 and 45 have been stacked.
- Followed by stacking in order to derive the study area in total the images are mosaicked and the procedure is stated as “Mosaiking”..
- From Mosaiking ultimately the Area of Interest or AOI is being scooped with the aid of “ Subsetting”.
- Such ultimately lead to the origin of the Study Rea “Indian Sundarban Delta “.

Temperature Analysis

Temperature Dynamics is being analysed in this section under two heads namely:

Annual Average Maximum Temperature.

Annual Average Minimum Temperature.

Secondary data based analysis concentrated from 2000 to 2015 temperature. The secondary data has been archived from the Director of Agriculture, Station - Baruipur, Government of West Bengal (Directorate of Agriculture 2017).

Impact and Correlation Analysis between Temperature and Vegetation Coverage

Sundarban is dominated by the vegetation of Mangrove as already mentioned. The major artesian of the region lies on its vegetation adobe. Such in total enrich the ecosystem of the region which in turn also provide a hazard barrier the entire state of West Bengal. Rise in temperature directly impact the biology of the mangroves thus leading to disturbance in community interactions. Temperature greater than 35°C affects root structure, seedling establishment and photosynthesis in mangroves (Numbere and Camilo 2017). Photosynthesis of most mangrove species sharply declines when the air temperatures exceeds 35 (Noor et al. 2015).Temperature dynamics disparity has already been ascertained in the temperature analysis section. Now, the impact of such temperature on vegetation coverage is being asceratained here by the trend analysis. Also the correlation between the said major factors are analysed which in turn will help to ascertain the most adverse site of the temperature.

This in turn will clear the vulnerability count in case of vegetation coverage. Excel Statistics is being incurred here.

Hazard Impact Analysis for Final Scenario of Vulnerability of ISD

This part is being dissected into two sections:

- I. Analysis of hazard impacts.
- II. Final vulnerability analysis by temporal relationship of the temperature factor (which is strongly impacting or correlated with the vegetation coverage) with the hazard impacts.

I. Analysis of Hazard Impacts

Secondary data on disaster and its impacts from Disaster Management Department of West Bengal and the report from the same department (West Bengal Disaster Management Department 2017) aided in such study. The impact data on Population, blocks and villages have been studied here taking into account each year's all natural hazard occurrence (2002–2014). Respective data on Population count, Villages count and Block count of each year have been assisted by government census reports of 2001 (Government of India 2001) and 2011 (Government of India 2011) In order to identify the hazard vulnerability a mathematical computation has been made with the impact data:

- Ratio of natural hazard affected population: Computed between “Population affected during impacted year with respect to Total number of population of the same year”
- Ratio of natural hazard affected blocks: Computed between “Blocks affected of the impacted year with respect to Total number of blocks of the same year”.
- Ratio of natural hazard affected villages: Computed between “Villages affected during impacted year with respect to Total number of the villages of the same year”.

II. Final Vulnerability Analysis by Temporal Relationship of the Temperature Factor (which Is Strongly Impacting or Correlated with the Vegetation Coverage) with Hazard Impacts

With the aid of mathematical computation the impacted ratio of population, blocks and villages are now ascertained. With such outcome the temporal relationship between temperature and such have been tried to conquer in this section. This is done in order to see that if also the strong negative impacted temperature site on vegetation coverage is also aiming directly on the characteristics of the hazards thus making the total ecosystem vulnerable in nature.

Results and Discussion

NDVI analysis lead to the most accurate vegetation coverage count. In Fig. 2, Fig. 3, Fig. 4, Fig. 5, Fig. 6 and Fig. 7 respectively the thematic maps are showing the NDVI classification of 2005, 2007, 2008, 2009, 2010 and 2011 respectively.

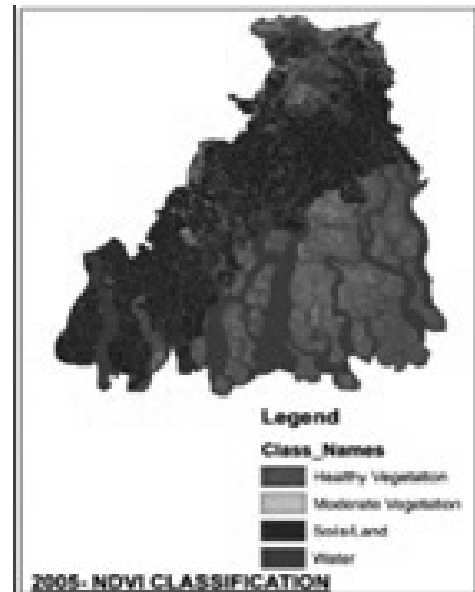


Figure 2: NDVI classification 2005

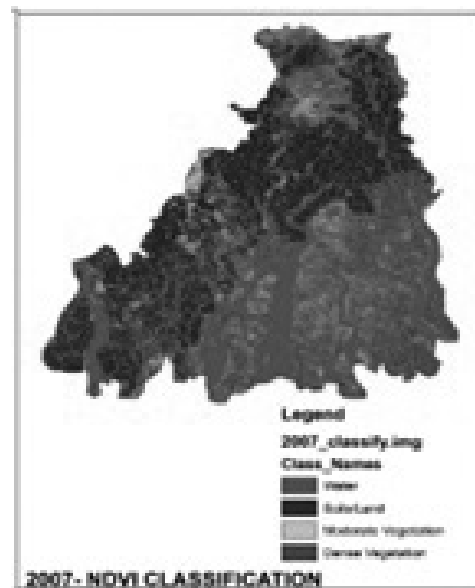


Figure 3: NDVI classification 2007

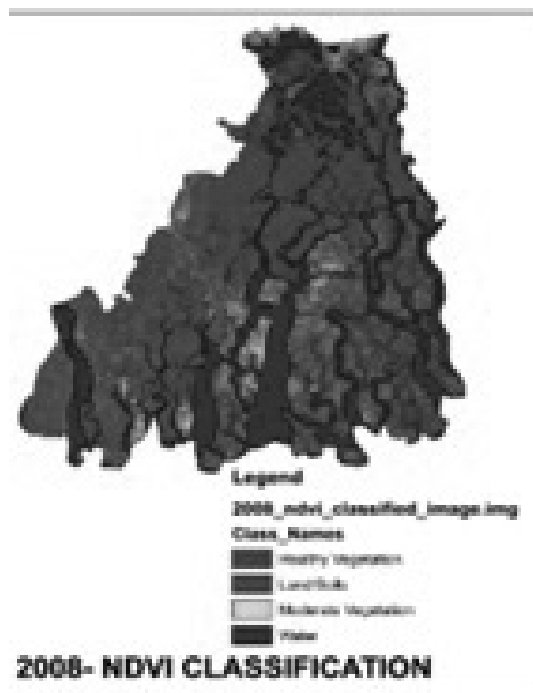


Figure 4: NDVI Classification, 2008

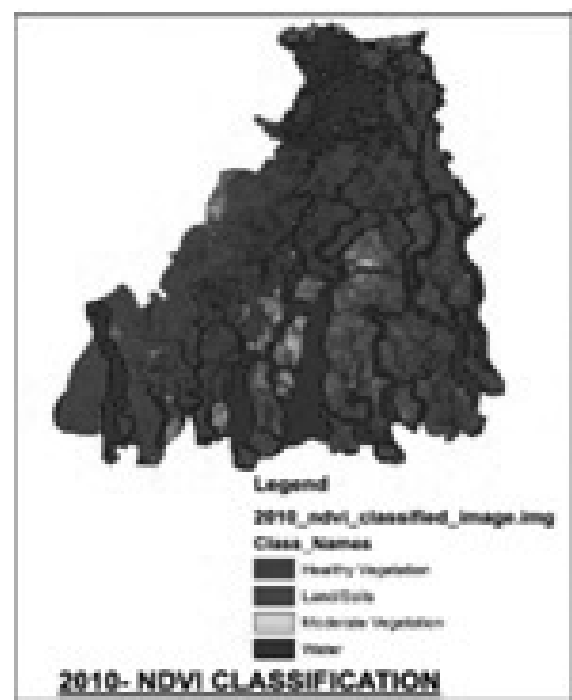


Figure 6: NDVI Classification, 2010

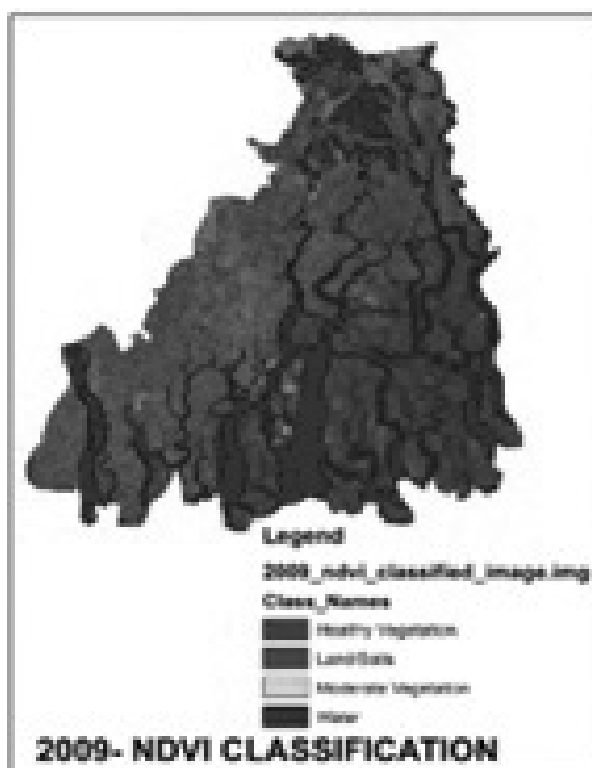


Figure 5: NDVI Classification, 2009

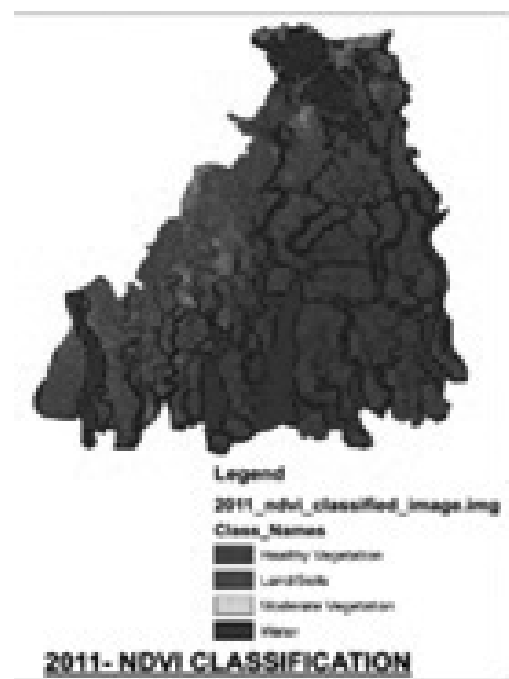


Figure 7: NDVI Classification, 2011

Such classification scooped out the vegetation coverage area in Square Km given in Table 1.

Table 1: Vegetation Coverage Area through NDVI.

Year	Vegetation Coverage (Sq.Km)
2005	3054.24
2007	3184.686
2008	2842.34
2009	2373.16
2010	2447.125
2011	2150.325

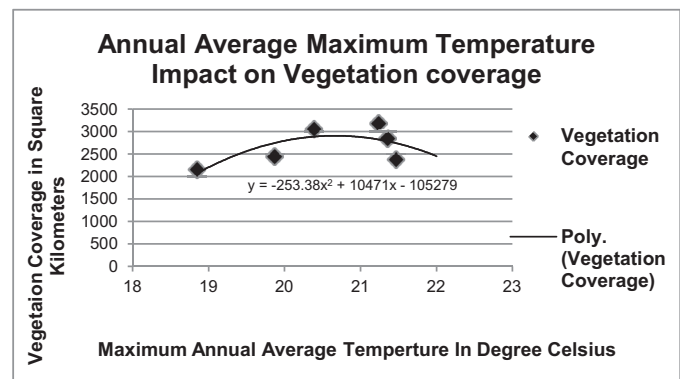
After the coverage count done. Then a correlation analysis is being made with Annual Average Maximum Temperature and Annual Average Minimum Temperature statistically. The results thus obtained are noted in Table 2:

Table 2: Linear Correlation Coefficient between Vegetation and Temperature Dynamics

Parameter -1	Parameter-2	Correlation Coefficient
Vegetation	Annual Average Daily Maximum Temperature	0.8705
Vegetation	Annual Average Daily Minimum Temperature	0.5615

In view to the results obtained it is clearly indicated that the annual average maximum temperature is bearing a strong negative correlation with the vegetation coverage. The following figure i.e., Fig. 8 is thus graphically indicating that how the temperature is impacting the vegetation coverage. In this case the annual average maximum temperature is being taken as the temperature claiming factor as it bears the strongest negative correlation with vegetation. The

Figure clearly strengthens the fact that the increasing temperature which is also a most important climatic factor under the era of global warming is actually decreasing the vegetation count. And moreover the count of vegetation if decrease it will make the condition of climate and environment even adverse leading to vulnerability of the region towards hazards. Hence temperature dynamics is the identified evil for Sundarban's vulnerability in such case of fact.

**Figure 8:** Annual Average Maximum Temperature Impact on Vegetation Coverage

As already mentioned that Indian Sundarban is actually a hazard protecting shield to the entire West Bengal hence, its vulnerability count also depends on the hazard impacts. In this context the major section of this research work arrives where it is being now to analyse if the most adverse temperature dynamics also affecting the hazard impacts of the region. For such the strongly correlated temperature factor i.e., annual average maximum temperature has been taken as the temperature dynamics deciding parameter. In the preliminary stage of this part of research firstly, the type of hazards and their occurrence from 2002 to 2014 have been sculptured in the following table: Table 3 is indicating to the hazards occurring in the north and south 24 pargans districts.

Table 3: Table Encompassing the Hazards and its Occurrence Place From 2002 to 2014.

Year	Hazards	Region of Occurrence
2002	Embankment Failure, Thundering, Cyclonic Storm.	South 24 Parganas, North 24 Parganas
2003	Flood	South 24 Parganas, North 24 Parganas
2004	Flood	South 24 Parganas, North 24 Parganas

(Continued)

Table 3: (Continued)

Year	Hazards	Region of Occurrence
2005	Heavy Rainfall, Flood, Cyclonic Storm, Lightning	South 24 Parganas, North 24 Parganas
2006	Cyclonic storm, Flood, High Tide.	South 24 Parganas, North 24 Parganas
2007	Flood, Cyclone, High Tide	South 24 Parganas, North 24 Parganas
2008	Flood, High Tide, Cyclone	South 24 Parganas, North 24 Parganas
2009	cyclonic storm, Aila, Flood	South 24 Parganas, North 24 Parganas
2010	Cyclonic storm, Flood, Embankment breaching	South 24 Parganas, North 24 Parganas
2011	Cyclonic storm, Flood, Heavy rainfall	South 24 Parganas, North 24 Parganas
2012	Cyclonic storm, Heavy Rainfall, Embankment breaching	South 24 Parganas, North 24 Parganas
2013	Cyclonic storm, Heavy Rainfall	South 24 Parganas, North 24 Parganas
2014	Cyclonic storm	South 24 Parganas, North 24 Parganas

Table 4: Ratio of Natural Hazard affected Population.

Year	Natural Hazard Affected Population in South and North 24 Parganas	Total Population in Two Districts	Ratio of Natural Hazard Affected Population
2002	78,615	16157622	0.004865506
2003	621458	16480608	0.037708439
2004	1023904	16610060	0.061643606
2005	1400982	17146107	0.08170846
2006	2456212	17488882	0.140444198
2007	2470212	17176230	0.143815727
2008	260705	18174432	0.014344602
2009	2702507	18517207	0.145945714
2010	67510	18859982	0.003579537
2011	1220164	18236028	0.066909527
2012	844528	17612074	0.04795165
2013	427955	16988120	0.025191428
2014	292509	16364166	0.017874971

The table above thus indicating that with the major occurring hazards are: Cyclone, Flood and Embankment Failure. Prior to this, the mathematical computation has been made to identify the ratio of

natural hazard affected population, blocks and villages respectively. In addition to the above tables 5 and 6 is respectively summarising the Ratio of natural hazard affected blocks and villages.

Table 5: Ratio of Natural Hazard Affected Blocks

Year	Natural Hazard Affected Blocks in South and North 24 Parganas	Total Blocks in Two Districts	Ratio of Natural Hazard Affected Blocks
2002	10	59	0.169491525
2003	0	59	0
2004	17	59	0.288135593
2005	30	59	0.508474576
2006	9	59	0.152542373
2007	30	59	0.508474576
2008	51	59	0.86440678
2009	34	59	0.576271186
2010	16	59	0.271186441
2011	51	51	1
2012	42	51	0.823529412
2013	48	51	0.941176471
2014	5	51	0.098039216

Table 6: Ratio of Natural Hazard Affected Villages.

Year	Natural Hazard Affected Villages in South and North 24 Parganas	Total Villages in Two Districts.	Ratio of Natural Hazard Affected Villages
2002	34	3721	0.009137329
2003	1106	3721	0.297231927
2004	1913	3721	0.51410911
2005	6665	3721	1.791185165
2006	3006	3721	0.807847353
2007	4428	3721	1.190002687
2008	1856	3721	0.498790648
2009	4412	3721	1.185702768
2010	206	3721	0.055361462
2011	2695	3515	0.766714083
2012	930	3515	0.26458037
2013	2528	3515	0.719203414
2014	35	3515	0.009957326

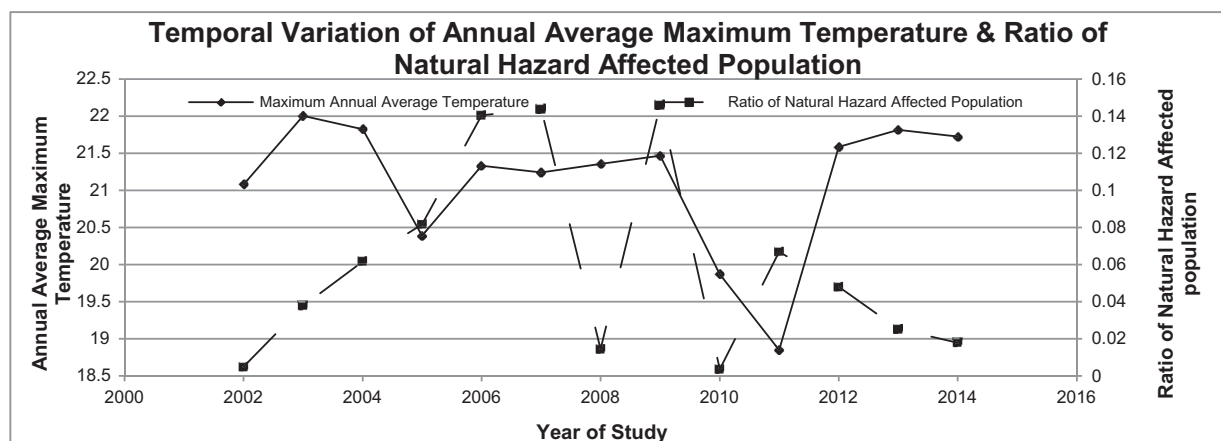


Figure 9: Temporal Variation of Annual Average maximum Temperature & Ratio of Natural Hazard Affected Population

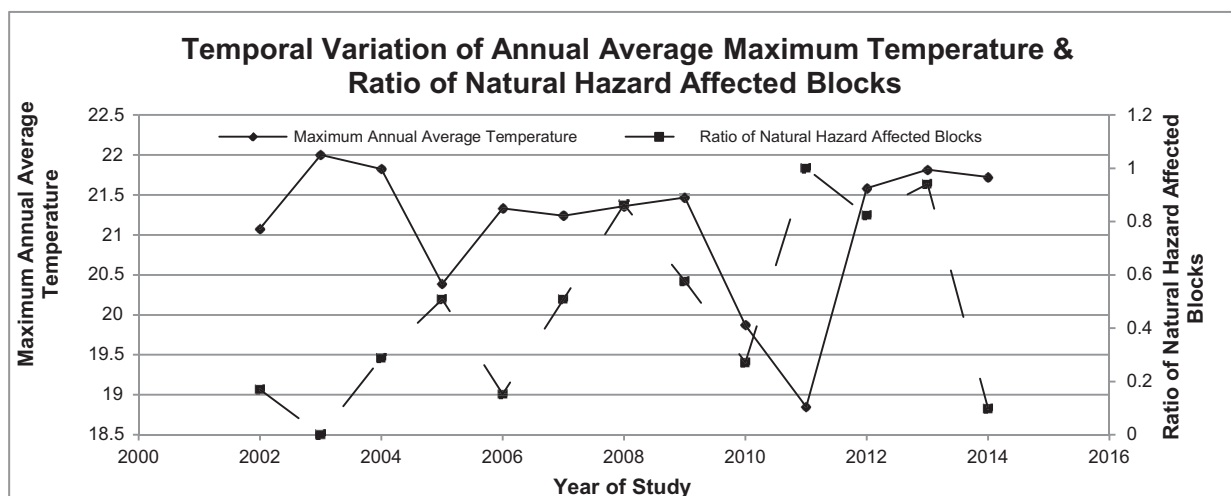


Figure 10: Temporal Variation of Annual Average maximum Temperature & Ratio of Natural Hazard Affected Blocks

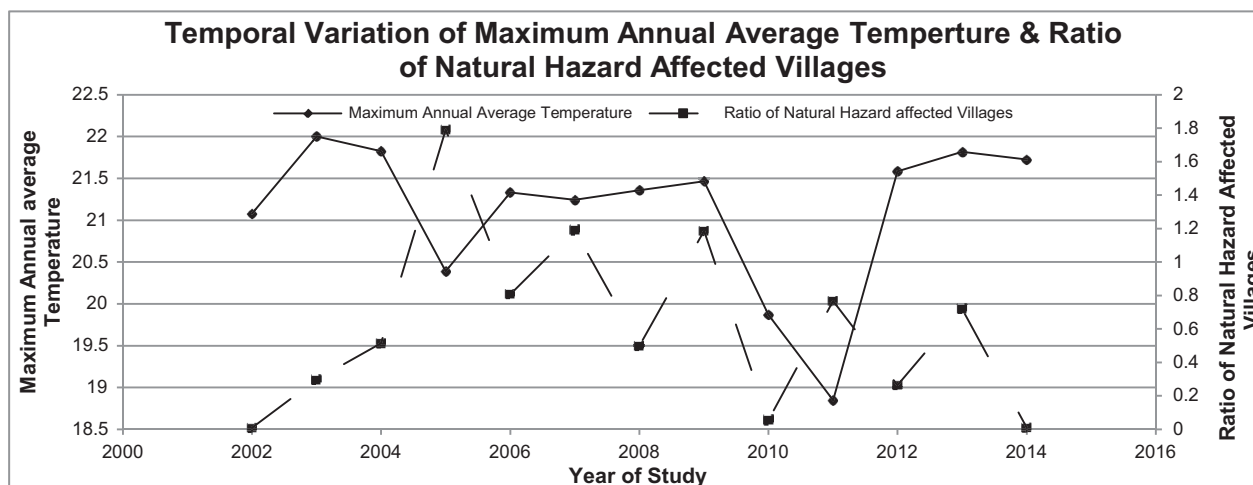


Figure 11: Temporal Variation of Annual Average maximum Temperature & Ratio of Natural Hazard Affected Villages

Respectively now the ratios of affected parameters are analysed respectively with the annual average maximum temperature. Temporal variation in each case have been made in order to see that how with the adversities of extreme temperatures the vulnerability of hazard impacts are behaving. The following figure i.e., Fig. 9 is indicating that with the increase in temperature adversities in almost all the cases with one or two exceptions the hazard impact over population is also adverse.

Below the Fig. 10 is also indicating that with the increase in temperature adversities again in almost all the cases, with only one exception, the hazard impact over blocks is also adverse.

In the following figure (Fig. 11) it is indicating that villages are also adversely impacted with rising temperature adversities in most of the cases.

Temporal Variation analysis thus indicated that in total the increasing temperature adversities are also increasing adversities of the hazard impacts. Similarly, the coefficient analysis previously has indicated that how adversely the temperature is impacting the vegetation adobe of ISD. Therefore, in total it can be summarised that temperature is impacting negatively to the vegetation and with time to time it is also affecting negatively the hazard vulnerability. Temperature increase accelerates global warming which in turn cause more heat waves, more violent rainfall and also amplification in the severity of hailstorms and thunderstorms (Shahzad 2015).

As mentioned already, that there are few exceptions in the temporal variation analysis where it is showing that with the increase of temperature adversities, the vulnerability of hazard impacts are not getting affected. Now, such or two exceptions from this particular research work have brought the “future scope of study and research- In order to find the reason behind such disparity in behaviour of hazard impacts and temperature increase”.

Conclusion

Present research work have brought to the sight some of the major outcomes:

- Decrease in Vegetation coverage with time.
- Increase in Maximum Temperature with time.

- Strong Negative impact of Annual Average maximum Temperature on the Vegetation Coverage indicating to the first stage of Vulnerability of ISD.
- Strong Negative temporal relation with the hazard impacts of temperature which ultimately is indicating the final scenario of the vulnerability of ISD.

Now, such major conclusions channelise a very crucial concern. This region of ISD economically depends on Mangrove adobe and the agriculture for their sustenance. If the vegetation covers decrease then the rainfall also will decrease or decreases (Guha et al. 2015). With the decreasing rainfall the agriculture is surely going to be adversely affected which will impact the economic condition. It has been observed that rainfall has become erratic due to climatic adversity in Sundarbans and its intensity has increased causing damage to the agricultural yield (Mahadevia and Vikas). Not only that if the hazard impact adversities also worsens with temperature increase then also the socio- economy condition will be disrupted. Extreme weather conditions, such as floods, droughts, heat and cold waves, flash floods, cyclones and hailstorm, are direct hazards to crops (Mall K R et al. 2006). As a result it will cause a negative picture of socio-economic condition which in large scale will again affect the economy of State of West Bengal.

More researchers, government officials must conduct and put hand in hand to conquer the situation and lead to the formation of a sustainable management model to save Indian Sundarban Region.

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Assessing Risks Associated with Various Stakeholders of Grape Supply Chain Management That Arise Due to Disaster Events

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ABSTRACT: India's Grape Country' where 55 per cent of countries production takes place. It also called as 'Grape Capital of India' and 'Wine Capital of India'. India is at 18th position in global grape production. It is itself is a major market for consumption. Maharashtra is a leading state in terms of production and productivity in India. Out of total production of maharashtra, nashik accounts for 75 per cent. With its important place in global horticultural market and export, it also acts as a input to wine and resin producing industry. Nashik also has highest wine production in country with good share in export. Grape used for consumption in fresh form called 'table grapes', for making wine and resins. At international level, 70 per cent used for making wine but in india large proportion is used for fresh consumption.

. India's production capacity is dominant in world with comparatively high productivity. The working of supply chain is very primary in india as compare to advance supply chain in other grape producing countries like USA and China. Indian grape supply chain has large domestic and international market. The grape supply chain management has a challenge with respect to production in terms of long volumes, seasonality, perishability and heterogeneity. It faces endogenous risks of quality, technicality, ergonomic, logistic and management, also faces exogenous risk of natural, market and policy environment. The disaster events widen the spectrum of challenges faced in normal time, it creates risk over whole supply chain collectively and to individual according to their position in supply chain. The chain format allows for distribution of benefits and apportion risk among stakeholders.

This creates risk upon all the stakeholders in supply chain and put forth need for alternative chain in order to continue supply even though it is hampered by disaster event. These disasters impacts the whole supply chain associated with grapes, where various other stakeholders are involved. Three successive years of hailstorm and drought cost a large damage and losses to the horticultural crop. Also, unseasonal rain, cold waves and accidental crop burning destroying grape cultivation. These disasters exposes social, economic, political, physical and environmental vulnerabilities of different stakeholders in grape supply chain.

Though this paper risk perception of different stakeholders will be studied for better risk management. The paper will identify various stakeholder specific risks associated to grape supply chain due to extreme weather events. This paper will also try to identify flow of information, finance and product during extreme weather situation and will try to compare chain in normal and emergency times for better understanding of risks associated with it. Later, paper will use a risk management framework to conclude how agricultural products are facing major risk of extreme weather events and disrupts a supply chain that creates need for efficient supply chain risk management to avoid impact of extreme weather events.

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KEYWORDS: supply chain, productivity, supply chain management, seasonality, perishability, heterogeneity, endogenic risks, exogenous risks, logistics and management, disaster events, risk management, extreme weather conditions, emergency, supply chain risk management

History

Indian wine is gaining popularity in international export market and has a huge domestic market potential. Introduction of viticulture in India believed to be dated back to 4th BC by Persian traders and used for fresh consumption and juice rather than wine. Later Portuguese colonists introduced production of fortified wine in sixteenth century in Goa and expanded later. Wine became more familiar in India through the influence of a British Colonist in nineteenth century who planted wine in Baramati (Maharashtra) and Kashmir (Jammu & Kashmir). Indian wines were showcased in Calcutta International Exhibition, 1884. But in 1990s, vineyards in India were totally destroyed due to unknown reasons. During 1950s, unfavourable opinions about alcohol in public lead to prohibition of alcohol by many Indian states resulting in uprooting or conversion of vineyards for production of table grapes and raisin where in places like Goa production continued as before (Manual of Good Agricultural Practices for Quality Wine Production, 2013).

1980s was the time when modern wine industry experienced major shift with establishment of Chateau Indage winery in 1985 in Maharashtra. Wine industry started its new journey with the help of new technology, import of new wine grape varieties from European Countries resulted in expansion of domestic wine grape cultivation and wine production. Indigenous production of quality wines started through establishment of vineyards and through contract farming with small farmers by wine companies like Champagne Indage, Grover and Sula (Manual of Good Agricultural Practices for Quality Wine Production, 2013).

Introduction to Study Area

Out of 29 states 10 are grape growing states that include Maharashtra, Karnataka, Telangana, Andhra Pradesh, Tamil Nadu, Punjab, Haryana, Uttar Pradesh,

Rajasthan and Madhya Pradesh (APEDA, 2018). Grape production in India mainly takes place in peninsular parts in states of Maharashtra, Karnataka, Tamil Nadu and Andhra Pradesh (Good Agricultural Practices for Production of Quality Table Grapes, 2013). Maharashtra has a highest share of more than 81.22 per cent in total national production and highest productivity in country (APEDA, 2018). Maharashtra state is a leading cultivator, producer and exporter in India. Out of total cultivation, Maharashtra produces around 65 per cent for fresh consumption and rest for other purposes like juice, raisin, jam, jelly and wine (Manual of Good Agricultural Practices for Quality Wine Production, 2013).

Nashik, being one of the fastest growing cities in India, also called as 'The wine Capital of India', has largest number of wineries in the country. Nashik has a mild climate for most part of the year but grapes are grown in winters from November to February when weather used to be mild and dry with warm days and cold nights (Manual of Good Agricultural Practices for Quality Wine Production, 2013).

Nashik is called 'India's Grape County' where 55 per cent of country's production takes place. It also called as 'Grape Capital of India' and 'Wine Capital of India'. India is at 18th position in global grape production. It is itself a major market for consumption. Maharashtra is a leading state in terms of production and productivity in India. Out of total production of Maharashtra, Nashik accounts for 75 per cent. With its important place in global horticultural market and export, it also acts as a input to wine and resin producing industry. Nashik also has highest wine production in country with good share in export. Grape is used for consumption in fresh form called 'table grapes', for making wine and resins. At international level, 70 per cent is used for making wine but in India large proportion is used for fresh consumption. Diversity of product outputs for sell creates more complex diversity for the whole supply chain of grapes depending upon demand diversity. India's production capacity is dominant in world with

comparatively high productivity. The working of supply chain is very primary in India as compared to advance supply chain in other grape producing countries like USA and China. Indian grape supply chain has large domestic and international market. Real success of supply chain management lies in well actively coordinated vertical and horizontal chain in delivering quality service to the full coverage of market at the least cost with consumer satisfaction with quality and delivery of product. The grape supply chain management has a challenge with respect to production in terms of long volumes, seasonality, perishability and heterogeneity. It faces endogenous risks of quality, technicality, ergonomic, logistic and management and also faces exogenous risk of natural, market and policy environment. The disaster events widen the spectrum of challenges faced in normal time, it creates risk over whole supply chain collectively and to individual according to their position in supply chain. The chain format allows for distribution of benefits and apportion risk among stakeholders. It individual in supply chain tries to manage its own risk, risk control for himself leading to transfer of risk to above or below of them. In case of grape production, the fruit crop is very delicate and sensitive to weather conditions. This creates risk upon all the stakeholders in supply chain and put forth need for alternative chain in order to continue supply even though it is hampered by disaster event. These disasters impact the whole supply chain associated with grapes, where various other stakeholders are involved. Three successive years of hailstorm and drought cost a large damage and losses to the horticultural crop. Also, unseasonal rain, cold waves and accidental crop burning destroy grape cultivation. These disasters expose social, economic, political, physical and environmental vulnerabilities of farmers.

Through this research, I will try to understand and figure out various problems of stakeholders of grape supply chain and related industries by giving special emphasis to Nashik district of Maharashtra, where majority of research has taken place with respect to pest attack on grape cultivation, but less in disaster management perspective. It will enable to understand the risks associated with grape supply chain management and role of individual in management of risk.

Broad Research Questions/ Hypotheses

- What is the role and positions of different stakeholders and how they are interdependent to address risk arising out of disaster event?
- What is the existing network of grape supply chain management with respect to disaster event?
- What are the risk management measures that stakeholders use to cope up with disaster event?
- How the product, information and finance flow in supply chain?
- How ad-hoc supply chain management will be done in disaster events?

Specific Objective(s) of the Study

- To understand role and position of different stakeholders and their interdependence in grape supply chain in disaster events.
- To study the existing supply chain management of grapes with respect to disaster events.
- To identify and study risks management measures of stakeholders to cope up with disaster events.
- To examine flow of product, finance and information for preparation of effective and efficient ad-hoc supply chain to cope up with disaster.

Methodology

The research will be a mix of qualitative and quantitative methodologies. It will also be ethical and participatory. It can be done by providing information to people in their local language from whom data is going to be collected. Also, consent will be taken before accessing data from individual or organisation. Also, research design will be a combination of descriptive, analytical, correlational and ethnographic study in order to deeply understand the said topic.

Analysis

As rain in month of December is not usual in India where at time plants grow beyond flowering and berry settling stage, unseasonal weather events can cause

a greater damage. In Maharashtra, Andhra Pradesh and Karnataka, temperature used to be considerably low, sometimes night temperature used to be near 10 degree C (Good Agricultural Practices for Production of Quality Table Grapes, 2013).

In fruit season of 2016–17, most of the harvest come to market in month of February as fruit pruning was done after October 15. This leads to crash in market price of grapes in February due to excess supply. Learning from this experience, most of growers in next fruit season of 2017–18 decided for early fruit pruning as there were no rains in early September 2017. Larger portion of area got pruned till end of September but a heavy rain in first week of October 2017 for 4–5 days led to heavy losses of crop as plants were in early stage of shoot growth to flowering stage. The high relative humidity and saturated soil moisture conditions due to rain resulted in Anthracnose, bacterial spots, bunch rot and downy mildew caused heavy damage to vineyards. In later time, weather in mid-October of same year was good for fruit development and helped to get good quality grapes as well as good market price for it. This case creates a need to emphasizes more focus on better supply chain planning and development of long-term strategies to address market price issues (ICAR-NRCG Annual Report, 2017–18).

In order to assure market price to grape growers, there is need for expanding timeline of fruit pruning from September to November by considering demand in market and increased area under grape cultivation. Maharashtra being leading grape producing state in India receives rain in month of September and October, posing heavy risk on grape growers to pruning fruit early (ICAR-NRCG Annual Report, 2017–18).

In countries like Spain and Italy, where vineyards are exposed to risks of rain, cold wave and hailstorm as similar to that of India, plastic covers are used that makes it safe for early pruning. In India, grape cultivators bear a risk of early pruning of fruits as nowhere happens in world (ICAR-NRCG Annual Report, 2017–18).

The crop harvested during month of December has to do pruning early involving greater risk due to monsoon season in India but it fetches high value in export market. The crop harvested in late May and early June also has a greater risk of damage as mature grapes

may get damaged due to early monsoon. This is main issue in northern grape cultivating states of Punjab, Haryana and Uttar Pradesh even though weather conditions are favourable and cost of cultivation is also low. The grape cultivation in these northern subtropical belt is possible to expand if new technology like use of plastic sheets is promoted (ICAR-NRCG Annual Report, 2017–18).

While considering technological benefits to grape cultivation, it is observed that cultivation of Thompson Seedless under plastic cover not only resulted in better growth and yield of grapes but also reduced irrigation water needs to crop by 20 per cent as compared to use of hail net or cultivation under open conditions. Also, introduction of sun surface irrigation technique saved 25 per cent irrigation water helping in water-deficient conditions without any adverse effect on quality and quantity of product (ICAR-NRCG Annual Report, 2017–18).

Negative aspects of current agricultural supply chain in India are presence of number of intermediaries who control over price and supply of product, high amount of post-harvest losses due to absence of post-harvest technologies and cold storage, high amount of wastage, degradation of product quality and high production cost. Government control over current agricultural supply chain in India is high; there is need to give essential importance to private operators being part of supply chain to collaborate with government and work on improvement of services for quality product, building and developing physical infrastructure and increasing information and communication across different operators of supply chain.

Complex problems of farmers are not adequately addressed by existing market system in India (especially in perishable products like fruits and vegetables) hence there is need of a modern innovative system that will reduce impact of intermediaries on chain that harm sustainability of product chain, improve quality of services necessary to modernise supply chain operations using IT technologies and scientific innovative applications for efficient handling and processing of products.

There were very few attempts made to identify losses in post-harvest situations but not at each stage. It is essential to identify losses at each stage so that

essential measures and solutions may be provided differently for different stages. Most importantly it will give clear understanding about factors responsible for loss and risks faced by operator at individual, collective and at whole chain level.

Murthy, Reddy & Rao (2014) studied post-harvest losses at field level and retail level for domestic and export market. They considered harvesting injury, malformation, rotting, immature, shriveled, waste, mummies, cracks, berry drops and diseased berries as types of losses for study. He observed 7.96 per cent of total post-harvest loss in domestic market where 3.40 per cent is field level and 4.56 is at retail level loss. In export market total 19.95 per cent loss is observed that include 7.82 per cent at field level and 12.13 per cent at cold storage level. It is important to notice that cold storage infrastructure is missing for domestic market and it is directly transported to its targeted destination. In export market chain multiple sorting used to take place for product at intermediate levels in order to standardise it as per the need of customer by removing loose and damaged berries.

Water shortage in production season, unseasonal weather conditions during growth and harvesting season result in fluctuation of grape prices. Also, trend of export also influences domestic market prices for grapes considering its major share in export market. Though having greater demand in international market, greater competition leads to lower price for Indian grapes that result in lower price at domestic market. There is need for more efficient planning and management to cope up with price fluctuations by using modern market systems, innovative post harvest loss and waste management techniques that will ensure better handling, storage, processing and

packaging of product along with better coordination with farmers for production planning.

Process reengineering is essential to reengineer existing processes in system in order to achieve better performance and management that may result in uniformity across the system. Retailers in agricultural food supply chain need to redesign to bring more equity, efficiency and minimise wastage.

New retail revolution in the form of supermarkets in fresh agricultural produce has come with new barriers as well as opportunities for different actors in the system.

Initial Findings

- Complexities of supply chain network.
- Lack of coordination among different stakeholders while considering horizontal and vertical chain
- Lack of understanding of disaster and disaster management in government officials.
- Lack of understanding of experts working about multi-dimensional perspective on agriculture, disasters and supply chain.
- Lack of risk communication among stakeholders.
- Lack of information management by key stakeholders like government, market operators and lack of information sharing among stakeholders.
- High level of risk faced by producer if chain is least coordinated as compared to other stakeholders rather many times only by producers.
- High presence of informal selling, trading, marketing.
- Individual level preparedness and response measures by producers without much of expert suggestions and other stakeholders interventions.

Leaving No One Behind: Inclusion of Animals in Disaster Management

Tajane Priyanka^a

ABSTRACT: Disasters have a devastating impact on human society and environment. In year 2015, 376 natural disasters were reported that lead to death of 22,765 people, 110.3 million victims and economic damage of US \$ 70.3 billion. But disasters not only impact human beings but also other living beings on the planet. Animals are closely related to the human beings. UNISDR defines term 'Recovery' as 'The restoring or improving of livelihood and health, as well as economic, physical, social, cultural, and environmental assets, systems and activities, of a disaster-affected community or society, aligning with the principle of sustainable development and 'Build Back Better', to avoid or reduce future disaster risk.¹ Hence, animals are not just a source of livelihood and mean of economic gain for humans but they are the indivisible part of social, cultural and environmental aspect of human life. When any disaster occurs animals are among those who used to be one of the vulnerable and needs to be recovered. There have been large-scale disasters that make one realise the need of focusing on animals and their recovery.

Through this document I am going to focus on 'Disaster Recovery of Animals'. This document begins with the basic understanding why animals are important, animals that are associated with humans. For the recovery of animals from disaster, I am studying three different case studies of different disasters in different parts of world, their different nature and their impact on animals. I am also focusing on how recovery process occurred in these case studies. At last, I am going to discuss recovery process for animals from disaster. Hence, by studying this recovery aspect I would like to contribute in the field of animal recovery from disaster which is still not considered important in conventional recovery scenario or a very less awareness is there among society and administration to look after their animals as well along with other belongings.

Note: With respect to recovery of animals from disaster situation, here I am considering companion pets, equines, livestock, avians, zoo animals, non domestic animals, exotic species and aquaculture that are essentially important to formulate the process of recovery.

KEYWORDS: inclusive disaster management, vulnerable, relief, rescue, recovery

Introduction

Pets are companion to the human beings. Since the time when humans shifted from hunting and gathering towards settled agriculture, they started domesticating animals. They used to rear animals and share a great bond with them. Animals became inseparable part of human settlements. Even in today's time they are not just companion to humans but beyond that they become friends and loved ones.

As mentioned earlier, settled agriculture and domestication of animals in early human history resulted in human and animal bond. Humans used animals for farming as a livestock. The animal milk nutritionally important and fetch good market value. It also provides leather, mutton, chicken, pork, eggs. Animals like sheep are important to obtain wool. Hence, livestock has a economic and commercial importance for human beings. When there were no vehicles unlike today, the horses, camels, bulls, donkey were used for

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the transportation purposes of goods and humans. Even today, in urban areas they are the only mean to do the same. People also identified with the increased quality of life. People organised horse race, bull race since longer time.

The awareness about conservation of nature has resulted into National Parks, zoo, species-specific reserved areas. As the source of economic benefits, in agriculture, food industry,

tourism, transportation, animals contribute to welfare of humans. Even if one sees from region-specific aspect, animals like camel in desert, yak in cold mountainous region, horses in hilly region are becoming socio-culturally and economically important to humans. Hence, from being companion to economic and environmentally important, animals are existential to humans. In disaster situations, many animals left behind idle without rescue and response. Even today there is no provision of considering animals in disaster management plans in many countries at various levels.

These abandoned animals remain in disaster situations either starving on roof top or dies due to polluted or contaminated water and food causing them diseases. Hence, there is need to consider them not just as an essential part of disaster recovery but in whole disaster management process.

For the understanding of disaster recovery of animals, we are going to study three case studies that put focus on animal component of recovery:

- Iraqi occupation of Kuwait between Aug 1990 and March 1991 (Kuwait)
- Fukushima Daiichi Nuclear Accident, 2011 (Japan)
- From Hurricane Katrina 2005 (USA) to Hurricane Sandy, 2012 (USA)

These case studies are significant as in 1990 Kuwait was impacted and was a part of Gulf War, that is a war prone country. Fukushima is important in the sense that Japan is one of the most developed country in terms of economy and science and technology. Also, the era of twenty-first century with very few experience in disasters like nuclear posed different challenges in recovery. The USA at the time of both hurricanes, that is Sandy and Katrina, was a global power with economic and technological advancement. With respect to disaster management, many countries followed USA for formulation of laws, policies and advice of experts.

Hence, it is important to look at these case studies with different conditionalities so that we can focus on animal recovery in more critical manner.

Iraqi Occupation of Kuwait between Aug 1990 and March 1991 (Kuwait)

Iraqi occupation over neighbouring state Kuwait in Aug 1990 lasts for seven months long period. The war had devastating impact on animals in country. In dairy population 15,000 cows reduced to 2500. The normal population of sheeps reduced from 800,000 to 10,000. Out of 8000 camels only 2000 survived in conflict. Out of 3000 horses only 500 survived. The release of crude oil from Persian Gulf and toxic smoke from burning oil wells estimated that 30,000 marine and migratory birds died, also it threatened sea turtles and marine mammals. Terrestrial animals thought to have killed because military vehicles ran over them and their burrows. More than 80 per cent of livestock animals in Kuwait died during Iraqi occupation with principle causes being starvation, dehydration, intentional or accidental shooting, slaughter for food and bombing. For the purpose of recovery, livestock solely depend on humans. In Kuwait, the collapse of its economy and domestic infrastructure left hundreds of remained animals helpless. Out of 442 inhabitants only two dozens animals were left in

Kuwait Zoo which were killed, shot, eaten and burnt by Iraqi soldiers.

International conventions having animal component in them like Hague Convention (1907), The Geneva Convention (1949), World Cultural And Natural Heritage Convention (1972) and ENMOD to few of which Iraq was signatory at the time have led to very less or no action against Iraq on animal issue. USA called this act as a 'Environmental Terrorism'. In this era of greedy world politics, even humans were sacrificed at the cost of anything, animals and their recovery remained sidelined.

Fukushima Daiichi Nuclear Accident, 2011 (Japan)

Japan is a developed country. As stated earlier there was very few history of nuclear disaster as the

technology is discovered in recent time. There were several industry-related disasters like Chernobyl, Bhopal Gas Tragedy and oil spills, impacts of which stayed for generations and scientific community is still working on them. In case of nuclear disaster, very less information is available with respect to its occurrence, impacts and complexities. Hence, it becomes difficult to be prepared for its consequences, to respond and recover. The exposure to radiation is the essential phenomenon which is not fully revealed. Even in many cases humans are not isolated from its influence though having scientific, technological and economic advancements so, animals naturally become vulnerable to it. Surprisingly, in case of Fukushima Nuclear accident, no specific data is available about animals affected, search and rescue and recovery. A study shows decline in abundance of species and diversity of birds. The people fled and migrated to save themselves from radiation but their animals left behind freely roaming around the villages suffering starvation, dehydration and radiation effect led them to die. The animals include stray dogs, livestock, pigs, poultry animals in empty villages with nobody to look after them. After the incidence, the media reporting showed that the exposure of these animals over TV and news channels made the government to consider these animals and their recovery. For this purpose, a committee of subject matter experts from Japan and USA was formed to discuss animal issues resulting from this nuclear disaster.

IFAW conducted a summit to discuss impact on animals left inside the restricted zones and with experts had formed a sub group to address different risks to companion animals, livestock and wildlife. This summit came up with a comprehensive document about response procedure, protocol to safely monitor, evaluate and treat animals contaminated by radiation. The committee prepared a report named 'Nuclear Accidents and Impacts on Animals':

- Companion animal recommendations – efforts to keep human and their animals together, Colocation centres for animals in shelter homes, abandoned animals in home territory for reunification, does not support exportation of animals out of country. Rescue, Decontamination, Transport, Sheltering

Specifications were also suggested in report which were essentially specific to nuclear disaster.

- Wildlife recommendations – support the principle of 'one world one health'; the health of people, domestic and wild animals, and the ecosystem as a whole are all inextricably linked. Committee suggested following short- and long-term measures for wildlife.

Short-term recommendations – include rescue and monitoring process, utilise and reinforce the capacity of the Fukushima Wildlife Rehabilitation Center (FWRC), wildlife can move over large areas and therefore monitoring beyond the presently recognised zones, rescue for small range of animals taxa and monitoring for large range of animals taxa.

Long-term recommendations – standardisation of methods for monitoring the effects over time on wildlife health and biodiversity, to monitor the long-term effects on migratory species, monitoring changes in wildlife populations, considering species-specific approach, multidisciplinary approach, disposal methods for carcasses.

Livestock recommendations – Livestock in the 20 km zone needs to be rescued, moved or humanely euthanised (determine livestock location, limit worker's exposure based on IAEA recommendations, locate feed and capture stations outside of 20 km zone, co-locate testing stations with feed and capture facility, survey and decontaminate and relocate animals according to MAFF protocols). Plume zone (Planned Evacuation Zone) livestock should be surveyed and evacuated according to MAFF protocols. Livestock evacuation should be completed before people are evacuated. Every individual animal may not need to be surveyed. One representative sample per management location may suffice. OIE euthanasia guidelines should be followed. The Government of Japan (GOJ) should mobilise adequate personnel to ensure surveying and movement of animals out of restricted area. Train additional personnel in use of PPE and radiological surveillance equipment to expedite movement process. GOJ will ensure adequate transport vehicles are available for rapid movement of animals. Committee supports MAFF's safe forage

protocol. Long-term monitoring of valuable breeding stock is recommended.

By considering economic development and technological advancement in country, the recovery approach of Japan was very primary that started growing after the response process. There was no legal provision to consider animal as a part of recovery and emergency plan.

From Hurricane Katrina 2005 (USA) to Hurricane Sandy, 2012 (USA)

Hurricane Katrina caused greater damage to USA. According to CNN report, 60,000 to 70,000 household pets died. For response and recovery process of animals, there were multiple organisations working on it at various levels specifically non-governmental and animal care organisations after the disaster. Hence, there were mainly individual efforts to recover animals from disaster but limited only up to search and rescue. At certain places health care and shelter facilities were provided without no prior data available. According to media reports, those who have not evacuated, half of them were pets. These pets were left behind as humans became priority in emergency situation. They were found on roof tops starving and dehydrated. Many of them caught diseases. This hurricane left about 250,000 animals abandoned.

Hurricane Sandy, after seven years of Katrina, seen some progress with respect to animal recovery. Government had the responsibility to search, rescue and recover animals from such emergency situations. The Humane Society of United States (HSUS) made various efforts in collaboration with government of USA and various other non-governmental organisations. Damage assessment and rescue were done. In New York and New Jersey shelter homes were started for these animals. At several places pet and animal food were distributed by organisations. The deployment of staff and volunteers too place where local volunteers were also included. Rescue hotline was started to unit pets and their families. From 2005 to 2012, USA, between the two devastating hurricanes the efforts were made to by various animal care organisations to catch the attention of government on animal recovery in emergency situations. The USA has passed Pets

Evacuation and Transportation Standards (PETS) Act, 2006. The act bound the responsibility of rescue and recovery of animal with government. The pets no more remain companion to humans but became a member of society. Pet is included in Emergency Evacuation Plans. It bound the government to procure, construct, renovate emergency shelter facilities and materials that will temporarily accommodate people with pets and service animals. But, it does not have mention of other animals as it only considered pets but excluded other kinds of animals in an act. Government became responsible to protect them in emergency situations and help communities to protect them. At many places Veterinary Emergency Response Units were set.

These two hurricanes and intermediate time between them show how recovery process had progressed in USA. Even though the act lack disaster management perspective for recovery of animals. It has led the foundation for importance of animal recovery in disaster situations. In the later time FEMA came up with various guiding principles and training modules for recovering animals from emergency situation and their management.¹⁰

International Legislations

The following conventions were proposed by committee for the convention for the protection of animals, 1988.

- Convention for the Protection of Animals – Humans and animals co-exist within an interdependent ecosystem. Humans and animals share an evolutionary heritage.

Humans, as moral beings, have an obligation to act responsibly towards animals. Life has intrinsic value. No animal should be killed unnecessarily or be subjected to cruel acts or to unnecessary suffering. When humans have control over specific animals they have a positive obligation to provide these animals with an environment and care appropriate for the species.

- Companion Animal Protocol – No person shall cause a companion animal unnecessary pain, suffering or distress. No person shall abandon a companion animal. Any person who is the keeper of a companion animal shall have the affirmative

obligation to provide the companion animal with adequate food, water, shelter and veterinary care. Wildlife, particularly captured wildlife, should not be utilised as companion animals.

- Protocol for the Care of Exhibited Wildlife-Persons possessing wildlife for purposes of public exhibition have the obligation to provide each animal an environment which approaches the species natural environment. Captive wildlife should not be subjected to unnecessary suffering or cruelty. Captive wildlife should be under the control and direction of individuals competent to deal with such animals.
- Protocol for the Taking of Wild Animals – The taking of wildlife is permissible only when necessary and then only to the extent necessary to accomplish the purpose desired. Any taking shall be accomplished in the most humane manner possible, and only by a licensed or otherwise authorised person or agency. Any taking shall be accomplished by the method which is least disruptive to animals, species and the ecosystem.
- Protocol for the International Transportation of Animals – The transportation of animals shall not be done in a manner or under such conditions as is likely to cause injury, damage to health, unnecessary suffering or death. During the transportation process, those transportation agents with physical possession of animals shall have the legal obligation for their well-being and shall care for them in the event of any breakdown, delay or other emergency. No transportation agent shall accept for shipment animals inadequately prepared for shipment, given the needs of the animal and the method of transportation. During the legal formalities of custom control requirements, priority shall be given to the speedy inspection and clearance of live animal shipments. The most direct, safe route of transportation of shortest duration shall be utilised in order to reduce stress and risk of injury or illness.

Other international legislations like-

- United Nations Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES)

- International Whaling Commission (IWC)
- European Union (EU) legislation. It is of fundamental importance to EU member states – and has moved the animal welfare agenda forward markedly.
- The Council of Europe (CoE) has also agreed upon a set of animal welfare conventions, which are comprehensive and provide useful lobbying material for countries in the wider Europe.
- The International Organisation for Animal Health (the OIE)
- Convention on Migratory Species (CMS)
- Convention on Biological Diversity (CBD)
- Universal Declaration on Animal Welfare (UDAW)
- United Nations Environmental Programme (UNEP) and the Environmental Assembly (UNEA) were bound to the parties (countries) signatory to it. But in terms of considering these provision with respect to disaster recovery process, there were very few linkages made which can be improved in coming times.

The Sendai Framework has now stated need to incorporate animal protection in disaster risk reduction.

Sendai Framework, Animal Recovery and India

World Animal Protection and World Society for Protection of Animals (WSPA) along with National Disaster Management Authority (NDMA) of India had organised National Conference on Animal Disaster Management in New Delhi¹². The key topics were-

- Regulatory and institutional perspective on animal disaster management in India
- Causes and impacts of disasters on animals.
- Transboundary animal diseases, epidemics, pandemics and zoonosis
- Emergency response for animals in disasters
- Preparedness, prevention and mitigation strategies in animal disaster management

Even though this has a good step towards animals and disasters. But there was no mention of recovery in this initiative. The Recovery of Animals is not popularly recognised in India. The livestock with respect to

livelihood aspect seems primary focus in India where formulation of state policy, reducing vulnerabilities and capacity building take place. India lacks inclusive approach that considers all animals in its disaster response process. For example, the Kaziranga National Park in Assam used to flood every year, where all animals in national park suffer due to emergency. It causes hundreds of animal deaths including many endemic and endangered species like one horn rhino, tiger. Hence, India needs to formulate more inclusive policy for disaster recovery of animals as it is home to many species, highest number of livestock in world. The livestock is focal point for animal recovery in India in current scenerio. The government of India, Ministry of Animal Husbandry, Dairies and Fisheries and Ministry of Agriculture and Farmers Welfare have formulated 'Disaster Management Plan' for this purpose.

The Animal Recovery Process

From these case studies it is evident that global community needs to give more focus on considering animals in emergency evacuation and disaster recovery plans. It showed how there is a lack of efforts and planning where there is very few awareness among authorities and communities to put efforts for recovery of their animals.

Hence, the following recovery process may be a point of initiation in order to have better provision for safety, security and welfare of animals from disaster situations. These are the key areas that need special attention in animal recovery from disasters which are derived from some of literature in disaster and animal welfare studies.

Short-term Recovery Measures

- Search and rescue
- PDNA (Post-Disaster Need Assessment)
- Helpline services
- Disposing animal carcasses
- Identification, communication, reunification
- Availability of clean water
- Availability of food and fodder
- Protection and security

Medical and Health Care

- Infection, poisoning, diseases

- Mental health (fear, Post-Traumatic Stress Disorder)
- Operations/surgery
- Animals with special needs
- Pregnant female animals
- Medical tools and equipments
- Temporary shelters

Long-term Recovery

- PDNA (Post-Disaster Need Assessment)
- Care homes
- Adoption
- Community participation
- Database and Information Management: Veterinary Department
- Awareness, sensitivity and training
- Deployment of experts in field of animal care and veterinary services for rehabilitation
- Inclusion of animal care factor in disaster management plans
- Unique Identification System
- Monitoring change in population, behaviour
- Special disaster recovery plans for zoo, national parks, sanctuaries etc according to its specificity
- In-situ and ex-situ recovery measures

Challenges

- Insensitivity of people towards nature, environment and its components like animals
- Poor existing disaster infrastructure
- Lack of peoples and political will
- Lack of inclusive disaster management approach
- Lack of interdisciplinary approach in disaster management
- Poor policy implementation
- Lack of local understanding while preparing international or national protocols

Conclusion

All the 17 Sustainable Development Goals have to do with the relationship between humans and animals in indirect way. As stated earlier Sendai Framework incorporated animal as essential component in disaster risk reduction. The importance of animals is evident from the progress of human beings occurring from centuries. The world requires more awareness

and efforts to care for animals in coming future as they are important part not just of their daily routine but of natural ecosystem and environment. Hence, disaster recovery process will be moved forward towards more inclusive way after considering animal care in it. It will make human animal bond even more stronger and build empathy towards nature and other living beings in longer run.

Notes

- ¹ UNISDR- Terminology on DRR, Feb 2017.

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CSR Practices and Disaster Risk Reduction: A Critical Observation of Medium-Scale Industries

Niranjan Sahoo^a

ABSTRACT: Disaster Management is one of the front running themes among contemporary global issues. Disaster control and mitigation measures have been gradually attaining a level where it has been extensively practised. Disaster management has been assumed great importance due to the occurrence of natural as well as man-made disasters. Not only the structural and physical measures but the awareness about disasters in India is also minimal. Therefore, much more needs to be done to create better awareness on disaster management that could lessen the degrees of damages. This could lead to quicker and more honest efforts for responding to a disaster situation. NGOs, Government agencies and community as a whole have greater responsibilities towards making the society a disaster resilient one. This empirical research is a small effort in this direction. A few case studies taken from Bihar which explain the Social Responsibilities (CSR) of different corporates which have been involved in flood disaster risk reduction, relief, post-flood management and as a whole plan preparedness in Koshi River basins of Bihar. For the research, total 30 medium sized industries in Bihar have been taken into consideration to get the appropriate results in relation to correlation between CSR policies and CSR practices. The study has highlighted the differential CSR policies and practice among the industries. Community need identification methods, implementation strategies, interventional areas, fund utilisation, measuring the benefits, contribution towards the resilience, sustainability aspects and as a whole disaster preparedness are the main aspects which have taken part in the research in order to come to a conclusion about the correlation of CSR functions and disaster risk reductions. As part of methodology, questionnaires were used to for primary sources data collection. The findings, conclusion and policy notes are highlighted in full length paper.

KEYWORDS: CSR policy & practice, disaster preparedness, community participation

Introduction

Disaster management is one of the front running themes among the contemporary global issues. Disaster control and mitigation measures have been gradually attaining a level, where it has been extensively practised. Disaster management is assumed to be of great importance due to the occurrence of natural as well as man-made disasters. Not only the structural and physical measures, but the awareness about disasters in India is also minimal. Therefore, much

more needs to be done to create better awareness on disaster management that would lessen the degree of damages. This would lead to quicker and more honest efforts for responding to a disaster situation. NGOs, government agencies and community as a whole have greater responsibilities towards making the society a disaster resilient one. This empirical research is a small effort in this direction.

A few case studies taken from Bihar explain the Social Responsibilities (CSR) of different corporates which have been involved in flood disaster risk

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reduction, relief, post-flood management and as a whole plod preparedness in Koshi River basins of Bihar. For the research, a total of 30 organisations (PH Rail Solution Pvt. Ltd, Anmol Feed Pvt. Ltd., Hotel Windsor, Cybotech Campus, Petel Boutique, PC Laboratories, Tubex India Ltd., Astric Solution, AMAFFA Media Pvt. Ltd., BAID, BAMFT, Bihar Industries Association, Cobra Indian Beer Pvt. Ltd., Cybotec Ltd., DES India Pvt. Ltd., Inductus Consultant Pvt. Ltd, ITC Ltd., Kanika Build Cons. Pvt. Ltd., Rukmani Buld. Pvt. Ltd., HR Solution, Saija Finance Ltd., Shamhavi Marketing Pvt. Ltd., Shipra Agro Tech Pvt. Ltd., Speed Craft Ltd., Vanco and Company Ltd., Surya Nest Build Ltd., Ruban Patliputra hospital, TL Enterprise Ltd., Suman Vatika food products, Sri Vedyanath Aaurvedhya) were taken and after the survey, following were the main findings and analysis.

Flood Management Practices of Corporate

Industries had engaged in different activities during and after the flood in Koshi areas. They had invested their moneyforthewelfareofthevictims.Manyoftheindustries

were working on crucial areas like health, education, nutrition, social forestry, environment, poverty alleviation, women empowerment, child protection, vocational/skill training, disability, old age home and disaster management. Most of the organisations had invested their money for strengthening the pillars of disaster management. 20 that is 66.67 per cent of the industries were involved in disaster management. After disaster management, they had invested their money for the poverty alleviation. 9 that is 30 per cent of the industries had worked rigorously towards the poverty alleviation. 7 that is 23.33 per cent of the industries had facilitated education to the flood effected children. 6 that is 20 per cent of the industries were involved in providing good health facility. 5 that is 16.67 per cent of the industries were involved in providing nutrition to the flood effected people. In the field of Social Forestry, Environment and Skills Training, 3 that is 10 per cent of the industries were engaged. For women empowerment and old age home, there were 2 that is 6.67 per cent of the industries working. Only one industry was involved in the child protection activities during and after the flood.

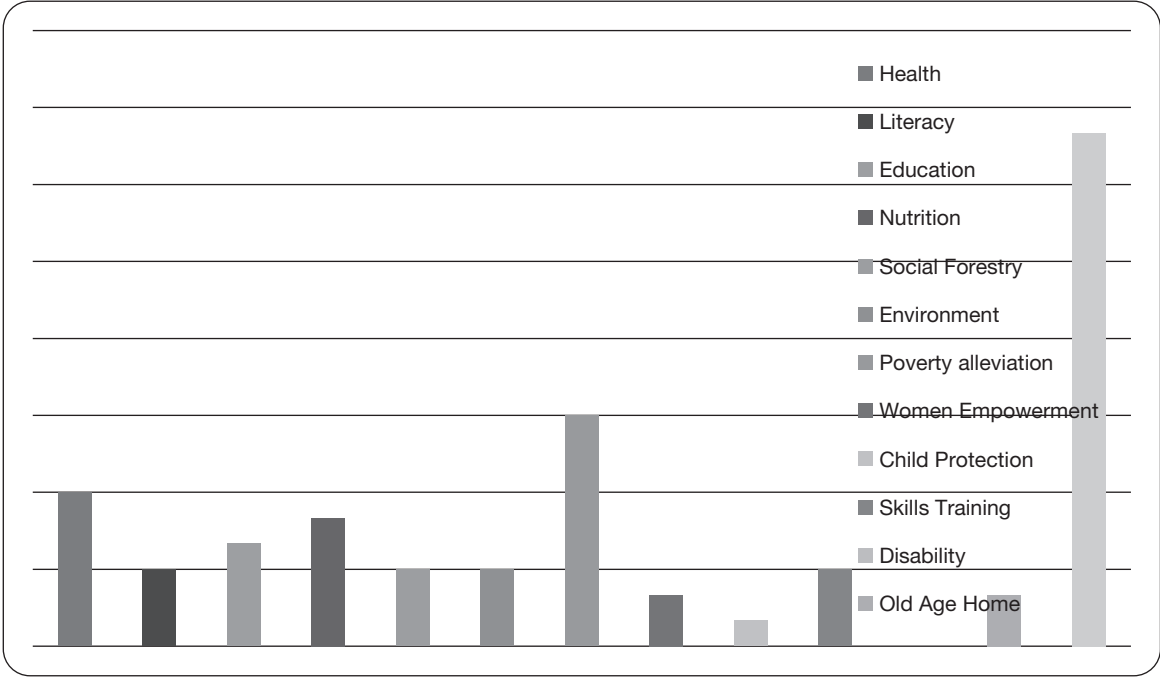


Figure 1: Priority of organisation

Table 1: Funding Priority

No. of Industries Involved in Different Areas		Per cent
Health	6	20.00
Education	7	23.33
Nutrition	5	16.67
Social Forestry	3	10.00
Environment	3	10.00
Poverty Alleviation	9	30.00
Women Empowerment	2	6.67
Child Protection	1	3.33
Skills Training	3	10.00
Disability	0	0.00
Old Age Home	2	6.67
Disaster Management	20	66.67

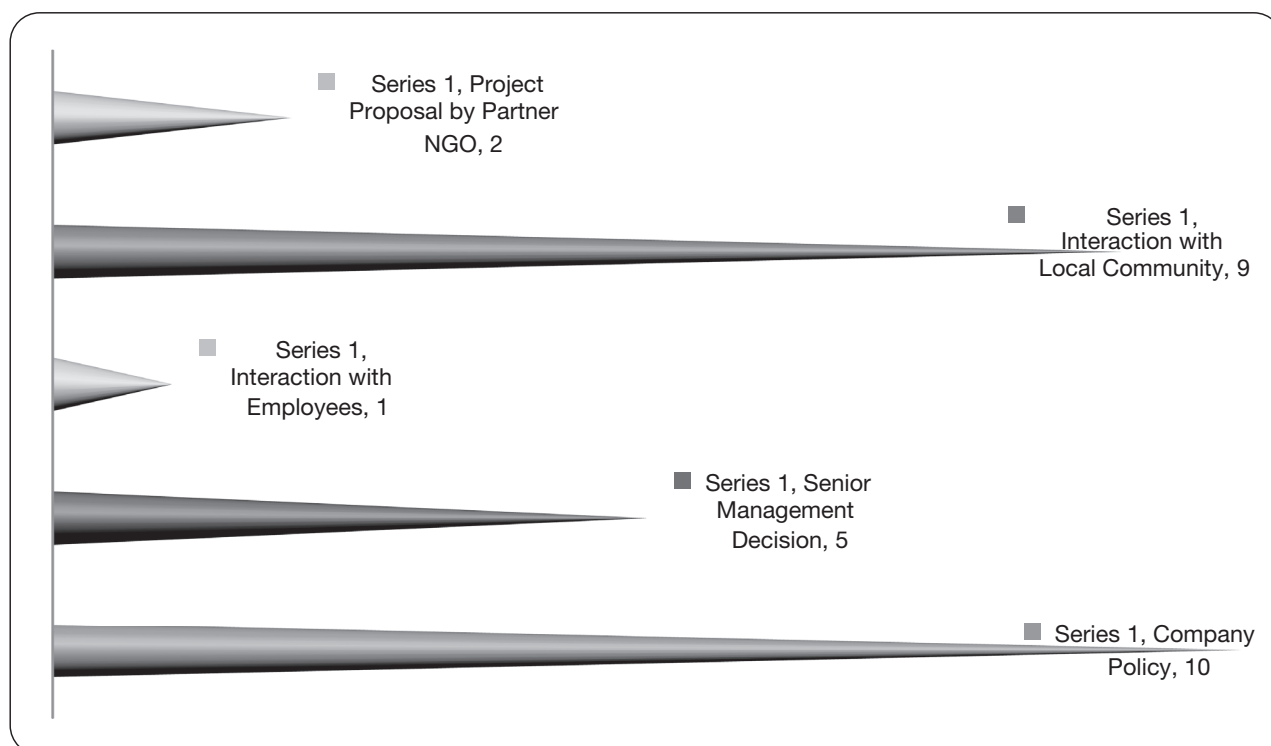
Areas of Intervention

Table 2 depicts the areas of intervention by the industries. Company Policy, Senior Management Decision, Interaction with Employees, Interaction with

Local Community and Project Proposal by Partner NGO are the main intervention of the industries. 10 that is 33.33 per cent of the industries had intervention in the field of company policy. 5 that is 16.7 per cent, 1 that is 3.3 per cent, 9 that is 30 per cent, 2 that is 6.7 per cent had intervention in the fields of Senior Management Decision, Interaction with Employees, Interaction with Local Community and Project Proposal by Partner NGO respectively.

Table 2: Intervention Strategy through CSR by Different Companies

Parameter	Number	Per cent
Company Policy	10	33.3
Senior Management Decision	5	16.7
Interaction with Employees	1	3.3
Interaction with Local Community	9	30
Project Proposal by Partner NGO	2	6.7

**Figure 2:** Areas of interventions

Disaster Risk reduction Interventions of CSR Department

Table 3 depicts details of the areas of intervention done by the industries. There were 22 that is 73.33 per cent of the industries which were involved in disaster relief. They performed different activities like post-disaster relief, long-term rehabilitation and pre-disaster risk production. From these 22 industries, 20

that is 90.91 per cent were involved in post-disaster relief, 6 that is 27.27 per cent were involved in long-term rehabilitation and 9 that is 40.91 per cent were involved in pre-disaster risk production. Only one industry, Anmol Feed Private Limited, was not involved in the area of disaster management. Data for 7 that is 23.33 per cent of industries were not found. Therefore out of 30, only 22 of the industries were involved in disaster management through CSR.

Table 3: CSR and Disaster Management

Parameters		Number	Per cent
Yes	Total	22	73.3
	Post-Disaster Relief	20	90.91
	Long-Term Rehabilitation	6	27.27
	Pre-disaster Risk Production	9	40.91
No		1	3.3
NA		7	23.3

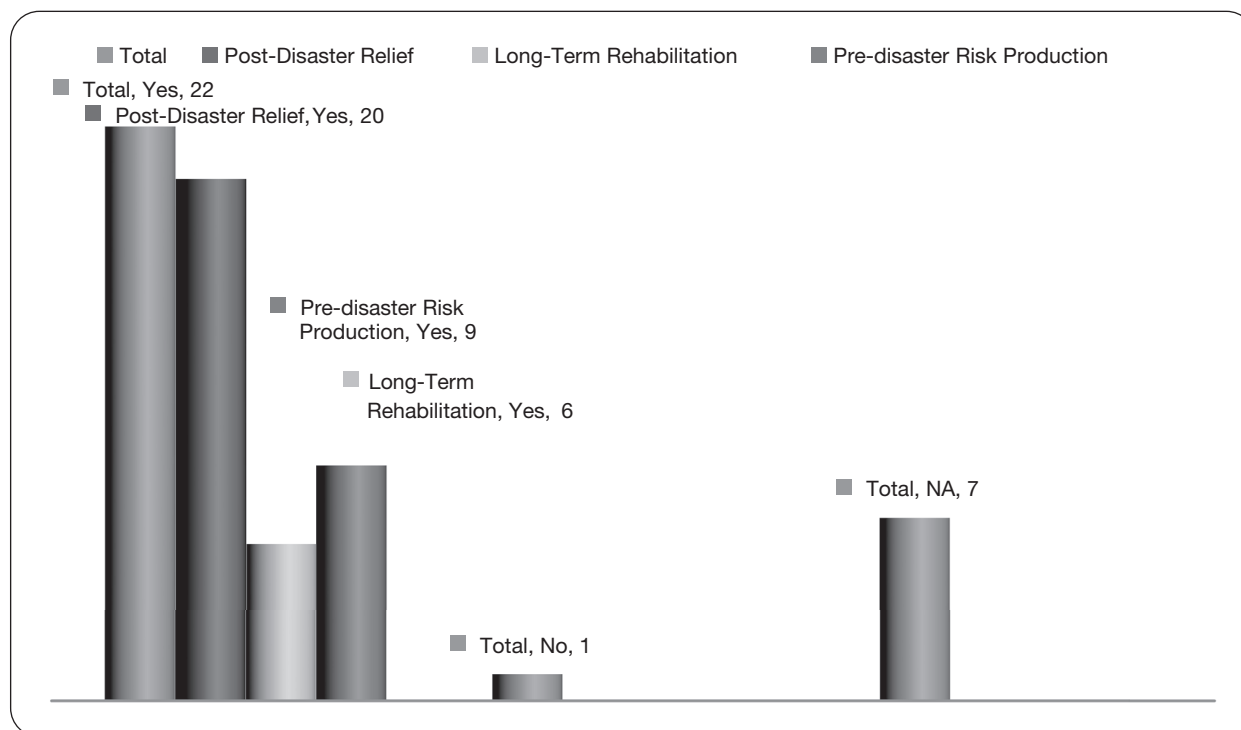


Figure 3: Status of involvement through CSR

Post-disaster Management Activities of CSR Functions

Out of all the industries which were involved in disaster management, few were involved in pre-disaster relief. Table 4 depicts different activities during the post-disaster relief. Distribution of Relief Material, Cash Donation, Medicines/Medical Teams, Community Kitchens, Provision of tents/Temporary Shelter, Distribution of Solar product, Information

Giving, Infrastructure and Training construction were the main activities of the post-disaster relief. Numbers of industries which were involved in activities of Distribution of Relief Material, Cash Donation, Medicines/Medical Teams, Community Kitchens, Provision of tents/Temporary Shelter, Distribution of Solar product, Information Giving, Infrastructure and Training construction were 11 (36.7 per cent), 0 (0 per cent), 5 (16.7 per cent), 1 (3.33 per cent), 4 (13.3 per cent), 1 (3.3 per cent), 2 (6.6 per cent), 1 (3.3 per cent) and 3 (10 per cent) respectively.

Table 4: Post-Disaster Relief Activities

Activities	Number	Per cent
Distribution of Relief Material	11	36.7
Cash Donation	0	0
Medicines/Medical Teams	5	16.7
Community Kitchens	1	3.3
Provision of tents/Temporary Shelter	4	13.3
Distribution of Solar product	1	3.3
Information Giving	2	6.6
Infrastructure construction	1	3.3
Training	3	10

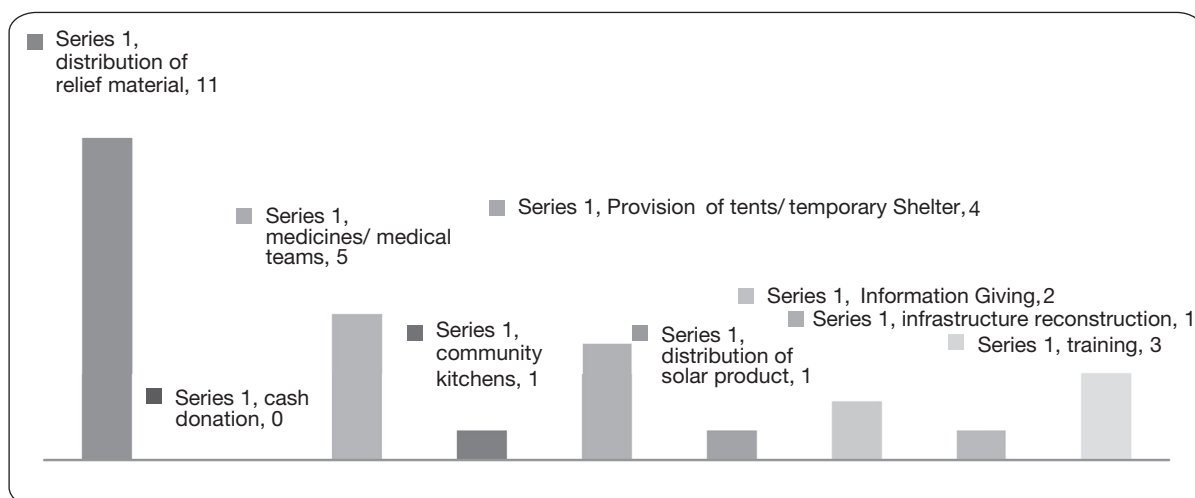


Figure 4: Post-disaster reliefs

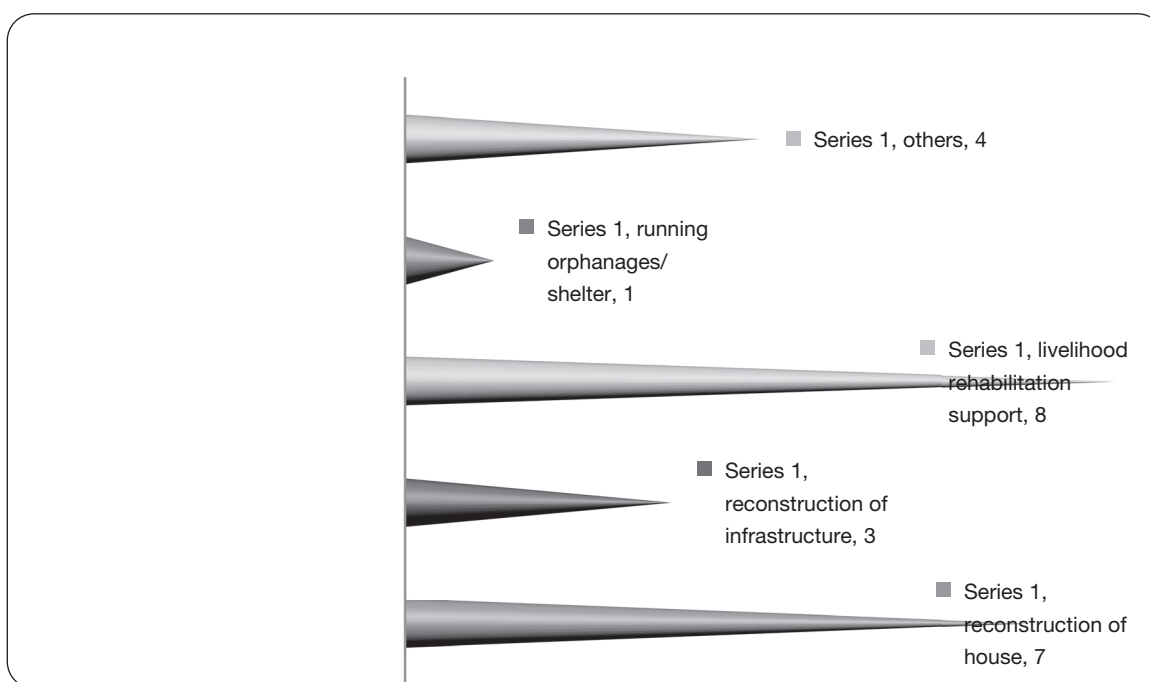


Figure 5: Long-term rehabilitation activities

Long-Term Disaster Measures Taken by the Corporate

Table 5 depicts the activities of the industries during long-term rehabilitation. During long-term rehabilitation, their main focuses were reconstruction of infrastructure and livelihood rehabilitation support. 7 that is 23.3 per cent of the industries worked for the reconstruction of the houses, 3 that is 10 per cent worked for the infrastructure reconstruction, 8 that is 26.7 per cent worked for the livelihood rehabilitation support, 1 that is 3.33 per cent worked for maintaining shelters and 4 that is 13.3 per cent worked for other construction-related work.

Table 5: Long-Term Rehabilitation Activities

Activities	Number	Per cent
Reconstruction of House	7	23.3
Reconstruction of Infrastructure	3	10
Livelihood Rehabilitation Support	8	26.7
Running Orphanages/Shelter	1	3.3
Others	4	13.3

Relief Practices of the Industries

It is found in many cases, two different types of interventions and their duration. Two interventions were the post-disaster relief and the long-term rehabilitation. In post-disaster relief, there were 4 that is 13.3 per cent of the industries that had worked under 30 days. Between 30 and 180 days, there were 6 that is 20 per cent of the industries. 9 that is 30 per cent of the industries had worked between 180 and 365 days. None of the industry worked for more than a year. In average, all the industries have worked for approximately 148.79 days for the post-disaster relief. Total number of industries which were involved in intervention of Post-Disaster Relief were 19 that is 63.3 per cent.

Pre-disaster Preparedness Practice of the Corporate

Some of the industries were also active in the pre-disaster risk reduction. Table 15 depicts all the activities and pre-disaster risk reduction. For Public Awareness Campaign, there were 9 that is 30 per cent of the industries which were involved. 10 that is 33.3 per cent of the industries were active in the Community

Capacity Building activities. Six of them were involved in Alternative Livelihood Support as they provided other alternative livelihood options for the flood affected people. Only 4 that is 13.3 per cent of the industries were involved in the construction of the Disaster Resistance House. 2 that is 6.67 per cent were involved for the shelter preparation. 1 that is 3.33 per cent of the industry was involved to protect the school. For the betterment of the livelihood of the flood affected people, 6 that is 10 per cent of the industries were involved in training and development programmes. These training and development programmes helped the poor people to reestablish their livelihood. 3 that is 10 per cent of the industries were also involved in pre warning of disaster.

Other Special CSR Measures for Flood Mitigation

It is learnt that the industries claimed, that all the benefits went to the vulnerable section and they were 100 per cent successful in providing these benefits to the flood effected people. Data, for this question, of 8 were unavailable. 18 that is 60 per cent of the industries claimed that they avoided the gender discrimination, only 4 that is 13.33 per cent of the industries claimed that they were somehow unable to avoid the gender discrimination. 8 that is 26.67 per cent of the industries did not give any answer for this question.

During the project implementation, 21 that is 70 per cent of the industries felt many problems. Only one industry answered that it had not faced any problems. 8 that is 26.67 per cent of the industries did not give any answer for it. For the publication and documentation, only one industry was involved. Rest of the 29 industries did not issue any documentation or publication for their work related to the help of the flood effected area.

Floods and Its Various Impacts

Social Impacts

Under this sub section, three indicators were taken. First was the respondent family stranded due to flood, second was the no. of days the family was stranded due to flood, third was the loss of any respondent's family member due to flood. On analysing the response of

the respondents on the above-mentioned indicators, following inferences were drawn. It was found that 45 (90 per cent) respondents along with their families were stranded due to flood. They said that their village was totally affected by the flood. The whole village was drowned in water. So they had to leave their dwelling unit and had to take shelter in the safer places. Five (10 per cent) respondents said that their place was not very much affected due to the flood, so they did not leave to the other places.

Impact on Economy

Under this sub section, six indicators were taken. First one was the status of house. This means that whether respondents house/dwelling units were damaged or not. Second was the rate of damage to the dwelling unit. Third indicator that was studied was how much cultivable land of respondent was affected due to the flood. Fourth was regarding the loss of crop. Fifth indicator studied was whether the respondent lose their livestock due to flood or not and the sixth one was about the number of lost livestock. On analysing the response of the respondents based on the above-mentioned indicators, following inferences were drawn: Regarding the status of the dwelling unit whether it was damaged or not, 48 (96 per cent) respondents said that their dwelling units were damaged due to the flood. As per the respondents, maximum no. of houses in the village was kutchha house with thatched roof and as the current of water of the flood was very high, their house were damaged due to the flood water. Only two (4 per cent) respondents' houses were not damaged.

The rate of damage to the dwelling unit was measured in three point scale, that is fully damaged, partly damaged and nil. On analysing, it was found that 48 (96 per cent) respondents said that their houses were fully damaged. They had to reconstruct new houses after they returned to their village. Two (4 per cent) respondents said that their houses were partly damaged, they had to repair their houses when they returned to their village.

Cultivable land which was affected due to the flood was also measured in five point scale that is no. of respondents whose affected cultivable land was less than 1 acre, second was between 1–2.5 acres, third was 2.5–5 acres, fourth was 5–10 acres, and last

was 10–15 acres of land. 34 (68 per cent) respondents were such whose cultivable land less than 1 acres were affected due to the flood. Six (12 per cent) had 1–2.5 acres of land affected due to the flood. Six (12 per cent) respondents had 2.5–5 acres of cultivable land which was affected due to the flood. As the flood came during the month of October and it was the time when farmers had kharif crops in their field, farmers had to bear huge losses. Loss of crop was also measured in three point scale viz. fully, partly and nil. 40 (80 per cent) respondents said that the whole crop in the field was destroyed due to the flood. The kharif crop in the field was totally wiped off. Due to the destruction of the crop, these respondents are still facing shortage of food for their family members.

Impact on Livelihoods

On analysing the number of households who have lost their livestock in flood, 21 (48 per cent) respondents' households said that their livestock were still not found and were either dead or missing.

Impact on Health and Education

Under this sub section, effects on health have been measured by three indicators viz. whether respondent's family suffered from any water-borne disease, which type of disease and the third indicator was whether respondent's family lost any family member due to the water-borne disease.

Effects on education have been measured by two indicators, viz. status of school building whether affected due to the flood or not and the second is the no. of days the students were cut off from their schooling. On analysing the response of respondents on above-mentioned indicators, following inferences were drawn.

On analysing that whether respondents family suffered from any water-borne disease, it was found that 9 (18 per cent) respondents said that their family didn't suffered from any such specific water-borne disease. 41 (82 per cent) respondents said that their family suffered from water-borne disease. If we look at the above figure, it is quiet surprising because maximum no. of respondent's families didn't suffer from any water-borne disease. But it's good to have

this figure because usually after such natural calamities there is great chances of epidemics, but it didn't happened here, otherwise the post-flood situation would have been worst.

On analysing from which disease most of them suffered, it was found that 32 respondents' families suffered from general cough/cold problem. 13 respondents families suffered from diarrhea. 10 respondents families suffered from Malaria. Other disease respondent's families suffered from were skin rashes, measles, jaundice, dysentery, fever, chicken pox and kala azar.

Regarding the loss of life of any family member due to the water-borne disease, it was found that two (4 per cent) respondents said that they have lost their family members due to such diseases. According to these respondents, they could not get proper treatment for the effected family member. Another reason stated by the respondents were, that all the communication channels were so badly affected during the flood that they were unable to take patient to other places for better treatment and due to this they could not save the lives of their family members.

On analysing the effects of flood on education, 47 (94 per cent) respondents reported that during the flood the nearby schools were badly affected by the flood. As per the respondents, some of the schools were half drowned and some of the schools were fully drowned.

No. of days children were stranded from schooling was measured in three point scale viz. 15 days, 15–30 days and more than 30 days. On analysing, maximum 36 (72 per cent) respondents reported that their children were cut off from their schooling for more than 30 days. As per these respondents one reason for this was, that nearby schools in the villages that were not badly affected by the flood were treated as a relief camp for the flood victims.

Impacts on Women and Children

This sub section mainly focuses on pregnant women. Two indicators were studied under this sub section viz. existence of pregnant lady in the respondent's households during the time of flood and difficulty experienced by the pregnant lady during flood. On analysing the response of respondents on above-

mentioned indicators, following inferences were drawn.

Out of 200 sampled respondents, only 9 (4.5 per cent) respondents were reported to have pregnant women in their house during the flood. These pregnant women did not face any such difficulties, because they were taken to safer places. During the interview with the respondents, evaluation team met the women who were pregnant at the time of the flood and asked them about the difficulties that were prevalent during the time of flood. They said they did not face any such problem as they had already shifted to safer places. One or two pregnant lady reported that they had their delivery in the relief camp itself.

Conclusion

It is found that the community education among the people is needed. Emergency service planning by NGOs, governments and international agencies are hardly being practiced in coordinated manner. Provision of infrastructural facilities like safe drinking water facilities, free distribution of medicines, water purifier, good roads to carry relief material to the stranded people during flood is absent and are not given priority by company. Establishment of sufficient primary health centres in all villages is hardly found. Above all, a concrete flood management policy needs to be formulated and allocation of adequate fund to combat the flood vulnerability (health hazards) needs to be maintained. It is generally believed that when income increases, economic condition and purchasing power of an individual are increased, which in turn leads to the improvement of other ancillary conditions like health, education and overall lifestyle as well.

Suggestions

- The focus should be on helping the poor in disaster-prone areas to create secure mechanisms and institutions as part of a comprehensive approach to disaster preparedness and quick recovery.
- Disasters must be analysed for the long-term effect it might have on the community, and that mitigation is not a separate stage after relief. Psychological counseling for the victims of the flood is must, as

the study reveals that most of the men folks were out of the state (migrated) for work. The women folks had to go through terrible trauma.

- Scientific land use planning of the upper reaches of the rivers, with emphasis on discouragement for use of forest land for any other purpose.
- Identification of erosion-prone areas along the rivers to delineate river reaches for flood mitigation measures.
- Protection of natural drainage system all over the river basins while planning for development of infrastructures and proper watershed management for use of water resources.
- Revival of ponds in the study areas is needed.
- Study of the drainage pattern and duration of flood inundation along with the frequently flooded river Koshi. Data base of forthcoming floods has to be made through sequential satellite imagery for flood management.
- Communities should know how to reduce risks. They learn from their losses but cannot always use this knowledge effectively. The need is to facilitate such learnings; try to make these insights available from one community to another; from one humanitarian effort to the next.
- The people must be treated as 'partners' in disaster mitigation and social security and the emphasis should be on solutions that change relationships and structures in society and, hence, pave the way for social transformation.
- A comprehensive disaster risk-management strategy is needed to help our fellow citizens to be prepared for all kinds of bad and worst situations.
- Therefore there is a need to adopt a bottom-up, participatory approach, documenting traditional knowledge and then creating strategies that are based on the community's experience that take into account the cultural, social and economic sensitivities of the people and the area. It is an ongoing process that enriches and equips the programme and the community for the future.
- It has been noticed that more money is spent on disasters than on development. This has to be taken seriously.
- Most importantly, what is overlooked is that the affected poor populations have their own coping

mechanisms and the widest range and depth of experience in mitigating disaster risks. Social security and disaster mitigation systems are most effective if they are owned and controlled by the community, local people can take small steps to make a big difference in reducing their vulnerabilities.

- Since disaster is a state subject, state government must work closely with the state and central governments as it does with other national and international stakeholders, corporate and donors.

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Risk Perception of Tourists towards Destinations Prone to Natural Disasters: A Case Study in Parts of the Uttarkashi-Gangotri Region

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ABSTRACT: This paper explores the influence of perception of risk on tourist decision about visiting the ecosensitive destination like Uttarkashi. The fundamental aspect of this paper is to focus on the change in risk perception of tourists, destination image and tourist decision-making process. Risk has been found as a major concern for tourists. The risk associated with the natural and man-made disasters not only affects the tourism industry and tourism security, but also threatens the economic foundation of countries (Ruan, Li, & Liu, 2017). The perception that to travel to a destination can be risky has become very common amongst tourists in the last decade as a result of occurrence of various disasters across the world. Risk perception generally conceptualised as perceptions of uncertainties that a person who is vulnerable to misfortunes and/or to dangers of any nature may be exposed to when travelling to, or at, the destination (Chew & Jahari, 2014; Reichel, Fuchs, & Uriety, 2007). It can also affect the tourist decision-making process.

In the past few years, media has also played a major role in covering the loss of life, destruction, damage to property and socio-economic disruption due to natural disasters. This can also damage the overall reputation of the destination like attractiveness, safety and security by affecting the tourist perception of destination. Tourists have mental image of destination that may be the reason to decide whether to visit or avoid the destination.

KEYWORDS: tourism, risk perception, Uttarakhand, livelihood, EWS

Introduction

Risk has been found as a major concern for tourists. The risk associated with the natural and man-made disasters not only affects the tourism industry and tourism security, but also threatens the economic foundation of countries (Ruan, Li, & Liu, 2017). The perception that to travel to a destination can be risky has become very common amongst tourists in the last decade as a result of occurrence of various disasters across the world. Travel risk should be studied in terms of real and perceived risk and in relation to destination

image and tourists attitudes, because it is crucial for destination marketers to understand perceptions and attitudes in order to devise promotional strategies, to address concerns and to alter negative and reinforce positive perception (Sonmez, Tourism, Terrorism, and Political Instability, 1998)

Risk perception generally conceptualised as perceptions of uncertainties that a person who is vulnerable to misfortunes and/or to dangers of any nature may be exposed to when travelling to, or at, the destination (Chew & Jahari, 2014; Reichel, Fuchs, & Uriety, 2007). It can also affect the tourist decision-making process.

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Tourism industry is highly vulnerable to natural disasters (landslides, floods and earthquake) and human-induced disasters (like crime, insurgency and terrorism). When natural disasters occur in a tourist destination, it can put a brake on the flow of tourist visiting the area. Considering the global context, disasters in an area affect the tourism industry globally. As catastrophic events are unpredictable, and associated risk factors are difficult to control, such 'events can cause interruption to the continuity of business operations for the international travel industry, through reduction in tourist arrivals and expenditure' (Sonmez and Graefe 1999).

In the past few years, media has also played a major role in covering the loss of life, destruction, damage to property and socio-economic disruption due to natural disasters. This can also damage the overall reputation of the destination like attractiveness, safety and security by affecting the tourist perception of destination.

The fundamental aspect of this research is to focus on the change in risk perception of tourists, destination image and tourist decision-making process. Risk perception has been studied in various disciplines but it has drawn attention in tourism and disaster studies recently. Past researches basically focused on the concern of the tourists towards the safety and security in a destination. Also the connection between risk perceived by tourist because of past travel experience towards the destination prone to natural disasters on future travel decision-making process has not been studied widely.

The purpose of this study is to address the gap by examining how risk perception of tourist is related to tourists visiting an area affected by disasters and its impact on destination image. Also there is an opportunity to deeply understand the literature on tourism that helps in incorporating significant observation from research on how risk perception of tourists may influence the decision-making process. This research aims to contribute how to better prepare for disaster in tourists destination. Limitation of previous studies: Very few research work done on risk of disasters and destinations image. Very few studies have been done to find out the impact of the risk perception of some of the specific risk factors like disasters that can influence tourist future travel decision. As disasters were found as one of the risk factors for the tourism

industry and also disasters have their potential impact on risk perceived by tourists, even though disasters were not much included in the many studies.

Literature Review

Risk and Risk Perception Concepts

Risk

The concept of risk is very comprehensive, even though it is deeply rooted in the history. Many experts and people used the term risk but each time it has different meaning. Renn (1998) argues that there is no commonly accepted definition of risk by the society and scientific community. In various research studies and available literature, there are many definitions of risk that exist.

Risk is considered a hazard, potential adversity or threat (Slovic & Weber, 2002). Risk involves multiple conceptions. Most commonly, risk is used as a hazard, probability, consequences and as potential adversity or threat. Slovic (2002) denotes 'human beings have invented the concept of risk to help them understand and cope with the dangers and uncertainties of life'. Risk is associated both with the occurrence of event and its consequences. Slovic and Weber (2002) argued that there is no real risk or objective risk but people invent risk in order to understand and cope with dangers and uncertainty in the future. Everyone engage in dangerous events at some point of their life, and this fact has prompted substantial effort among the academics to understand how people understand perceived risk (Sjoberg, Moen, & Rundmo, 2004). Apart from the definitions of risks there are two types of risk that have been discussed by various scholars. One is objective risk and other one is subjective risk. According to Renn (1992), objective risk is the probability of a well-defined adverse event. On the other hand Hansson (2010) defines that subjective risk is characterised by personal judgment without connection to physical world's facts. Whereas Slovic and Weber (2002) argues that terms like objective and real risk are illusionary and developed by human beings in order to understand and deal with uncertainties of life and further discuss that risk does not exist out there, independent of our minds and culture waiting to be measured.

The term risk has been defined in many ways. In the context of tourism, risks come from the lack of knowledge about touristic destinations and the future conditions from natural to societal hazards (Chang, 2009). Especially for the tourists travelling for the first time to any destination, risk acts as a distinctive factor in the travel experience. Also risk is an explicit component that tourists use in their decision-making process (Moreira, 2008).

Risk Perception

Risk perception is the subjective assessment of the probability of a specified type of accident happening and how concerned we are with the consequences (Sjoberg, Moen, & Rundmo, 2004). The term perception is widely used within risk-related studies for knowing how people and individual understand and interpret the concept of risk. Perception as used in cognitive psychology applies to the mental processes through which a person takes in, deals with, assesses information from the environment (physical and communicative) via senses (Jungermann & Slovic 1993, as cited in Renn, 2004).

Risk perception is a social as well as a cultural construct that reflects values, symbols, history and different ideology that means that risk perception goes beyond the individual. Perception of risk also includes evaluation and consequences of a negative outcome.

Lidsay and Norman (1977) define perception as the process by which organism interprets and organise sensation to produce a meaningful experience of the world.

Risk perception in the tourism context refers to the perceptual uncertainties that expose an individual to misfortunes and dangers of any nature at any stage of any journey (Chew & Jahari, 2014; Reichel, Fuchs, & Uriety, 2007). Reactions of tourists during and after the crisis are the consequences of their risk perception (Sonmez & Graefe, 1998). Also the reaction of people and risk perceived by them have become an important concept in policy making.

Theoretical Perspective

There are mainly two different theories that prevail in the field of risk perception. One is 'cultural theory' that

was developed by the sociologists and anthropologists and other one is 'psychometric paradigm' that derives from psychology.

Cultural Theory of Risk Perception

The cultural theory of risk perception was evolved from the work of Mary Douglas. Cultural theory explains how people perceive risk and determine the world around them. Cultural theory is a general sociological theory (Sjoberg, Moen, & Rundmo, 2004).

In the book 'Purity and Danger (1966)' by Mary Douglas, the author tried to establish the relationship between risk and culture by providing linkages between different culture and their perceptions of pollution. She also explains that different culture consider some specific activities as taboo not because that these specific activities bring harm but to maintain and reinforce the political, religious or social order of that culture to bind all members together. Cultural theory is based on the grid-group typology by Douglas. Douglas and Wildavsky developed the Grid-group model to explain the affect of culture on people and their response to risk. The grid refers to the individual characteristics whereas group refers to the bond between people. Rayner (1992) denotes that grid is defined as a measure of the constraining classifications that bear upon members of any social grouping and group as the degree of social interaction and the extent to which people rely on social networks.

One of the limitations of the cultural theory is that it explains very little about the variance in how risk is perceived by people. Most of the critique based on the less explanatory power of the cultural theory. Also the theory is very much ingrained in sociological theory. The cultural theory is effective for the understanding of how the risk varies in different culture and society.

The Psychometric Paradigm

Psychometric paradigm is an approach developed by psychologists which produces quantitative representations of risk attitudes and perceptions by using multivariate analysis and psychophysical scaling (Slovic & Weber, 2002). Various studies on risk perception have been grounded in the cognitive

psychology. Psychometric paradigm gained much attention for the first time when Fischhoff, Slovic, Sarah, Stephen, & Combs (1978) published a paper where they showed that perceived level of risk and risk tolerance could be explained by two variance of risk that is dread and novelty.

The theory of psychometric paradigm has gained popularity in risk perception studies. But it also leaves some of the important questions unanswered. The psychometric paradigm has some criticism. One of the criticisms was concluded that the psychometric approach describes data with lack of sufficient explanation. Another criticism is the use of numeric measures of uncertainty. Also psychometric paradigm neglects the very important distinction and variables. People make quite different judgment of personal and general risk (Drottz- Sjoberg, 1993). There is no difference seen between general and personal risk in the psychometric paradigm. Also Psychometric paradigm does not explain the mechanism of cognition that is necessary for risk perception. It is also limited to its application for the prediction of individual risk perception.

Hence the psychometric approach is an individual-based approach to risk perception research. By using this approach one can measure the quantitative judgments of individuals about risks and also the qualitative aspect of what is subjectively interpreted by the concept of risk to one or more than one hazard.

Tourism Industry and Natural Disasters

Tourism Industry

Global Scenario

Tourism is defined as when people move to a destination which is not where they live (Wall & Mathieson, 2006). Tourism industry is characterised by tourist flow, high substitutability, labour intensiveness and seasonality (Wu, 2015). Tourism has been becoming the major growth factor for both the developing and developed countries. It is considered as one of the important aspects of international trade. Tourist is the core of entire tourism system (Wu, 2015). The World Tourism Organization demonstrated that international tourists around the

world became twice from 1995 to 2013. As one of the world's largest economic sectors, travel and tourism creates jobs, drives exports and generates prosperity across the world (Global economic impact and issues 2018, 2018). It earns gross revenue and foreign exchange earnings, playing an important role in economic development (Jaiswal & Bisht, 2017). According to World economic forum, the tourism industry accounts for 9.8 per cent of global GDP, supports 277 million jobs around the world and represents 6 per cent of global exports. Moreover the industry has potential for further growth, with the current 1.1 billion international tourist arrivals set to reach 1.8 billion by 2030 (Kristin, 2018).

Impact of Natural Disasters on Tourism

The experience of tourism is vulnerable to the effects of natural and manmade risk events like natural disasters, cultural and language difficulties, terrorist attack, conflicts and so on. According to UNTWO (2013), extreme weather may result in major disasters to a 1.8 billion population of international tourists in 2030 because of events resulting from global warming and climate change. In comparison to most of the other industries, tourism is highly reliant on the natural environment and weather (Bode, Hapke, & Zisler, 2003).

'When a disaster occurs it has a negative impact on the tourism industry and various destinations as a whole affecting various sector of tourism' (Huang, Tseng, & Petrick, 2008). Tourism destinations are easily impacted by a variety of natural disasters which cause serious damage to the visited regions (Murphy & Bayley, 1989). Walters, Judith, & Brent (2015) additionally describe a natural disaster which has had negative impacts upon a destination. The sudden damages resulting from natural disasters, such as tsunamis, typhoons and earthquakes often disrupt tourism businesses in destination communities (Stylidis, Szivas, Biran, & Sit, 2014).

The tourism industry, especially nowadays, is more susceptible and fragile to any incidents related to safety and security (Valencia & Crouch, 2008). Overall, a high risk that natural disaster will occur may deter tourists' travel intentions (Ruan, Li, & Liu, 2017).

Effect of Previous Disasters on Tourist Numbers

For instance, because of terrorist attack on September 11, the number of tourists visiting North America declined by 6.8 per cent compared to previous year. The result of Tiananmen Square protests of 1989 was that about 11,500 tourists canceled visits to Beijing (Lepp & Gibson, 2003). SARS crisis in Hong Kong in 2003, Tsunami in 2005 in the Indian Ocean and suicide attacks to hotel enterprises in Middle East lead to a decrease in the number of tourists visiting countries (Kozak, Crotts, & Law, 2007).

The occurrence of natural disasters leads to a decrease in tourist's arrivals. For example, the 1999 earthquake in Taiwan caused a 15 per cent drop in international tourist arrivals to Taiwan (Huang, J. and Min, J. 2002). While the 2005 Indian Ocean tsunami caused a significant decline in tourist arrivals to the Maldives (-69.7 per cent) (WTO 2005). Tourism sector in Maldives has the largest direct damages and also largest indirect losses which has seen a sharp drop in tourist arrivals (Tsunami: Impact and Recovery, 2005). It was found that more than half of the deaths caused by the 2004 Indian Ocean tsunami were those of foreign tourists (Rittichainuwat, B. N. 2006). These statistics show that how the occurrence of disasters in the tourist destination can bring both short- and long-term changes on tourist numbers.

Risk Perception and Destination Image

Image attributes tend to correspond to the activities attractions, and resources that make a tourism destination attractive (Beerli & Martin, 2004), while risk attributes tend to correspond to the dangers and problems that jeopardise the safety and comfort of travelers at the destination (Reichel, Fuchs, & Uriety, 2007). Selection of a destination is highly influenced by the tourist's perception about them (Lapage & Cormier, 1977).

The concept of destination image refers to the perceptions an individual holds of a tourism destination (Blanch, 2017). Destination image encompasses only cognitive image components (Rajesh, 2013). Cognitive image refers to the beliefs, impressions, ideas, perceptions and knowledge that people hold

on objects (Crompton, 1979). Destination images can be identified as mental images accumulation about travel experiences; few impressions chosen from travel promotion advertisement, books, movies or general media which refers to the unique features of the destination and holistic evaluation of the components of a destination that tourists consider (Ruan, Li, & Liu, 2017). Destination images reflect to tourist's objective perceptions, motives, feeling, experiences and attitudes for destination evaluation (Martin & Bosque, 2008). Simply destination image can be seen as the sum of tourist's objective views, thoughts and impressions that a person has of a destination (Muhoho-Minni & Lubbe, 2017). When making the travel decision, the stronger is the positive image of positive feeling about the destination, the greater is the intent to recommend the destination to friends (Chew & Jahari, 2014). Likelihood to travel destination by tourists can also be assessed by knowing the probability of visiting place in the future. Similarly when tourists perceive that they have benefitted from past travel experiences or feelings, they are likely to become highly interested in future travel planning or destinations (Ruan, Li, & Liu, 2017). Risk perceptions are considered 'specific to the situation' or 'specific to the destination' (Schroeder, Pennington, Kaplanidou, & Zhan, 2013)

Role of Media

Media has a major influence in shaping the destination picture (Neumayer, 2011). Cavlek (2002) says that public pays more attention to negative news and media uses this very fact to full capacity. Extensive media coverage does not only cause a drop in tourist arrivals, it also creates a harmful picture in the tourist's mind that lasts over a long time, as they are confronted with the incident again and again (Mansfeld & Pizam, 2006, Cited by Neumayer, 2011).

Role of Safety and Security

Pizam and Mansfeld (1996) later on concluded that tourism and travel industry are highly influenced by the safety in the travel destination and how travelers perceive safety. High perceived risk and safety concerns have appeared to become a central

issue of visitors' decision-making evaluation (Kozak, Crotts, & Law, 2007). Also safety and security are very important aspects that need to be given attention as these two aspects play an important role in tourist's destination choice and decision-making process. Most of the tourists are unfamiliar with destination they visit. Because of the unfamiliarity to the destination in case of any disasters it would be difficult for tourists to protect themselves as they might not know which places are safe and where they can go to protect themselves.

Perceived Risk and Decision-Making

Tourist's decision-making process is made by evaluating and choosing from a set of alternative destinations (Sirakaya, 2005). The scholars started using term risk in tourism after the September 11, 2001, attack. When tourists perceive uncertainties and possibility of various misfortunes, it might influence their willingness to visit the destination (Perpina, Camprubi, & Prats, 2017). Visitors who perceived certain destinations as being at risk likely to avoid them in their future travel plan (Kozak, Crotts, & Law, 2007).

Travel judgment can be influenced by the past experiences. Mansfeld and Pizam (2006) point out that once the tourist has decided to travel to a destination, which afterwards affected by a crisis, they might cancel their holiday or choose among any alternative destination that offers the same features. The concept of perceived risk can be defined as a risk in terms of consumers' perceptions both of the uncertainty and the magnitude of the possible negative consequences (Yuksel & Yuksel, 2007).

Mansfeld and Pizam (2006) also argue that risk reduction strategies such as dissemination of positive communication can influence the risk perception of not only potential tourists who are engaged in a destination-choice process, but also to those who have booked but not already taken their trips, are in the process of visiting the destination and are returning from a recent trip. Also there were very few studies that contributed to the identification and understanding of the impact of perceived risk factor on tourism decision-making process.

Methodology

On the basis of the context in introduction chapter and the literature gap that has been identified in literature review chapter, this paper explains the methodology that is used to address the objectives of the research.

The objectives of the research are:

- To assess the changes in risk perception of tourist based on their knowledge of previous disasters.
- To identify the travel risk perceived by tourists.
- To identify the effects of natural disaster on the perception of tourists safety.
- To analyse the implication of government policies on disaster preparedness and post-disaster recovery on tourism.

This paper also explains the research paradigm used in this particular research and contributes to explain why quantitative method approach has been adopted along with explanation of how data collection has been done and how it was analysed.

Hypothesis

H1: Risk perception of tourists towards disaster has a significant effect on tourists decision-making.

H2: Media has a significant impact of risk perception of tourists towards disaster.

Research Question

1. Do tourists think about the natural disasters risk when they choose their destination to visit?
2. Can destination do anything to stop tourists to put off from visiting the destination that is sensitive to natural disasters?

Approach: This study employed quantitative research method using questionnaire to meet the research objective. Questionnaire was devised to address the research objectives. The questionnaire was devised according to the literature accumulated on risk perception, destination image and impact of disaster on tourism decision-making.

Study Area: Uttarkashi was chosen as the case study since a series of events of natural disasters from

1990 to 2017 affected the tourists and tourism industry. Apart from the pilgrimage and tourist destination, the area from Gangotri to Uttarkashi comes under ecosensitive zone and it's also prone to various natural disasters. Uttarkashi also falls partially in Zone V and partially zone IV of the seismic risk map of India.

It is one of the districts in Uttarakhand that is vulnerable to natural disasters like landslides, cloudburst, earthquake and floods.

Evolutionary history of the concentrated seasonal precipitation and cloudburst makes the districts of Uttarkashi prone to a number of natural hazards (Gupta & Uniyal, 2012). Despite of the prevalence of these disasters in Uttarkashi, it is one of the district of Uttarakhand that attracts foreign as well as domestic tourists for its natural beauty, adventure, pilgrimage, yoga, winter sports and so on. Most of the natural disasters like landslide and cloudburst in Uttarkashi occurred during the peak tourist and pilgrimage season. In Uttarkashi, peak tourist and pilgrimage season coincide with monsoon season that has led to the short- and long-term changes on tourist arrivals. So for better understanding of risk perceived by tourist towards destination affected by disaster and its influence on decision-making process to visit the destination or not Uttarkashi district has been chosen. Bisht (2017) says that people from other states are now scared and especially after the 2013 Kedarnath flash flood, the sector has plunged to a significant level.

Sampling and Data Collection

Simple random sampling method was adopted to collect the data sample as the population of tourists visiting the destination for pilgrimage, adventure and eco-tourism was enormous and therefore, the sampling frame was not available. To validate the questionnaire and further enhancement of questions, a pilot test was conducted with seven participants. The participants were chosen from a population of both international and domestic tourists that some of whom have already experienced tourism in Uttarkashi. E-mail id from participants was collected from both international

and domestic tourists leaving Uttarkashi so as to get accurate related facts of their experience.

Samples were collected from both the domestic and international tourists. The composition of the domestic tourists and international tourists sample in this study is a factual reflection of the tourist profile in Uttarkashi since 2010 (Uttarkashi Tourism Board). Majority of the participants were domestic tourists.

For the collection of the data structured, self-administered questionnaire was used to obtain the necessary data. The questionnaire was designed in English language. In order to explore the risk perception of tourist towards disasters affected destination, a questionnaire to evaluate the tourists knowledge towards destination, risk, natural disasters was carried out. A questionnaire was aimed to assess the risk perception of tourists towards destination affected by natural disasters. The questionnaire comprised demographic details, Likert scale-based questions, dichotomous questions, close ended questions, open ended questions on risk perception, destination image, aim and interest in selecting destination and so on. Revisiting intention of the participants was measured by asking respondents multiple choice questions as yes/no.

Data collection was carried out for a period of three weeks during the month of April and May 2018. The questionnaire survey was conducted at two locations of Uttarkashi district. One location is near Gangotri Temple and other one is in Uttarkashi market area. At first, printed copy of questionnaire was used to collect the data. Later on considering the difficulty of tourists to fill in a questionnaire during the travel and rest time, it was decided to reach the sample through e-mail containing a link to an online questionnaire. Email id was collected from 75 participants and then online link. Out of which seven e-mails were undelivered and identified as non-existing. Total of 102 questionnaires were collected out of which 20 were discarded as some questionnaire filled by respondent was incomplete. Total 82 questionnaires were filled by the tourist. The final number of questionnaires filled by tourists through e-mail was 68 and rest of the 14 questionnaires were filled through printed copy.

Challenges

One of the major challenges during field work is to get the hardcopy of questionnaire filled by the tourists as it was taking approx. 20 minutes to fill. Tourists were travelling continuously from one tourist's destination to other due to which they did not have the time to fill the questionnaire. To overcome the above-mentioned problem I have generated the Google form and QR code so that tourists can easily fill the form when they go back to their home or workplace from their destination.

Conclusion

The results indicate that fear of natural disasters is present in tourist's mind and it has the power to change the decision-making process of the tourists. The media has an influence on the tourists risk perception and decision-making. Also the perception of risk towards tourists depends on the nationality and social demographic profile of the tourists. Tourists were not satisfied with the development of the roads, waste disposal, signage and lighting for the convenience.

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Gender and Disaster

Role of Social Capital in Building Disaster Resilience: Special Focus on Gender

Akanchha Singh^a

ABSTRACT: Social capital is a rather old concept but it has entered academic and policy debates only in the last two decades. The notion of social capital is pivoted around societal relationships. It gets manifested and reinforced via social networks, civic engagement, norms of reciprocity and bonds of trust. Experience of disaster in various countries suggests that civic networks established immediately after disasters in pursuit of collective goals relevant to actual or potential disasters are extremely beneficial. In this background it is important to understand the role of social capital in building disaster resilience. Studies have highlighted the particular utility of social capital for women in post-disaster scenario which includes psychological rehabilitation, empowerment and overcoming the stigma of public assistance. The significance of social capital in resilience building can hardly be overemphasised. However, studies focussing on the same are very few in number. There is an urgent need to mainstream the concept of 'social capital' in disaster management and development planning discourse.

KEYWORDS: community, social capital, emergent networks, resilience

What Is Social Capital?

Humnath Bhandari and Kumi Yasunobu have theorised 'Social capital', as a rather old concept but it entered into academic and policy debates only in the last two decades. Social capital is used as an important factor in explaining economic and social phenomena.

The history of literature on 'social capital' can be traced way back to classical economists like Adam Smith, John Stuart Mill and also sociologists like Max Weber who provided the social and cultural explanation to economic phenomena. Karl Marx, Emile Durkheim and Georg Simmel have implicitly used the concept of social capital.

However, the first systematic use of the term 'social capital', into the academic debates, can be attributed to the works of Pierre Bourdieu and James S. Coleman. Nonetheless, the seminal work of Robert D. Putnam popularised the term 'social capital' among researchers and policy makers.

The notion of social capital is pivoted around societal relationships. It gets manifested and reinforced via social networks, civic engagement, norms of reciprocity and bonds of trust. Thus, social capital is defined as a collective asset with underlying shared norms, values, beliefs, trust, networks, social relations and institutions that facilitate cooperation and collective action which facilitate symbiotic relationship among members of a group. But, the theoretical underpinning of social capital is not that simple. It is a complex and multidimensional concept which is difficult to measure. Social capital may be of various types like

- bonding (structure and cognitive)
- bridging
- linking
- strong and weak
- horizontal and vertical

However, the types and manifestation of social capital remains still elusive.

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Large numbers of empirical studies have claimed the positive correlation between social capital and development. Nevertheless, the social capital concept is plagued by theoretical vagueness and conceptual weakness (Ponthieux, 2004) and its practical value has been challenged on various grounds. In this background it is important to understand the role of social capital in building disaster resilience

Putnam defines social capital as the 'features of social organisation such as networks, norms and social trust that facilitate coordination and cooperation for mutual benefit' (1995, 67). The definition implies that social capital has two components (Hooghe and Stolle 2003): first, the structural component such as civic networks that help solve collective problems, second, the attitudinal components such as norms and values (trust, for instance) which facilitate inter-personal collaboration within these networks.

According to Gittel and Vidal (1998) there are two main dimensions of social capital: 'bonding' and 'bridging'. These two categories can be held analogous to what Granovetter (1973) referred to ties among individuals, respectively. The 'bonding' dimension of social capital is a resource which allows individuals to rely on people who are alike, such as family members. The 'bridging' dimension of social capital on the other hand is a resource that allows individuals to rely on people who are less similar, such as colleagues at work. The processes of bridging and bonding together create networks in society.

Disaster, Gender and Social Capital the Interplay

Empirical works have shown that more women die in disasters than men. Not only this, women and women-headed households have a very limited access to formal relief in the post-disaster phase. Studies have documented how the structures of civic assistance perpetuate gender discrimination and further marginalise the women survivors. These structures position women in conflict with the state and its various agencies. This makes their rehabilitation difficult and cumbersome.

N. Emel Ganapati, through her work on Turkey suggests that social capital proves beneficial for women

during disaster recovery because these networks are 'therapeutic' in nature, it empowers the survivors, makes them conscious of their self-worth at the same time it obscures the stigma of public assistance.

An important criticism of social capital theory is related to gender issues. Molyneux suggests that gender is 'present and absent in troubling ways' in the social capital literature (2002, 177). Gender is present in 'troubling ways' because this literature is laden with gender-based assumptions which reinforce traditional gender roles and prejudices. Such assumptions are most evident in discussions about how social capital forms and how it is maintained or destroyed over time. For instance, how women play a significant role in shaping attitudes of children as they are home-bound and have more time to spare. In *Bowling Alone*, Putnam (2000) says that women's increasing participation in the labour market leads to progressively lesser involvement in the family; this weakens the socialisation and social capital formation in children. These studies easily ignore the social capital formation that results from their paid or unpaid work or from their participation in broader political movements (Molyneux 2002).

Gender, at the same time, is also absent in 'troubling ways' in the social capital literature, for two broad reasons. Firstly, women's networks remain largely invisible in the mainstream social capital literature. This is due to the fact that women's networks are different from men's networks (Godquin and Quisumbing 2008; Lowndes 2000; Molyneux 2002), in that they are more likely to rely on smaller-scale informal networks (e.g. network based on kinship, friendship or neighbourhood) compared to men. Such micro level, informal networks are often ignored by the main-stream social capital literature, which focuses broadly on 'formal' networks (family, office, caste or religion based)

Second, the mainstream social capital literature pays little attention to intra-household relationships of power, assuming harmony within the household (Bebbington 2007; Mayoux 2001). However, studies documenting in-house power relations give us a contrasting picture.

Gender is also conspicuously absent in the emerging literature on social capital and disasters. Of late, many scholars have proposed a gendered

approach to disasters (Enarson 1999; Fothergill 2003; Morrow and Enarson 1996; Peek and Fothergill 2008). Nonetheless, the link between gender, disaster and social capital remains little explored in scholarship. The examination of this link would focus on the formal and informal civic networks as components of social capital.

Experience of disaster in Turkey suggests that civic networks are established immediately after disasters 'in pursuit of collective goals relevant to actual or potential disasters' and are called 'emergent' networks (Stallings and Quarantelli 1985, 94). In the case of Turkey, these 'emergent networks' goal was to help the most vulnerable and disadvantaged earthquake victims: women, children, differently abled, elderly and the destitute. An important problem with these networks is that they become dormant and further completely inactive in the post-disaster scenario for the lack of leadership or narrowly defined goals.

Methodology of Studying Social Capital

Studies on role of social capital in disaster response have used extensive qualitative research method. Primary tool for data collection has been semi-structured interviews with disaster survivors, policy makers, historians and resource persons. The respondents were identified from newspaper and through snowball technique. These interviews were concluded upon reaching 'theoretical saturation' (Glaser and Strauss 1967), that is, when additional interviews did not add anything new to the knowledge gained from previous interviews. In addition to the in-depth interviews, participatory observation and a focus group discussion were also carried out.

Ganapati highlights the utility of social capital for women in post-disaster scenario which includes psychological rehabilitation, empowerment and overcoming the stigma of public assistance.

Studies conducted in the aftermath of disasters indicate that women survivors were more likely than men to experience psychological problems, including

depression (four to five times more likely) and post-traumatic stress disorder (2.4 to four times more likely) (Bagoglu et al. 2004). They also exhibited higher degrees of need for psychological and emotional support than men (Kasapoglu, Ecevit, and Ecevit 2004). However, such an understanding has to be taken with a pinch of salt. Usually, men have a tendency to under report psychological weaknesses. Societies which are highly patriarchal report that women are at a higher risk of post-disaster.

Empirical studies suggest that formal and informal emergent networks are highly therapeutic for these survivors. It helps them overcome their disaster-related psychological trauma. In Turkey, various workshops sprang up post-disaster. In these workshops a range of goods were being processed and manufactured by women (like soaps, candles, incense sticks, wooden craft, textile, etc.). It helped the women earn a livelihood, utilise their time better, gain back their self-worth and gradually erased the memory of trauma. Authors document it as a 'liberating' experience for women survivors. To that extent, these workshops were colloquially referred to as 'rehabilitation centres'.

In patriarchal societies, women though politically emancipated in public sphere are hardly 'liberated' in the private sphere. Patriarchal societies are characterised by clear stereotypes and attitudes towards role of women. Thus there are large gender gaps within society. Therefore, while rehabilitation attempt is under way, one size fits all rule should not be followed. World Bank economists note that Turkish women lack a 'voice' and 'power' at the household, community and national levels, which disempowers them.

In this background, the emergent networks have been found to empower disaster survivors in four ways. Firstly, they helped women better express themselves in their households and in their larger social contexts. Those women who did not use to contribute economically pre-disaster have started to do so now. This has made them more confident and outspoken. Secondly, the emergent networks helped women gain 'civic consciousness,' thereby allowing and empowering them to fight for their rights. While, many

women were dependent on their parents or husbands before the earthquake, they gained independence after being involved in these emergent networks. Thirdly, these emergent networks give women a chance to celebrate their identities as women. For instance an all-women's cooperative in Turkey was named as FISKOS, meaning 'murmuring' or 'gossiping'. In a patriarchal society, women are not allowed to raise their voice while speaking; this is how they communicate by murmuring. Ironically, these workshops are the places where women redeem their lost voices. Fourthly, these networks enable women to express their dissatisfaction with the gender biases society in subtle ways. Being a part of a formal organisation they experience 'equality' in truest sense of the term. The profit, however, meagre or large it may be get equally divided among members of the collective. The cooperative bestows on the women equal rights thus also giving a call for equality in the larger society. By merely being a part of this organisation, women, in their very small ways, are trying to shatter the deep-rooted hierarchy in the broader society.

Overcoming the Stigma of Public Assistance and Surviving with Dignity

Disaster survivors often need assistance from the government to stand on their own, once again. However, sociological enquiry reveals that there is stigma attached to assistance seeking. We must understand that, most of the disaster survivors were previously well off. They had houses, property and a flourishing business. Suddenly, overnight they have lost almost everything. They feel reduced to the state of beggars and are embarrassed while asking for help. The problem is worse in case of women who cannot venture out on their own (in a patriarchal society to seek public assistance).

Fothergill's (2003) article on the 1997 Grand Forks, North Dakota, flood suggested that most survivors who received aid by state experienced the 'stigma of charity'. Most of these survivors were receiving charity

for the first time in their lives and they found the entire experience quite humiliating. This was a huge setback to their own self-image as so far they were self-sufficient and independent women.

In Turkey too, survivors were left at the mercy of the state. The hardships that they faced post-disaster made them wonder, if at all they were lucky to have survived the disaster. After all, it was easier to die along with the thousand others, rather than brave all the hardships and start afresh. Having lost their houses, jobs, businesses they were clueless how to start again. Women in such a situation faced double disadvantage. Most women who were confined within the four walls of the house were now forced to seek employment outside, having lost the sole breadwinner in the family. Add to this their limited skill set and the truncated job opportunity available to them in a patriarchal society. There are structural constraints on women. A man can do various kinds of jobs: waiter, bus conductor, driver, sanitation worker and so on. However, women are not supposed to be in these kinds of jobs where she is consistently subjected to public glare. She faces the threat of being harassed. In these circumstances, unable to find suitable jobs to support their families, many women survivors needed government assistance. While doing so, they have to keep their dignity and pride at bay, which is demeaning and demoralising to a great extent.

This stigma is reinforced by the lackadaisical attitude of public officials who often stereotype the assistance seekers as 'no real poor', 'lazy' and 'quite picky'.

In this context the role of informal social networks becomes critical. These social network become instrumental in mobilising support in post-disaster phase. The needs of the survivors can also be addressed better through these local networks while keeping the pride and dignity of the survivors intact.

When we know that there are numerous benefits of social capital accruing to the community, the question arises how can we build social capital?

Though scholars have described the meaning of social capital and its implications, there is very scanty literature on how social capital itself is built in

the first place (Freitag 2006; Ganapati 2009; Khrisna 2002; Ostrom 2000). However, the role of face-to-face interaction, local leadership and role of institutions of the state are said to have an important impact on formation of social capital.

Face-to-Face Interaction

It is a fact that repeated face-to-face interaction helps in building trust and reciprocity among individuals and groups. Thus, it triggers cooperation among group members and is a win-win situation for all. In the post-disaster scenario, officials should promote face-to-face interactions among survivors while simultaneously promoting public places which would provide platform for such interactions. In the process the potential of local leadership can also be leveraged. Krishna, notes that, 'social capital represents a potential - a propensity for mutually beneficial collective action. Potential needs to be mobilized, however, and directed toward care- fully selected ends' (2002, 163).

Building Local Leadership

Local leadership comes in handy at times of disaster to tackle the unforeseen exigencies. But such a leadership should have broadly three categories. Firstly, they should focus on enhancing skills which are relevant in the context of disasters like emergency evacuation, first-aid mentoring and so on. Kapucu and Van Wart (2009) do not specifically discuss 'affective' leadership within the context of a disaster, their emphasis on a more humane and caring approach to leadership is relevant for proposed leadership-building programmes in disaster- stricken communities, especially in dealing with women survivors, who are disproportionately affected by psychological problems following a disaster.

Secondly, leadership-building programmes should more likely be long-term. It is a fact that honing leadership skills requires time. It needs to be inculcated in the subconscious.

Thirdly, leadership-building programmes should be customised to the specific needs of women community.

Role of Institutions in Building Social Capital

Of late, there is an emerging literature on the role of state institutions in nurturing social capital. This literature is inspired by North's (1990) work on new institutional economics and Evans's work on state-civil society synergy (1996a, 1996b). The new discourse has emerged as a reaction to Putnam's work on Italy (1993), which essentially implied that creating social capital is difficult in places where it has been historically found lacking. The role of state in formation and destruction of social capital is now well recognised. Thus, there is a need for institutions and policies that are conducive to collective action in post-disaster contexts. These institutions are significant to sustain social capital in the long run.

LaLone in his article 'Neighbours helping Neighbours: An examination of social capital mobilisation in building community resilience to environmental disasters' lists a set of general community-based research guidelines.

- Do not underestimate the social capital potential of a community and its wider region.
At the outset, these bonds may appear superficial but on ground these social support structures have a substantial impact. It is therefore important to mobilise them in disaster planning.
- Develop a community-based plan preparedness: This should be based on study of particular community (the age profile, gender, socio-economic standing of the community, etc.). Formation of community-based group for disaster planning is essential to mitigation of disaster impact.
- Emphasise on community-based discussion, brainstorming and planning – This is an attempt to bring all stakeholders on the table and have an effective deliberation while making an attempt to engage with each partner on equal footing.
- Soliciting the support of social scientists trained in community-based research to prepare mitigation plans – who can use their training to develop plans for provisioning of equitable assistance.

- Mobilising resources for exigencies during disasters – There is a need to make adequate provision of resources (physical and economic). Also, there should be a plan in place to make use of volunteers as and when need be.

LaLone argues that while planning for community resilience, we need to give adequate attention to local level resources, leadership and capabilities. He bats for a bottom-up approach to disaster planning. In order to illustrate the potential for mobilising social capital in disaster response and recovery, the article provides an in-depth micro-level examination of the social capital mobilisation process that occurred after tornadoes struck Appalachian region in 2011.

Olivia, Frederick and Kavita in their article on 'The Role of Community in Disaster Response: Conceptual Models', focus on the role that community plays in disaster preparedness, response and recovery phases respectively by using case study of hurricane Katrina. 'Social capital' helps community achieve bigger goals collectively, rather than individually. Community as an autonomous actor with its own interest, preferences, resources and capabilities can efficiently plan for disasters. The article effectively highlights the strengths and weaknesses of community-based disaster management.

Thus, the above studies effectively communicate that social capital is an important instrument to deal with exigencies of a disaster. It helps in developing resilience in pre-disaster phase and also leads to evolution of better coping strategies when disaster hits. Thus, the significance of social capital in resilience building can hardly be overemphasised. However, studies focussing on the same are very few in number. There is an urgent need to mainstream the concept of 'social capital' in disaster management and development planning discourse.

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Heat Waves and Their Impact on Women: The Case of Women Workers in the Streets of Mumbai

Rashika Saini^a

Nonetheless, where to draw the line and which side to emphasise is widely in including the issues off which particular proposal to endorse among environmental footprints, polluter pays principles, and much more. The debate about climate is not about whether it exists, but what to do because it exists. (Brooks, Introduction to Climate Change Justice n.d.)

ABSTRACT: Climate change is gradually emerging to be one of the most dangerous issues which is posing an inescapable threat to the global environment and patterns of natural climatic conditions which we are accustomed to. The anthropocentric interference with the climatic system which disturbs the inherent equilibrium, by causing elevated concentration of Greenhouse Gases (GHGs) more than the acceptable limit, leading to increases in global mean temperatures. This inequality arises due to the asymmetry which exists in terms of the responsibility for causing emissions in the past and the also the extent to which the impacts if climate change would affect individual countries.

Cooperative action, especially between the two blocks of developed and the developing nations is needed to undertake major decisions in core areas of climate adaptation, mitigation, climate justice and capacity building which equally address the needs of all. This paper would be examining the work outdoors and the impact of heat waves on people who don't have money to fulfill basic needs, people who live in poverty. People in order to survive work in hazardous conditions and are forced to work in heat which is likely to affect their health. Women are often among the worst affected this research focus will be on the working class women and how they cope with heat waves.

This paper aims at exploring the gap between various factors and their linkage to each other i. e. how the change in environment or commonly known as heat waves affect the health of women labourers and how poverty added to worsen the situation. Climate change and its related policies are likely to have a wide range of effects on gender relations, especially in developing countries.

Poor women face many gender-specific barriers that limit their ability to cope with and adapt to a changing climate. Gender and development and women rights in the context of climate justice need a lot more attention. It is in the context of other risks including globalisation, conflict, unpredictable government policies, health, natural hazard, poverty, employment and factors that add to the vulnerability of the women. India being a developing country faces problems of poverty and unemployment which adds to the problems that are caused due to change in temperature and rainfall pattern and a shortage of clean water. It raises voices for those people whose actions have not caused climate change but are the ones who are most severely affected. Human activities have created greenhouse gases that give rise to climate change causing all the problems that we are facing now a day of constant increasing temperature or heat waves.

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In response to this, our policies have shifted to mitigating people to other places from affected place to other rather than focusing on the root cause of climate change. So, the paper would like to raise questions on various aspects of climate change around working women class.

KEYWORDS: climate change, climate justice, women workers, heat waves, urban settings, policy and framework, poverty health

Introduction

Gender, Informal Sector, Climate Justice

The report submitted by IPCC 2007 has listed the relation of gender invulnerability caused by climate change. It specially mentions the vulnerability of the women residing in the developing country because often their livelihoods are basically based on natural resources or agricultural work. Climate change is widely predicted to affect women's lives in the areas where there already exists a weak economy. Climate change makes agricultural unpredictable, fuel crisis, rise in temperature and so on leading to the condition of forcing women to work in the adverse conditions. Ultimately this leads to poor women likely to bear the brunt of health problems caused by the heat and rising temperature. Women face greater vulnerability in comparison to men due to the social construct and cultural norms that we hold on to limiting access to resources, no voice in the decision-making at family or community level, a division of labour being unequal, physical mobility. So, to come back to justice why should a person belonging to a particular gender be more vulnerable to unjust, just because she is a woman? ((2009) n.d.) The climate justice message is that poor people have not been "waiting for the science" on global warming. They have been living with it and with many other forms of pollution and degradation for many years, as *social sinks* for the externalisation of environmental costs. Articulating in the human rights, our concern about climate change is who is responsible for this enormous new threat to their survival. Rather than asking the poor to mobilise how important it is to align oneself with a global political force which is forcing people into poverty in life-threatening situations. How the power dynamics helps the elite in easy escape from the responsibility of power democracy. As environmental regimes increase

in global governance in the twentieth century, the argument over justice in the climate change provides the most striking evidence of the quest to ensure that these global environmental governance arrangements are based on the widely shared ethical standard of responsibility and fairness. The international relation comes to the point of a dilemma on the basis of environmental concern is as the rich imposing risks on the poor. The developing countries where people's economy still remains on daily basis wages face massive impacts on the resident. As nature treats all the same but we cannot ignore the fact of inequality that is incorporated in our system creates more problems for the minorities, it's not the nature but the misbalance of the world on a different basis.

Climate Change, Heat Waves and India

Climate change is gradually emerging to be one of the most dangerous issues which is posing an inescapable threat to the global environment and patterns of natural climatic conditions which we are accustomed to. If immediate control measures are not timely implemented, then the impending consequences may prove to be extremely disastrous, going to the extent of endangering our very existence. Mounting evidence proclaiming that this phenomenon actually is a major global peril for the whole world, various measures are being devised to try and limit the magnitude of the damages climate change may cause. Over the past few years now, published literature especially originating from the scientific community has directed its attention towards coming up with, and recommending increasingly different mechanisms to prevent dangerous climate change (Mastrandrea n.d.). The paper signifies any anthropogenic interference with the climatic system which disturbs the inherent equilibrium, by causing elevated concentration of

Greenhouse Gases (GHGs) more than the acceptable limit, leading to increases in global mean temperatures.

Ever since the inception of the United Nations' Framework Convention on Climate Change (UNFCCC), national governments and the political community have focused international climate negotiations on designing an inclusive climate architecture which would be adopted in the post-Kyoto. The need for designing a module for equitable allocation of the global burden of climate change mitigation has been the chief plan of action ever since the first Conference of Parties (COP) in Berlin in 1995. Although in principle policymakers and climate negotiators all over the world are in agreement that the issue of climate change has to be dealt with, there is lack of overall consensus regarding the definitive course of action which needs to be taken to achieve this. This inability to derive a feasible solution agreeable to all can be attributed to the global nature of the climate change problem especially considering the reality that we live in an "*unequal world*". This inequality arises due to the asymmetry which exists in terms of the responsibility for causing emissions in the past and the also the extent to which the impacts if climate change would affect individual countries. Hence, to arrive at a common understanding amongst all nations regarding the most important criteria that any climate agreement should fulfil, there is a need to build long-term international cooperation amongst all countries so as to devise a burden sharing and justice. Cooperative action, especially between the two blocks of developed and the developing nations, is needed to undertake major decisions in core areas of climate adaptation, mitigation, climate justice and capacity building which equally address the needs of all (BASIC experts n.d.).

In this era of global warming, heat waves have become a more frequent occurrence. In order to meet these changes new technologies are adopted by the middle class to protect themselves (AC, cooler, etc.) but for working class in the street. This study would be examining those who work outdoors and the impact of heat waves on people who don't have money to fulfil basic needs, people who live in poverty. How they cope with the changing temperature. Labour in India is amongst the cheapest by cost as we compare it across the globe because of the high unemployment rate. People in order to survive work in hazardous conditions

and are forced to work in heat which is likely to affect their health. Women are often among the worst affected this research focus will be on the working-class women and how they cope with heat waves (Jayaraman 2014) (Brooks, Political Science and Politics, Vol. 46, No. 1, pp. 9–12 2013). The rise in temperature due to the emission of greenhouse gases into the atmosphere has a massive effect on the earth's climate system, which indeed affects the human living conditions. According to the report of the Intergovernmental Panel on Climate Change (IPCC) in 2008 significantly covers the outcomes of climate change which cause heat waves. One of the dominant factors of climate change is heat waves. Heat waves are a period of abnormally high temperatures that are more than the normal maximum temperature a place usually faces. Heat waves occur usually between March - June in India. (D. S. PAI 2012) (Murari 2015). This research aims at exploring the gap between various factors and their linkage to each other, that is how the change in environment or commonly known as heat waves affect the health of women labourers and how poverty added to worsen the situation. Aim is to give voice to their everyday experiences and steps the government can and should take to overcome unemployment and reduce the vulnerability up taken the class.

India Labour, Climate Change and Gender

India being a vast country and a home to millions of people fail to satisfy the basic needs of the bulk. The bureaucracy here has a very little to say about informal sector work in cities and the growth and poverty rate relationship. Whenever questioned about the development, GDP and national income are the numbers given in hand as an answer. But the question which arises is if the GDP and national income are the true measures of development if so, then why do the poor starve in India. The poorest of the poor or the most vulnerable group in the country is the labour class. India being dominant agricultural country misleads people to often consider only agricultural labourers as labour and ignoring the labourers who work in the urban area or the informal sectors like construction sites workers, rag pickers, daily vendors and so on. If we look into the history, agricultural labourers

and informal labourers or factory workers had a few common things till the war period, there was no term as globalisation or migration until then. People were born in the same place they worked in the same place and died in the same place. Over a period of time, there has been a rapid increase in the number of labours in the informal sectors placed in cities and large degradation in the agricultural population. “Why do as the labour mitigate” is the question. In this industrial world where agriculture has moved on from plough to machines and from seasonal crop to cash crops, it has become difficult to survive for the agricultural labour. Countries like England, Australia which have the same economic balances as India still succeed so much due to less economic pressures, where they are able to maintain a perfect balance between Industrial and agricultural population India seem to largely fail in it. There has been a presidential migration of men and women ruthless of social and economic forces which compel them to leave their roots and move towards cities for employment options. Apart from the common causes, there have been many other causes like village craft dying due to cheap import goods, family fights or the social construct forcing people to move out, the climate change which leads to crop failure ultimately forcing people to starve. Moving out towards cities does not actually solve the problem of starvation but at least lead them to semi-starvation. Searching for labours in the past was an employment option in itself but nowadays people don’t need recruitment armies to search for the labourers. The long distance these people travel in the search for jobs is uncountable for the commoner. Cities like Mumbai draw almost 80 per cent of the total population which do not belong to Mumbai. Then finding shelter in these places also becomes an issue. People tend to stay in inappropriate places like the “cherries” of Madras, the “chawls” of Bombay, the “bustis” of Calcutta, which completely fail in providing the basic hygiene and sanitation leading to health break down. Illiteracy is another factor which makes them easily exposed to exploitation, people lack in skill and hence agree to work in any condition and any kind of work which help them to run the livelihood (Mohapatra n.d.) (B. M. Power n.d.). The status of women labourers in India has been through many ups and downs. As we move on in the twenty-first century towards the global arena, we can see many changes

in the economic, scientific and social construct of the women. Women have not only raised their voices and demanded for equal opportunity but they also tend to compete with men on an equal platform and surpass them too. Slowly and steadily the differences between them have been diminishing. Before the twentieth century, women were mostly relegated to the home and their place was considered or forced to be in the kitchen. Women understood and contributed during the independence struggle where they fought shoulder-to-shoulder with men for the freedom of the country. This started a phase when women also gained their voice. Thereafter they never turned back and started to demand equal education and opportunity to succeed and become self-sufficient or contributing at an equal level with men in life. But, unfortunately in spite of great women in the past still a larger part of the female society is still not under good conditions as they do not have their basic rights. In today’s world too we still see a large percentage of women who work in the labour class and who really don’t understand or know what their rights continue to work under exploitation. Women labourers despite the heat and direct sunlight continue to work in the open areas for their livelihoods in various sectors so that they can support for the betterment of their family even though they face many health issues due to it. What forces them to do so? There are many factors which affect the conditions that women working in the informal sector which adds them to the vulnerable group.

The prominent role of the women in the Indian context has been always of a homemaker. She is always expected to take care of the family first and then look after the other desires she holds. The patriarchy that does exist in the Indian system cannot be ignored and hence forces women to work in horrible conditions. The decision-making power has never been in hands of women which ultimately force them to follow whatever the hierarchy says. Sometimes the horrible condition of the home also forces women to work in these harsh conditions. The economic status or the poverty makes women work as one need to feed their kids and survive. Many a times we can also see discrimination on the basis of gender in different work places as women are considered to be slow or less creative than their male counterpart. Pregnancy leaves or leave to help their family members or look after them is considered as

a hindrance even if they show equal capabilities as men or even better. Seldom do we see women rising to higher positions. But we cannot ignore the fact that times are slowly and steadily changing but still a lot needs to be done. Being a part of the unorganised sector of labours they don't have the power to bargain for fair wages. Despite labours act, the true reality is women are still underpaid than the men. Moreover, their working time and hours are not well regulated they work overtime for excess profit. They work in hazardous conditions. Despite belonging to biological weaker gender as termed by all, they tend to work more than the men. In the day they work for earning and after that, they do the household work. The resting period of these labourers hardly ranges from 5 to 6 hours which is too less for any human body which does so much of physical task daily. Apart from this, these people work in conditions where they don't have any kind of facilities available like drinking water, toilets and so on nearby and hence they drink whatever water is available and go for unhygienic sanitation which leads to many health issues. The problem at work sites gets compounded and multiplied more if they are pregnant or have small children. There is no system at all to take care of these children in working areas. And they cannot just leave out of work during this period too because it may lead them to face extreme financial problems. Besides the problems of the labour physically there is no social security or benefit in terms of labour welfare measures or any provisions that are present in the Indian system. They don't get any kind of pension or Insurance Scheme, maternity leave, accident and death claims, concession loans and financial aid for children education and medical needs which make them work more as the expenditure is beyond what they earn (Bagchi n.d.).

Climate Change and Gender

Seasons are common phenomena of our environment and are essential for our survival. Over the last few decades, there has been a massive change in the pattern of the climate. Climate change is one of the major challenges of today's time; it adds considerable stress to our environment as well as societies. From shifting weather patterns that threaten food production, to rising sea levels due to melting

glaciers causing catastrophic flooding, the impacts of climate change are global and unprecedented in scale. Without drastic action today, adapting to these changes in the future will be beyond control. Climate change has become a dominant issue in industrialised countries, partly due to well-publicised disasters such as hurricane. Many other signs of climate change that are now constantly reported on television and in the newspaper have helped to raise awareness and increase understanding of climatic and environmental changes to the general public. On the other hand, the wide range and profound effects that climate change is having on human societies are still being neglected which needs better exploration. With global warming forecast to continue into the foreseeable future, heat waves are very likely to increase in both frequency and intensity. In urban regions, these future heat waves will be called by the term heat island effect and will have the potential to negatively influence the health and welfare of urban residence especially on women labourers (Füssel 2006; Murari 2015).

Climate change and its related policies are likely to have a wide range of effects on gender relations, especially in developing countries. Poor women face many gender-specific barriers that limit their ability to cope with and adapt to a changing climate. This research explores issues of both gender equity and adaptation efficiency. Gender and development and women rights in the context of climate justice need a lot more attention. *Why it is hard to disentangle the connection between climate change and gender and health issues.* Climate change does not happen in a vacuum. It is in the context of other risks including globalisation, conflict, unpredictable government policies, health, natural hazard, poverty, employment and factors that add to the vulnerability of the women. These vulnerabilities are so dominant that they hide the seriousness of effect of climate change under them. When one's survival is at stake for the poor do not receive climate change is often not viewed as the most urgent or important problem. In urban areas such as Mumbai, poor women are likely to bear the brunt of health problems caused by the "urban heat Island effect" more than anyone else as they work in direct contact with heat. India being a developing country faces problems of poverty and unemployment which adds to the problems that are caused due to change

in temperature and rainfall pattern and a shortage of clean water. Women become more vulnerable to these disastrous heat waves effects in cities like Mumbai or Bangalore which sustain in the dry zone and are in an open call for employment which ultimately increases the vulnerability of the women in the area. While for women are more vulnerable as compared to men is also partly due to their limited access to resources and their resulting poverty. Women's vulnerability also rises from social and cultural norms about gender division of labour, physical mobility and who is entitled to take part in decision-making at household and community level. Gender inequality is one of the most pervasive expressions of inequality worldwide and women still form the majority of those who live in poverty. In the already existing conditions of poverty, climate change magnifies the existing inequalities. Women are subject to particular vulnerabilities biologically but as per words of Lorena Aguilar, senior gender advisor for IUCN *women are not vulnerable because they are naturally weaker*. So the question that arises is what makes them vulnerable? (Dankelman n.d.; Brockhaus n.d.)

Climate Justice

Climate justice raises more of a question than an answer to climate change. The idea of climate justice provides a link between human interventions on the

environment and global political system. It basically links human rights and human-centred development or safeguarding the rights of the most vulnerable group. Climate justice includes both burden and benefits of climate change and its resolution equitable fairly. It raises voices for those people whose actions have not caused climate change but are the ones who are most severely affected. It puts forward a question of who will carry the cost of climate change? And the cost here not only involves livelihoods, health or changing weather patterns but also includes the cost of limiting the growth because of the fossil fuel intensive path, which affects the poor communities and poor countries. The threat doesn't get limited to this generation but does dissolve the entire concept of sustainable development. Climate change is the biggest issue that the world is facing at present in which all the public policies seem to have failed over years, the continuous degradation in the level of the green environment leading to issue of *environmental refugee* globally. Human activities have created greenhouse gases that give rise to climate change causing all the problems that we are facing now a days of constant increasing temperature or heat waves. In response to this, our policies have shifted to mitigating people to other places from affected place to other rather than focusing on the root cause of climate change. Moreover, people who are being affected and have to shift are not responsible for the mishap (Okereke n.d.).

Focus of the Study

(Mitra 2005)

Category of Employment	Male Workers (per cent)	Female Workers (per cent)	Average Income in Rs. (Male)	Average Income in Rs. (Female)
Casual employment	36.3	71.7	2597.4 (59.5)	1359.7 (88.5)
Regular wage/ salaried	32.9	14.6	2163.9 (64.0)	1357.4 (42.1)
Self-employment	30.8	13.7	2619.6 (90.6)	1582.5 (50.3)
Total	100	100		

Referring to the above table, we can easily make out that women are more into informal sector and are paid less than the men in the same sector. They don't have any job and payment securities which further forces them to work under harsh conditions. This research is trying to figure out why the situation have raised to this point and what can be done to deal with these gaps.

Construction Workers

The dictionary definition of Construction Worker is "a worker skilled in building offices or dwellings etc". But there is much more to a construction worker than just this definition they are the ones who meticulously lay out brick on cement sand mortar and then climb up hundreds of feet supported only by make-shift ladders of bamboos tied by coconut ropes, all the while risking their lives only to make our dream home come true. Construction workers are involved in every phase of building activity of any structure. Even if the labour is an unskilled one, his contribution is important in a building activity. Construction workers are the first and the last to leave construction work site. The tasks they perform require great physical strength and also the job involves continuous risk to life and limbs (Labour. 2008). Regarding the education and training most construction workers learn from their supervisors or skilled workers who are often their colleagues at work. A lot of experience is required to be a skilled construction worker. Enterprises and individuals engaged in construction industry are very diverse. From self-employed, agricultural labours we can also find multinational firms engaged in this industry. Mostly it is either the big contractors or small contractors who are principal employers of construction workers. Some construction workers also work for local or state government bodies and some in public utility companies. Most construction workers work outdoors. Construction work is often hazardous to health as the workers are always exposed to sun and sand. Thus construction workers require special clothing like helmets, gloves, goggles and so on. The usual working hours for a construction worker is eight hours, but often it is seen that workers do overtime by working at night also. Construction activity is always

at its peak except the winter season. (The Unorganised Workers Social Security Bill, 2008 n.d.).

Construction in India

Construction industry produces the very fabric of cities and towns. Urbanisation and development are not possible without subsequent help from this industry. Construction industry is also one of the major providers of employment for unskilled labour, a number of ancillary industries and are also connected to the construction industry like production of materials and equipments, post-construction maintenance and so on. Indian Construction Industry is an integral part for the development of the country. India is among the fastest growing economies in the world today, thus construction industry is one of major areas for opportunity and investment. With rising expectation among people for economic development and a high quality for living construction industry is definitely set to become one of the priority areas. The Indian construction Industry employs more than 32 million people. Further they are second largest workforce in India after agricultural labourers. Investment in the Construction sector contributes 6 per cent of the Gross Domestic Product (GDP) growth. There is also another face to the construction industry in India, which are the construction workers. Construction workers in India are mostly migrant labours. They come from remotest area of states like Bihar, Uttar Pradesh, West Bengal, Madhya Pradesh and Orissa to metropolitan cities like Delhi, Bangalore and Mumbai in search of livelihood. Most of the migrant labours are agricultural labourers. They come when they have a lean period in agriculture. While some go back, some others find construction work more profitable than agriculture. Most of the construction workers come from the backward sections of the society like Dalits, Scheduled Caste, Scheduled Tribes and people from Other Backward Classes (OBC). Many migrants especially tribal have come to cities as a result of displacement due to development activities like dam, industrialisation. Many others migrate because of the Naxalite issue and other conflicts in their region that hampers development as well livelihood of the poor (B. M. Power n.d.).

Social Security of Labours in India

The Social Security system in India can be divided into two broad sectors –

- The ones that fall in the Formal Sector, approximately 7 per cent of the total workforce of India.
- The ones that fall in the Informal Sector, approximately 93 per cent of the total workforce of India.

In the formal sector, workers in establishment having more than 20 workers and earning less than Rs 6500 per month are required to participate in at least two social insurance programs. For most others there is some kind of social security provided by the organisation itself. In fact for the formal sector there are proper legislations and an institutional framework for providing Social Security. Social Security is a big problem for the unorganised sector. Although there had been many attempts, there is no proper legislation and institutional framework for providing social security to the unorganised workers. Many labour laws have been passed in recent years, but most of them cater to one specific category of the unorganised workforce. Besides even after implementation of these acts, they are not sufficient. Some of them are Workmen's Compensation Act, 1923; Payment of Wages Act, 1936; Employees State Insurance Act, 1948; Plantation Labour Act, 1948, Maternity Benefit Act, 1961; Personal Injuries (compensation Insurance) Act, 1963; Payment of Gratuity Act, 1972; Bonded Labour System (Abolition) Act, 1976; Employees Provident Fund and Misc. Provisions Act, 1976, Inter-state Migrant Workmen (RECS) Act, 1979 and Child Labour (Prohibition and Regulation) Act, 1986 (M n.d.) (india n.d.) ((2005) n.d.).

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A Gender Perspective on Disaster Risk Reduction

K. Sowmya^a

ABSTRACT: There exists a persistent gap between promises and action when it comes to the question of gender inclusion and disaster management. Gender inclusion is accepted with no contestations among major stakeholders be it policy makers, civil societies, government, NGOs, or international organisations, but lacunae are found when it comes to implementation.

The concept of “gender” is often misinterpreted to refer to only women in most policy documents related to gender inclusion, but as a broader term it encompasses men, women and third gender as well, thereby requiring a more holistic approach. Gender intersects and overlaps with other social dimensions such as poverty, socio-cultural norms and class, adding to its complexity. The socially constructed roles and statuses for every gender are perceived to be different and are reflected in gender inequalities. Gender inequalities of normal times are exacerbated during disasters, leading to gender differentiated vulnerabilities.

Disaster itself is perceived differently by different genders. Men tend to assume their roles to be protectors of families while women tend to sacrifice their health and their needs as subordinate to others in families during disasters. Third gender tend to have a very different equation with respect to disasters as they do not fit within conventional social roles and are systematically excluded from existing support networks and are often neglected in disaster research, recovery and relief during disasters. The impact of disaster on different genders is found to be synonymous with relative social status in society.

This paper aims at gender mainstreaming through analysis of gender issues in disasters and providing possible solutions for different gender groups – men, women and third gender – to bridge existing gaps in implementation of gender-sensitive disaster risk reduction. The paper also looks at gender equations in different phases of disaster management: pre-disaster, during disaster and post- disaster. It also tries to construct a model for gender-sensitive disaster risk reduction.

The paper discusses perspectives on gender based on literature review. The purpose of this paper is to highlight the significance of gender and its scope in the realm of disaster as that of a cost-effective disaster risk reduction intervention.

Further, the paper tries to throw light on taken for granted gender perceptions such as viewing gendered identities of men as masculine and requiring the least assistance during disasters and women being portrayed as highly vulnerable and dependent on men for relief.

The future that is perceived is an inclusion of all genders in disaster risk reduction and society as a whole.

KEYWORDS: gender, gender differentiated vulnerability, socially constructed roles, disaster, gender inequality

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There exists a persistent gap between promises and action when it comes to the question of gender inclusion and disaster management. Gender inclusion is accepted with no contestations among major stakeholders be it policy makers, civil societies, government, NGOs, or international organisations, but lacunae are found when it comes to implementation. The challenges that impede implementation at ground level may be described as follows:

- Lack of understanding of gender as an integral component of disaster risk reduction by trained professionals and treating it as a 'women's issue' overlooking structural gender inequalities between men, women and third gender
- Gender component perceived as of secondary importance by institutions and marginalised within organisations of authority
- Lack of political commitment and accountability to the issue of gender; also reflected in lack of adequate representation of women and gender minorities in decision-making. Commitment often seen only in documentation
- Lack of institutional capacity in gender mainstreaming of disaster as knowledge of gender is possessed by relatively few professionals
- Lack of finances for gender mainstreaming
- Implicit reference to gender in disaster risk reduction as opposed to explicit guidelines or frameworks in policies at national level

As shown above, the challenges are many but the solutions to the problem often lies within. There is an increasing need to mainstream gender in disaster risk reduction.

Gender as a Concept

For the purpose of conceptual clarity, it is important to define gender. The concept of gender is often confused with the concept of sex. Sex is a biological concept determined on the basis of primary characteristics of the human body, whereas gender is a social construct that is determined on the basis of meanings, values and characteristics that people ascribe to different sexes.

Ann Oakley (1972) was one the first social scientists to distinguish the concept of gender from the concept of sex. According to Oakley, gender parallels the biological division of sex into male and female, but it involves the division and social valuation of masculinity and femininity. Men are therefore assigned socially constructed roles of gender to be strong, bold and aggressive while women are expected to be feminine, nurturing and submissive. The socially constructed roles and statuses for every gender are perceived to be different and are reflected in gender inequalities. Gender inequality is the environmental constraints and opportunities that are created in structural and interactional ways to benefit men more than women and other gender minorities such as third gender. Thus as gender intersects and overlaps with other social dimensions such as poverty, socio-cultural norms and class its leads to complexity.

Gender Minorities: Third Gender

This paper includes men, women and third gender as a component of gender. While there is less misperception over who is a man or a woman, there exists certain ambiguity as to who constitute third gender. As there is no universally accepted definition of third gender, this paper attempts to define third gender. For this purpose, it is important to differentiate between third sex and third gender. Third sex can be regarded as a sexual orientation that is different from that of codified heterosexuality. Third sex is a broader concept encompassing categories such as gay, lesbian, bisexual or queer that exhibit non-confirmative sexual behaviour but may not essentially exhibit non-confirmative gender in the gender structure of society. Gender reversed roles need not necessarily mean third gender. It is important to understand there is no link between third sex and third gender. The very notion of creating and sustaining a third gender category is tenuous and problematic, yet this is the need of the changing times. Third gender is defined as "those individuals who do not conform to the existing social structure of gender as either male or female". It is a social category present in societies that recognize

through social consensus the existence of gender other than the gender ascribed at birth. Often third gender is recognised based on the cultural precedents and context of a particular society.

This interpretation of third gender may be viewed as narrow in its approach by some; nevertheless, for the purpose of the study and based on a policy perspective, this definition of third gender has been considered as most appropriate.

Gender and Disaster

The gender dimensions of disasters have been drawing significant attention since the 1990s (Fothergill, 1996; Enarson, 1998; Fordham, 1998). However, the study of gender and disasters in various studies has focused completely on vulnerabilities and capacities of women, sidelining gender as a “women’s issue”. This is also reflected in the policy documents related to gender inclusion and disaster risk reduction at both international and local level.

Gender inequalities of normal times are exacerbated during disasters, leading to gender differentiated vulnerabilities. Gender differentiated vulnerability is susceptibility to disaster in terms of differences in gender and its roles, for example women tend to be more vulnerable than men. The UNDP reports that women and girls are 14 times more likely to die in a disaster than men.

Objectives

- Gender mainstreaming through analysis of gender perspectives on disaster
- Inclusion of third gender as an integral component of gender-sensitive disaster risk reduction
- Construction of a model on gender-sensitive disaster risk reduction

Methodology

This study is based on a literature review of various scholarly articles, e- journals, reports and case studies. In addition, it uses secondary data from various sources as stated above.

Disaster and Men

Gender studies of men and disaster are insufficient, despite the fact that they ‘face their own socially constructed roles and expectations which may also place them at risk’ (Fordham, 2012, p. 428; see also Forthergill, 1996; Mishra, 2009; Enarson and Pease, 2016). The taken for granted gender perception is viewing gendered identities of men as masculine and requiring the least assistance during all phases of disasters, be it pre-disaster, during or post-disaster. Thus vulnerabilities of men are often not visible and overlooked, especially during implementation of disaster risk reduction mechanisms.

Gender shapes men’s interactions with men as well as women during crises, differently in different contexts. Gender differences are found in studies of emergency preparedness, voluntary action, emergency communication, the division of labour, post-traumatic stress and coping strategies, among other areas (see Fothergill’s 1996 review). Men are more likely to hesitate to ask for help during disaster or post-disaster as they don’t want to be perceived as dependent. This reluctance to ask for help can create psychological trauma among men. Men are also likely to endanger their own lives as well as their families due to underestimation of risks during crisis, and this is especially true in male-dominated households. Masculinity norms may encourage risky (‘heroic’) action during the search and rescue period, debris removal and reconstruction. Further, men tend to migrate for economic reasons and are thereby exposed to high-risk zones. Gender-based violence can occur against young boys as well as they are easy targets post disaster. Thus, young boys may require additional psychosocial support.

Obesity, physiological inabilities due to aging or illness and addiction to intoxicants can make men more vulnerable. Men’s reproductive health can also be affected during disasters but may be sidelined in comparison with women.

Men are generally the ‘first responders’ during disasters and this leaves them susceptible to injuries more than other genders. Men also require rehabilitation in economic terms such as jobs and

livelihood in order to support themselves and their families.

Disaster as perceived by men is the reinforcement of their role as protectors of families, though this may not be necessarily accurate.

Pre-disaster:

- Carry out a gender-sensitive risk assessment of disaster in the local community block or area, identifying risks and vulnerabilities associated with men, risks associated with older men (including physiological inabilities such as aging or illness) and risk associated with young boys.
- Train men to be gender sensitive to their own needs as well as women's in case a disaster occurs.

During disaster:

- Trained men can help professionals in effective communication of disaster-affected areas for immediate response and by sharing information on gender diversity in the area.
- Men can help evacuate people to nearby schools or other buildings marked as safe places.

Post-disaster:

- Gender-responsive teams of professionals should identify specific resources and needs of men in all high-risk groups and participation of men in the locality in reconstruction and rehabilitation efforts.
- Sensitive issues such as loss of partner or children or subjection to violence have to be dealt with using appropriate psychosocial support.
- Hazard identification, vulnerability analysis, mitigation strategies and risk communication programmes should be evaluated from a gender perspective with attention to local context for coping with future disasters.

Disaster and Women

It is widely observed, researched and documented that women belonging to different social classes, races, and ethnic and age groups are more vulnerable than their male counterparts of the same social class/group before, during and after disaster (Source: Ariyabandu, M.M. and D. Forensaka 2006, 'Do Disasters Discriminate'

in Duryog Nivaran (ed.), South Asia Network for Disaster Mitigation: Tackling the Tides and Tremors, pp.23–40, South Asia Disaster Report 2005, Islamabad).

Merilyn Childs argued that women were largely represented in the samples as helpless victims who are passive, prone and inhabiting domestic or quasi-domestic settings, and critically examined the representation of women through photo-essays used immediately following the December 26, 2004, tsunami. She argued that a 'disaster genre' has emerged and that disaster images matter and the disaster community needs to care about the 'ethics of seeing', so that the viewer can 'see' women, not simply as domesticated, vulnerable, passive and prone but in their diverse and complex lives and roles.

In the chaos of disaster situations, when existing family, community and institutional security and protection breaks down, generally prevailing gender-based disparities are exacerbated, putting already vulnerable groups at higher risk. The following are some of the gender-based factors which put girls and women at higher risk in disasters (Ariyabandu and Wickramasingher 2004):

- Limitations in mobility, segregation and social restrictions which require women and girls to be accompanied by males
- Less access to warning information and poor ability to respond
- Greater risk of sexual and domestic violence, and sexual abuse
- Childbirth and pregnancy-related factors
- Higher illiteracy rates, and lower levels of schooling and training
- Socially assigned role of caring for the young, elderly and sick within the family

The social aspects of reproductive functions provide the required physical and psychological support for protection of women and young girls in pre-disaster (normal) situations by family and social networks. This feature breaks down during a disaster, and both neither men nor women are familiar with or prepared for the new situation. In the new scenario where all individuals are vulnerable, including men and boys, it is the women and young girls who are at the highest risk of rape, assault, sexual violence and trafficking.

Consequently, it is women who bear the brunt of unwanted pregnancy and the psychological trauma of rape and sexual assault, while both men and women face the risk of STDs and AIDS. For example, there was the reported incidence of a 17-year-old girl who was gang-raped hours after being washed ashore, left orphaned and homeless (Senanyake 2005)

In the first disaster response phase following Hurricane Mitch, with the exception of Nicaragua, information on the affected population was not disaggregated by sex, and relief efforts did not incorporate a gender perspective. This was evident in the inadequacy of addressing women's reproductive health needs: no provisions were made for menstrual and other reproductive health needs in shelters (Buvinic et al. 1999).

There are also cases of the social and cultural behavioural expectations of women having implications for their survival. In Bangladesh, without proper protection and observance of purdah, women do not respond to cyclone warnings and move to safety: the risk of being socially stigmatised for breaking the socio-cultural norms takes precedence over the risk of cyclone.

Disaster for women is often perceived as reinforcement of their social roles of nursing and taking care of others, placing their own needs as secondary as prescribed by the existing socio-cultural norms of a particular society.

Pre-disaster:

- Carry out a gender-sensitive risk assessment of disaster in the local community block or area, identifying risks and vulnerabilities associated with younger women, older women, widows (including physiological inabilities such as aging or illness) and young girls.
- A separate gender-sensitive fund for disaster can be allocated within the existing fund structure for disasters.
- Train women for leadership and ensure sufficient representation of women in decision-making bodies with respect to disaster.
- Put in place gender-sensitive early warning systems and analysis of the socio-cultural context of that society.

- Acknowledge women's traditional knowledge and perceptions in the analysis of risk.

During disaster:

- Enhance women's roles as communicators during disasters and share information on gender diversity in the area.
- Train women professionals in being part of gender-sensitive teams.
- Ensure that gender-sensitive emergency response needs are fulfilled by women.

Post-disaster:

- Providing psychosocial support to women who have been subjected to violence.
- Participation of women in rehabilitation and reconstruction.
- Analysis of gender issues based on socio-cultural context, especially for women.

Disaster and Third Gender

Third gender tend to have a very different equation with respect to disasters as they do not fit within conventional social roles and are systematically excluded from existing support networks and are often neglected in disaster research. Often, their deaths and losses are not recorded in official disaster statistics, and they are stigmatised in ways which mean they cannot access regular channels of information or warnings, and they may be neglected or ignored in disaster preparedness, relief and recovery.

Accessing resources and means of protection only designed for 'men' and 'women' has been shown to cause difficulties and discomfort for third gender—for instance, evacuees in Nepal have to be recorded as either men or women to access shelters (Knight and Sollom, 2012). Pincha and Khrista (2008, pp. 41–42) underlined this gap in their report on the Aravanis of India, who were affected by the Indian Ocean tsunami of 2004, and who 'see themselves as neither women nor men' and 'whose gender category cannot be explained using a two-gender framework'.

For third gender, sex and sexuality matter less than gender in defining their identity (Besnier, 1994; Schmidt, 2003).

During the tsunami of 2009 and Cyclone Evan in 2012, which both affected the country of Samoa severely, Fa'afafine spontaneously placed themselves at the forefront of rescue operations which were traditionally held tasks of males. At the same time Fa'afafine respondents also reported doing household chores that typically are female tasks, such as caring for babies, cooking and doing laundry. The multiple skills acquired in daily life proved essential at the community and household level to alleviate the hardship associated with the disasters. In addition, unlike other genders, Fa'afafine said that they do not have children to look after, giving them more time for extra community and household activities. Despite this significant contribution to alleviating disaster impacts, many Fa'afafine participants who had to evacuate to public shelters following Cyclone Evan felt discriminated against. They were particularly uncomfortable using shower and toilet facilities where they felt rejected by both men and women.

There are several challenges which obstruct third gender from being accommodated in disaster risk reduction such as including them as men or women in disaster information records rather than keeping separate records, ignoring instances of violence against third gender during and post-disaster, and most importantly the question of defining third gender and enabling their access to existing support networks.

Pre-disaster:

- Identify third gender and enable access to existing support networks.
- Third gender and their contribution to disaster risk reduction can be enhanced through proper training and accommodating them as part of gender-sensitive teams.
- Address third gender-sensitive issues and specific vulnerabilities.

During disaster:

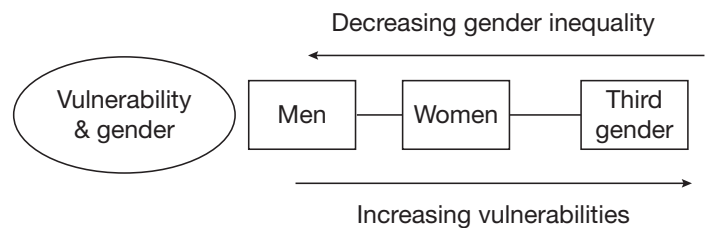
- Communicating information to third gender during disasters and emergency response

Post-disaster:

- Maintaining specific records on third gender and training teams on third gender sensitisation

- Relief and rehabilitation for third genders

Model Construction



Linear model on Vulnerability and Gender

The proposed model attempts to develop the relationship between vulnerability and gender. It proposes that there is an inverse relationship between increasing vulnerabilities and decreasing gender inequality, that is, there is a direct relationship between increasing vulnerability and increasing gender inequality.

It has been established through numerous studies that women are more vulnerable than men due to gender inequality. However, though it is presumed that third gender tend to be more vulnerable than both the other genders, there is a lack of sufficient research on disaster to prove the same and this requires more research on comparative analysis between vulnerability among men, women and third gender. This model can serve its purpose in such a comparative analysis and can be either proven or disproven in order to build subsequent models on vulnerability and gender. This model can be especially useful in gender-inclusive and gender-sensitive disaster risk reduction.

Findings

- The needs and priorities of women and men in different stages of the disaster cycle are different (biological, family, social and cultural).
- Gender-based prejudices view women as weak, passive, incapacitated victims in need of rescue in crisis situations, although in reality women of different age groups may play an active role.
- Gender-based identities view men as strong and capable, requiring the least assistance.

- Due to gendered identities, women's vulnerabilities are highlighted, while their capacities and skills are masked.
- Due to gendered identities, vulnerabilities of men are not visible or recognised.
- There exists a research gap with respect to third gender in gender and disaster research.

Suggestions

Inaccurate gender assumptions by policy makers and practitioners and insensitivity to women's issues or third gender issues in gender perspectives on disaster risk reduction mean that interventions fall short of reaching disaster risk reduction goals as well as development. Therefore, gender inclusiveness in policies, strategies, plans and programmes is vital in order to empower nations and communities to successfully build the resilience to face the challenges posed by disasters.

Conclusion

Gender by itself is a complex issue and complexity is added to it by its entanglement with disaster. Any intervention on disaster risk reduction without truly adopting gender as an integral component is impractical and will not lead to any substantial outcomes.

'The future that is perceived is an inclusion of all genders in disaster risk reduction and society as a whole.'

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Gender-Based Issues in Disaster Management Training in Palghar District

Vivekanand V. Kadam^a

ABSTRACT: Demographically Palghar district is a tribal-dominated district, geographically it is in coastal area and economically it serves the nation through Bhabha Atomic Research Center and Tarapur Atomic Power Station. These circumstances make the district highly vulnerable to disasters from natural and technological hazards. The high disaster risk in the area requires disaster risk reduction measures through lessening vulnerability of people and property, by risk-sensitive management of land and the environment, improved preparedness, early warnings, mock drills, trainings for effective disaster risk management, and so on. Training and mock drills are periodically conducted by the district administration. In recent times about 50 different types of training programmes have been conducted in the district; however, the participation of women in the programme was found to be very low even though women are more vulnerable than men. The high vulnerability of this area and disregarded women can be considered as the crux of the research problem. The low participation of women in training programmes could be due to many reasons, such as, male-dominated social practices and related lack of confidence and factors connected to clothing and menstrual cycle.

In rural and especially tribal areas most women don't have the habit of expressing themselves or the confidence to speak up in public meetings/trainings. This leads to women lacking knowledge and information and higher numbers of women affected by and killed in disasters compared to men. A sample of 100 women participated to focus in this research. The study objectives is to promote and increase women's participation in disaster training programmes. The study will also motivate women for maximum contributions in disaster risk management.

KEYWORDS: gender-based disaster management training, disaster risk reduction, women's participation in disaster risk management

Introduction

Palghar district was formed on August 1, 2014, after the division of Thane district, and it is the 36th district of Maharashtra. Palghar is a district geographically positioned with sea and mountain ranges. It is considered a tribal-dominated district. According to the 2011 census, the population of the district is 29,90,116. The total area of the district is 5344 sq. km.

The border of Palghar district Thane and Nashik districts on east and north east, North of Valsad District Gujarat State and Dadra-Nagar Haveli Union Territory, The Arabian Sea border on the west, while Vasai-Virar is part of Mumbai Metropolitan Region. Palghar District encompasses 4,69,699 hectares of the total geographical area in a total of 1008 villages and 3818 sub-villages as well as 477 gram panchayats.

^a District Disaster Management Authority, Collector Office, Palghar, Maharashtra

Population as per Census 2011

Sr.No.	Tahsil	Total Population			ST Population			Percentage of ST population
		Male	Female	Total	Male	Female	Total	
1	Vasai	709771	633631	1343402	48921	49377	98298	7.32
2	Palghar	288514	261652	550166	83424	84728	168152	30.56
3	Wada	91990	86380	178370	51160	50549	101709	57.02
4	Dahanu	199574	202521	402095	135842	142062	277904	69.11
5	Talasari	76417	78401	154818	68699	71574	140273	90.61
6	Jawhar	69333	70854	140187	63280	65182	128462	91.64
7	Vikramgad	68489	69136	137625	62646	63722	126368	91.82
8	Mokhada	41691	41762	83453	38246	38596	76842	92.08
	Total	1545779	1444337	2990116	552218	565790	1118008	37.39

<https://palghar.gov.in/about-district/>

Scheduled Area in Palghar District

Sr.No.	Tahsil	Total Villages	Villages in Scheduled Area	Scheduled Area of Tahsil
1	Palghar	222	164	Partial
2	Vasai	125	51	Partial
3	Dahanu	183	183	Whole Area
4	Talasari	46	46	Whole Area
5	Wada	170	170	Whole Area
6	Vikramgad	94	94	Whole Area
7	Jawhar	109	109	Whole Area
8	Mokhada	59	59	Whole Area
	Total	1008	876	

<https://palghar.gov.in/about-district/>

Palghar, Boisar, Tarapur, Wada and Vasai in Palghar district are colonies of Maharashtra Industrial Development Corporation. District headquarters is located 110 km from Mumbai. There is a main line of the Western Railway and Mumbai–Ahmedabad National

Highway No. 8 runs through the district. There are 427 large-scale companies and 5757 small companies in the district. There is a significant number of chemical companies. Asia's first nuclear power plant was set up at Tarapur in Palghar district with a capacity of 1600

MW, the highest electricity generation capacity in the country. Bhabha Atomic Energy Research Station is also located in the district, as well as the Ethernet pipeline of the Reliance Group runs. The climate in the district is hot and humid, and it receives 2577.8 mm rainfall in a year.

Palghar is highly prone to a variety of disasters, those from natural hazards: hurricanes, floods, high tides, tsunamis, and earthquakes, as well as technological and industrial disasters such as fire, factory fires, railway accidents, road accidents, and stampedes.

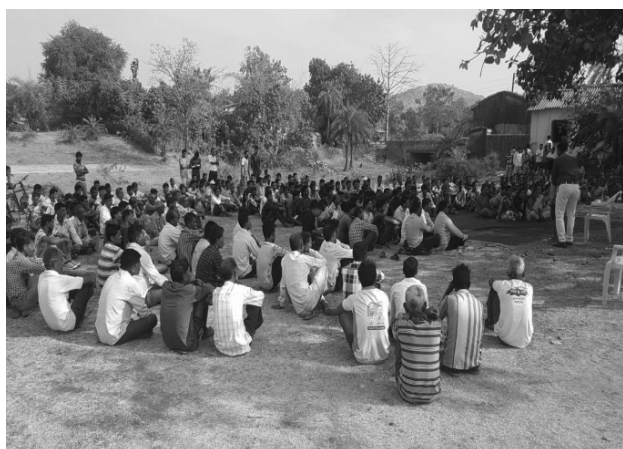
People Who Have Died in Different Disasters in Palghar District

Sr. No.	Year	No. of people
1.	2014	10
2.	2015	08
3.	2016	41
4.	2017	49
5.	2018	42
Total		150

Source: District Disaster Management Cell, Collector Office Palghar

Considering the disaster-prone nature of Palghar, the district administration conduct public awareness through various programmes to inform the population people, but the presence of women in such programmes appears very low.

Field training photos



Statement of the Problem

Studies have shown that women are more vulnerable to disasters, from natural and technological hazards due to gender-based economic, social and cultural factors. Gender-based inequalities in access to resources and information, capacities, distribution of roles, power relations and cultural norms in India and elsewhere result in varying capacities and vulnerabilities between men and women regarding disasters. Women play an important role in overall disaster management process and make significant contributions in preparedness, emergency management and post-disaster recovery within their existing capacities.

Women's specific vulnerabilities in Palghar district are due to the fact that they are unaware of the disaster management trainings. When women are empowered with information, enhanced knowledge and skills through training programmes, they can more effectively participate in disaster preparedness, emergency relief, recovery, reconstruction and resettlement efforts and make a better contribution. This will not only reduce women's vulnerabilities in disasters, it will benefit families and communities by developing stronger resilience to disasters.

Objective of the Study

- To understand the role of women in disaster risk management

- To promote and increase women's participation in training programmes for disaster management
- To motivate and enhance women's contribution to disaster risk management

Research Design

Parameter	Description
• Type of Research	Ex post facto descriptive type research
• Population	Women in Palghar district
• Sample Size	100
• Sampling Method	Simple random sampling
• Research Method	Survey Method
• Research Instrument	Structured questionnaire
• Sources of Data	Primary and Secondary data sources

Various Programmes on Disaster Management Conducted in the District in 2018

Sr. No	Name of Disaster Management Programme	No. of Programmes	Total attendees	Women attendees
1.	Mock drill	9	2165	456
2.	Training	69	18554	3646
3.	Run for Disaster Management	01	335	87
5.	Disaster Management Exhibitions	3	1589	345

Source: (Raw data) District Disaster Management Cell, Collector Office Palghar

a. Is there a need for disaster management training for women?

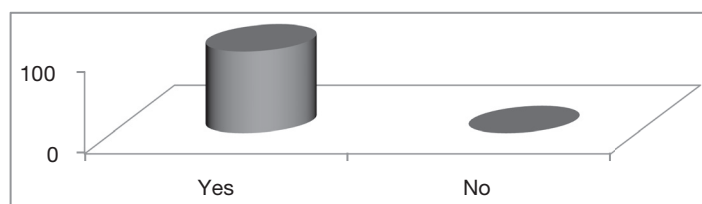


Figure 1: 100 per cent of the respondents agree that women need to take disaster management training

Parameter	Description
• Measurement Scales	Nominal

Data Analysis and Interpretation

Meaning of Disaster Management Training

This is a disaster management training that can teach how to properly deal with all kinds of disasters. For example, what to do before the disaster comes, what to do during the disaster, what to do after the disaster, how to implement first aid, and how to provide mental support.

Through the District Disaster Management Authority, various disaster management trainings are being conducted in the district, including workshops, camps, colour training, street plays, seminars, essay competitions, painting competitions, and disaster management integration.

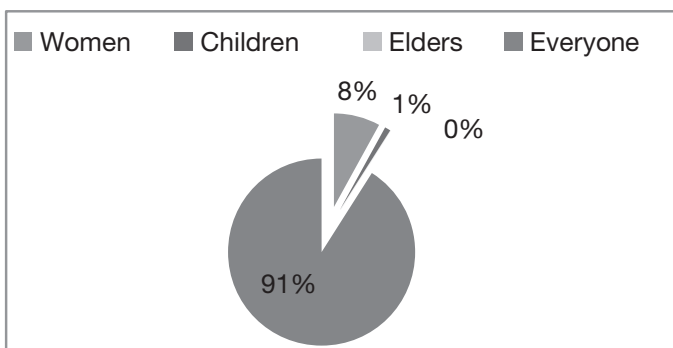
b. Responsibility for disaster management training

Figure 2: Eight per cent of women think that women are responsible for disaster management training.

It is the children's responsibility to take disaster management training according to one per cent of the respondents and 91 per cent of respondents believe that everyone has the responsibility for taking disaster management training.

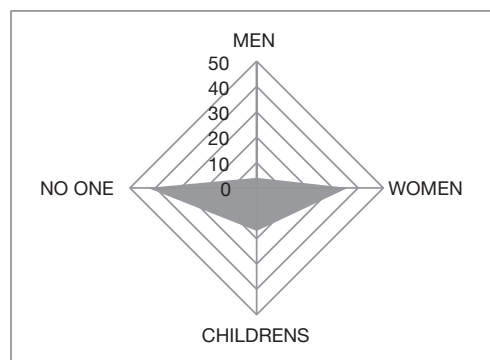
c. Effect of the worst case scenario

Figure 3: 36 per cent of respondents believe that mostly women are affected in emergency situations, 17 per cent of respondents believe that in emergencies children are mostly affected, 4 per cent of respondents mention that mostly men are affected in emergency situations.

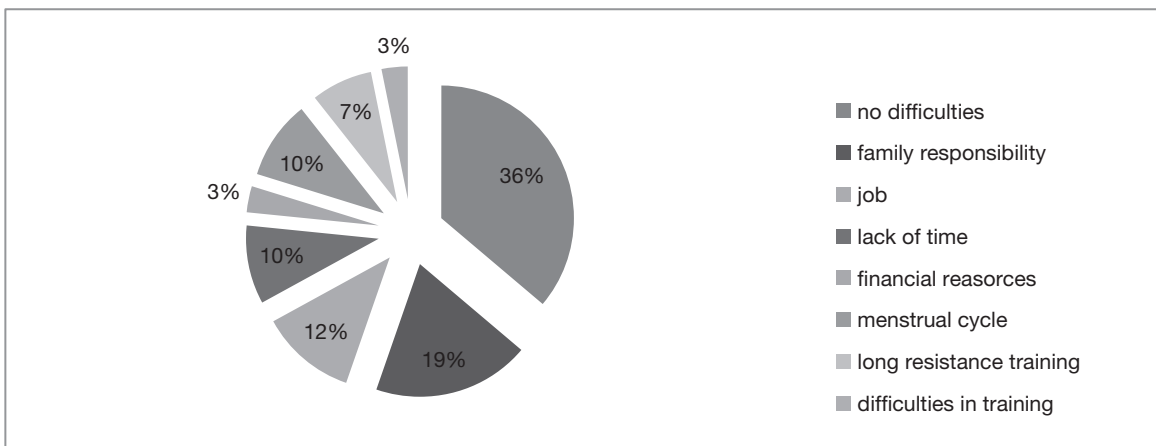
d. Problems affecting women in disaster management training

Figure 4: 36 per cent of respondents do not face any difficulty in participating in disaster management training. 18 per cent of respondents feel that they cannot attend because of family responsibilities. 11 per cent of respondents cannot receive training because of their job. Nine per cent of respondents mention lack of time.

Three per cent of the respondents face difficulty in training due to financial reasons. For example, there is no money to travel to the training location, or if you attend a residential training your salary will be deducted. Nine per cent of the respondents face difficulty in attending the training due to their menstrual cycle. Seven per cent of respondents are hesitant to participate in long or residential trainings. They are concerned that if there is a two to three-day residential training, where will they stay the night and will they be safe? Is there a toilet facility? Three per cent of women feel that there is a lot of difficulty in training. And one per cent of women state that they will not have time for training due to their engagement in farming.

e. Readiness of women for disaster management training

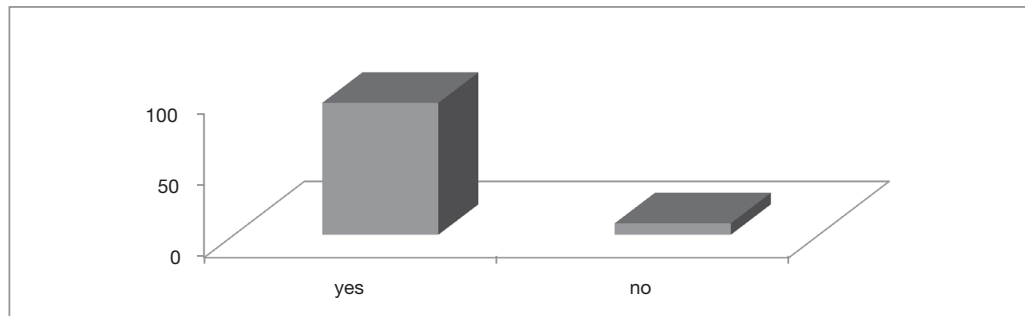


Figure 5: 92 per cent are prepared to take up the responsibility for training in disaster management, while 8 per cent of the respondents are not ready to take the training because they feel they are not responsible for training.

f. How much disaster management training have you attended to date?

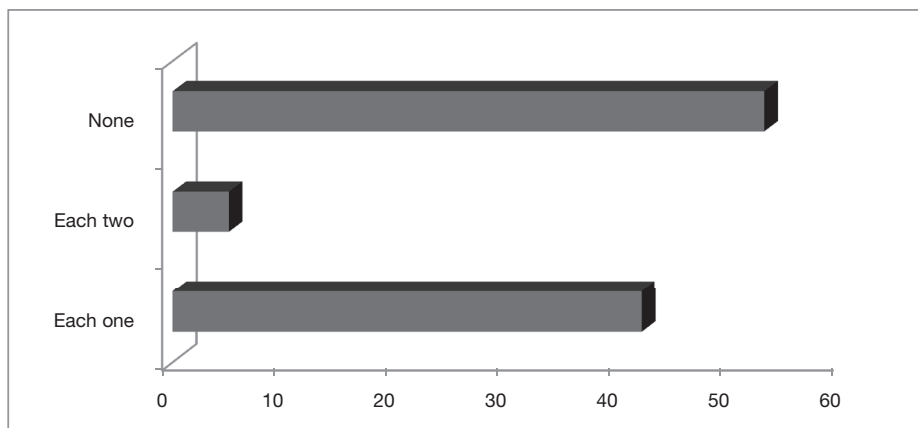


Figure 6: 42 per cent of respondents took one training on disaster management. Five per cent of respondents took two trainings on disaster management. 53 per cent of respondents did not take any training on disaster management.

g. How many people can save lives through disaster management training?

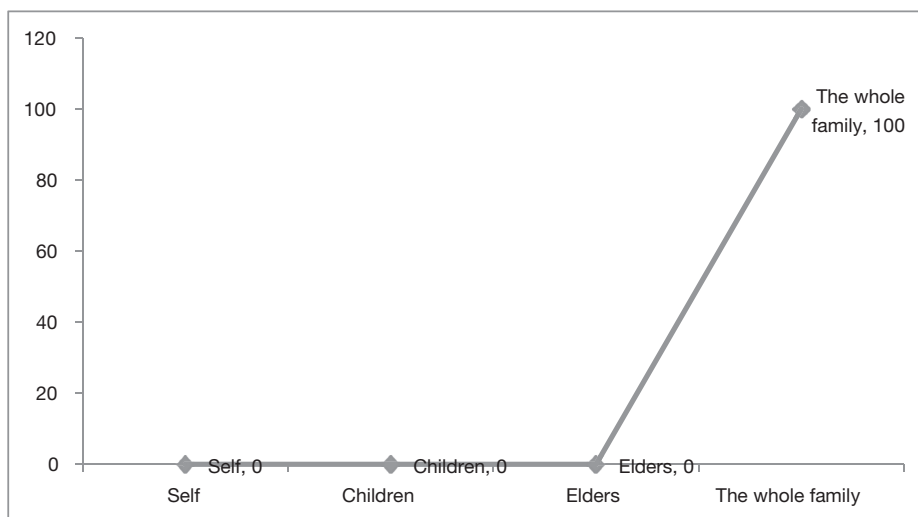


Figure 7: 100 per cent of respondents think that if a woman is trained in disaster management, she can protect the whole family

h. Did the men in the household become disenchanted by attending disaster management training?

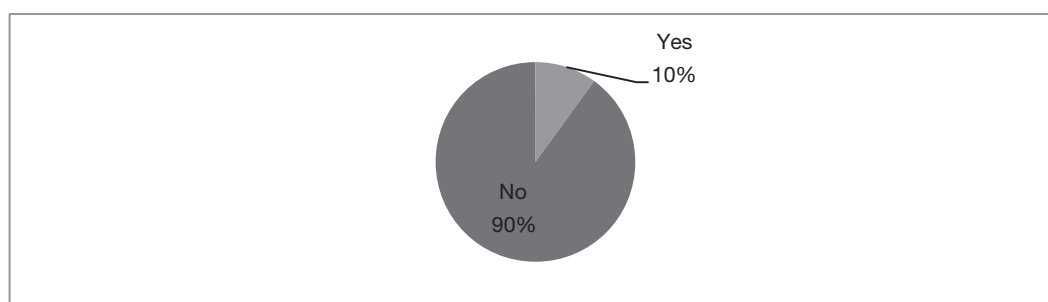


Figure 8: Only 10 per cent of respondents said they had interrupted the men in the family for disaster management training. And 90 per cent of respondents said they did not interrupt family men for the management of disaster management training.

i. What kind of help do you need from disaster management training organisers?

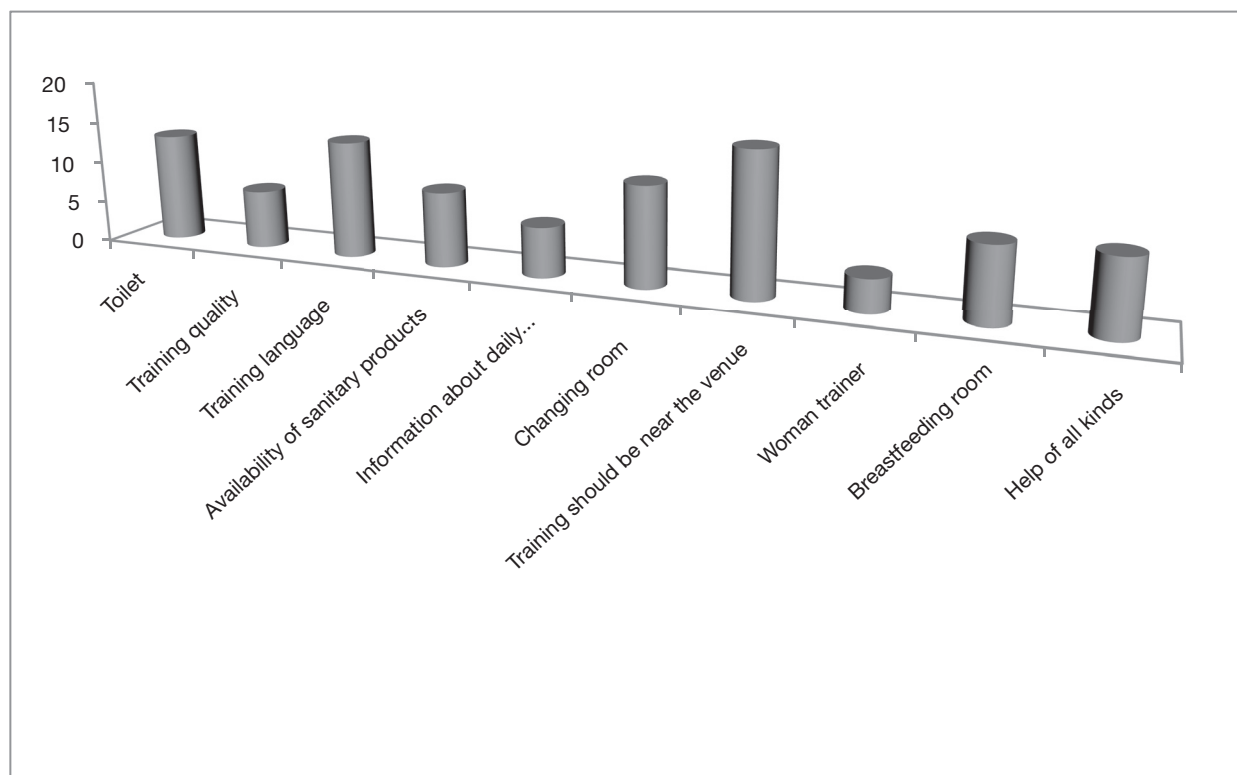


Figure 9: 13 per cent of the respondents believe women should have facilities like toilets in the disaster management training location. Seven per cent of respondents believe that training should be of high quality. According to 14 per cent of respondents, the language of training should be the local language. Nine per cent of the respondents mention that sanitary products/facilities should be available at the training location. Six per cent of the respondents expect to be trained for daily disaster problems faced by family. According to the 12 per cent of respondents, there should be a separate changing room for women at the training camp. 17 per cent of respondents think that training should be near community homes. Four per cent of women believe that there should be a female coach in disaster management training. According to 9 per cent of respondents, there must be a breastfeeding room on the training site. And 9 per cent of respondents believe that all physical facilities are needed.

j. Disaster management training is a kind of force that allows a woman to save her family.

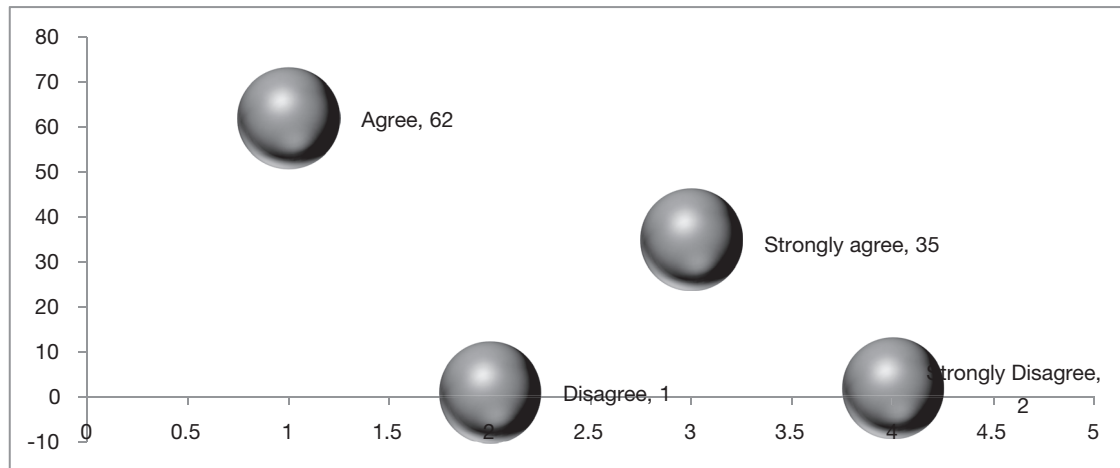


Figure 10: 62 per cent of respondents agree that disaster management training is a boon for women to save the entire family. One per cent of respondents disagree about disaster management training being a boon given to women to save their lives. 35 per cent of respondents strongly agree with disaster management training that women are a gift given to women to save their family. Two per cent of respondents totally disagree with this view.

Conclusion

The study found that women are ready to take appropriate high-quality disaster management training; women will thus be able to manage disasters and save lives better. Some of the main reasons for poor attendance of women in disaster management trainings conducted in Palghar district found in the study are as follows.

Women are not made aware of disaster management training programmes, programmes are residential and held in locations far away from home, trainings are not conducted in the local language, and there is a lack of women trainers/coaches.

It is important for women to take care of their children and the elderly; this should be considered in organising the training to ensure better participation of women. Lack of toilet and sanitation facilities and breastfeeding areas for lactating mothers at the training venue are other key concerns.

Some women have difficulty in attending training due to menstrual problems.

Some women feel trainings are complex. Others are concerned that the changing rooms are not separate for women.

Suggestions

- The training venue should be a central location in the village like Zilla Parishad (Govt.) schools and women should be informed about the programmes/dates well in advance.
- The language of the training should be a local language.
- There should be a female coach because they can freely communicate with women participants.
- It is necessary to provide training on regular, seasonal and day-to-day disasters. Consider engaging women/getting feedback from women in designing the content of the training programmes.
- Training venues should be safe to encourage women's participation.
- Training venues should have separate toilets and sanitary facilities for women.
- Sanitary products should be available at the training venues.
- There should be a separate breastfeeding room.
- Since some women cannot attend training due to financial difficulties, this aspect should be looked into.

- Develop indicators to review benefits of women in the district trained in disaster management.
- District Disaster Management Authority is responsible for implementing the recommendations.

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The Due Dynamics of Disaster Risk Perceptions and Gender Roles: A Case Study of Rudraprayag District after the Uttarakhand Disaster of 2013

Aditi Sharma^a and Santhosh M. R.^a

ABSTRACT: This research examines the disaster risk perceptions of the local community of the villages in Rudraprayag district with contextual reference to the Uttarakhand Disaster 2013. The region has been experiencing disasters and is vulnerable to hazards that a mountain ecosystem is generally exposed to. The field work was conducted in 2018, 5 years after the incident. The intensity of emotions and hence the perceptions differed from person to person as per their experience and memories. The actual risk did match the perceived risk while considering the geological factors but sometimes there was a clash between geography and the perceived risk motivated by culture and religion. An important factor that emerged while examining the pattern of perception was the gender-specific social roles along with the associated worldview reasoning. The understanding of risk perceptions, their types and the causes, deeply rooted in life experiences, plays a vital role in the correct anticipation of the subjective responses to any risky event or hazard. This study is an attempt to understand the perceptions construct and its linkages with the ecological, socio-cultural, religious and economic situation of the community people of the selected study sites in Rudraprayag district.

KEYWORDS: Uttarakhand disaster 2013, disaster risk perceptions, disaster management, gender and disaster, environmental psychology

Introduction

In 2013, Uttarakhand witnessed landslides and flash floods that redefined its contextual definition. The date, June 16, 2013, marked the onslaught of unending miseries where just the word 'loss' did not suffice to describe the actual extent of destruction. The worst affected areas were the five districts of Chamoli, Uttarkashi, Pithoragarh, Bageshwar and Rudraprayag. The impacts ranged from landscape disorientation to number of casualties reaching approximately 5000, of which 169 were found dead and 4021 were missing, presumed to be dead after July 31, 2013 (Satendra, K. J. Anandha Kumar, V. K. Naik, 2014). Rudraprayag¹ saw its temple bells turning into the knell of human settlement loss (Satendra, K. J. Anandha Kumar, V.

K. Naik, 2014). The number increased as the incident happened simultaneously with the *yatra*² season when religious tourists from around the world visit the State, who, on one hand, become the contributors to the carrying capacity of the area, and on the other, the unfortunate victims of the mishap.

According to the Indian Meteorological Department as cited in India Disaster Report 2013, the magnitude of the rainfall was almost 5 times more than normal. The highest measure was fixed at 385.1 mm in contrast to the average 71.3 mm (Satendra, K. J. Anandha Kumar, V. K. Naik, 2014). A total of 4200 villages were impacted by the wrath of the disaster (Singh, 2013). The disaster impacted every possible physical entity in its vicinity, both anthropological and environmental. In all, the disaster of 2013 completely wrecked the region, in the

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dark shadow of misery leaving behind a significant number of interpolations narrating the account of mistakes and future cautions. Thinking anything beyond the event requires an in-depth approach to understand its close inferences. The impact is never limited to the immediate effect; there are long-term impacts that even today the residents of the hills are enduring.

Background of Perception Studies

One of the pioneer exponents of perception with respect to the environment is James J Gibson who through his theory of direct perception tried to set the exposition that perceiving information about the environment will require identification of cues through the ecological properties (Braund, 2008). His major emphasis was on the structures which basically rationalises that an individual tries to engross on their “transactions” and thereby carefully analyse the properties of the environment and be sensitised about the changing composition of its characteristics (Braund, 2008). René Descartes, on the other hand, focuses on the importance of subjective interpolations while accessing the reality around us. He views the formation of perception as a result of “linear chain of events beginning in the material world and ending in the mind” (Braund, 2008, p. 126). The perception of an individual contributes to a great extent to shaping their attitude, which includes a feeling, a thought and an action towards a situation. According to Alfred Adler, propounder of the theory of individual psychology, the behaviour and decisions of an individual are greatly influenced by the attitude she/he carries towards the environment (Pickens, 2011). The theory of selective perception by Sherid and Cantril in 1945 states that a person may sometimes subjectively define an event based on their beliefs and experience and form a boundary of their own understanding, whereas the attribution theory given by Daley in 1996 establishes that the people, on the basis of their perceptions, promulgate their own set of explanations about why something happens (Pickens, 2011). John Locke in his theory of perception explained that whatever knowledge we have will be valid only if there is an

adjustment between our personal ideas, reflecting our thoughts and understanding, and the matter of reality (Jacovides, 2015). The whole idea of accessing the subjective experience of an individual, whether it is in forming an understanding developed through “cues” or the idea of action–reaction thereby considering a natural hazard as a human-induced disaster is essential in understanding that the perception is formed due to multiple factors. Descartes also highlighted the importance of subjective interpretations: the reality of one individual can be different from the other and how it shapes perception and attitude of an individual and the most important factor, the theory of selective perception, opens up the understanding towards the socio-cultural as well as religious influence in the shaping of perception and resulting attitude.

Risk Perception Studies

Risk perception with reference to environmental events is nothing but the ‘intuitive risk judgements’ or cognitive understanding that people form in order to substantiate a particular hazard (W. J. W. Botzen, 2009). The perceptions about risk of a disaster are defined by the magnitude and past experiences (Hellen Nyakundi, 2010). The formation of a perception comes with both dependent and independent variables (W. J. W. Botzen, 2009). The understanding about community perception and their description of hazards is essential for any resilience plan of action, the context of which starkly borrows the ideas from the social as well as cultural context (José María Bodoque, 2016). The noesis of assessing the perception about any ecological risks can be around three dimensions of the subjective judgements, the psychometric model and in terms of associated values and morals (Gisela Bohm, 2013). Another major antecedent that determines the risk perceptions is the sentiments of an individual, which are derived from the kind of relationship one shares with nature, the circumstances they are in or the general mood (Gisela Bohm, 2013). It may also be an outcome of their experience as well as belief system. The values and morality is nothing but the ethics that people associate with the environment (Gisela Bohm, 2013). It goes on to cover the social as well as cultural

moralties and it can be a very influencing factor in deciding the relationship between an individual, a representative of a community and the natural world.

Perception studies holds a lot of importance while assessing the reactions of the community, which becomes an important insight for framing the strategies of managing a disaster situation altogether. Therefore, the objectives of the research were:

- To understand community risk perceptions about natural disasters
- To study the linkages between perception about disaster and the existing belief system, social roles as well as experiences of the community

Methodology

In this particular study, I have tried to explore the case of the Uttarakhand Disaster 2013 in order to understand the disaster risk perceptions of the community related to such disasters. The basic idea of such research was also to yield an understanding about disasters which is grounded within the respondent's perspective. A qualitative inquiry enables a researcher to have a cognitive understanding and meaning that an individual imputes to the social, human or even ecological problems associated with such kind of disasters. It also aims at finding out a respondent's subjective narratives with respect to their memory, cultural associations and social roles.

The research tools used in this process were Focus Group Discussions and In-depth Interviews. The in-depth interviews were conducted in an informal setting and were semi-structured, conversational and polymorphous. The outcomes from the Focus Group Discussions were directly documented whereas the in-depth interviews were transliterated from Hindi to English in verbatim format, coded and the epiphenomenon was segregated into various themes. The names of all the respondents have been kept confidential due to privacy issues as stated by a few of them. The basic agenda of the interviews was to understand the connection with the risk perception of the respondent and the reason behind it.

The study site selection was based on the criteria of multistage sampling, after reviewing the secondary source of data from the District Disaster Management Office in Rudraprayag. Of the 3 blocks, Ukhimath was chosen because it had the highest number of cutoff villages³. The three Gram Panchayats (GP) selected, that is, Kotma GP, Kalimath GP and Dewali Bhanigram GP, were distinct in terms of the effect that the disaster had and the cultural and religious significance.

Findings and Discussion

This section covers the understanding of the site-specific context, the findings in the form of responses and their linkages with various existing schools of thought such as the disciplines of social ecology, environmental psychology and perception studies.

Understanding the Study Sites

Rudraprayag district came into being in 1997 covering the parts from Chamoli, Tehri and Pauri districts (District Administration of Rudraprayag, 2018). The place has great significance historically as well as culturally. Being one of the most important religious centres, there are many expressions that find linkages between the identity of nature and religion and many connotations of the disaster are drawn from the religious point of view. For instance, according to these beliefs, the place is known to have discovered the expression of music through instruments, the place where the rudra veena was played by the narad rishi. Before the destructive dams were built on the river, it is said that one could hear the cosmic sound in the noise of the sangam at Rudraprayag, the two mighty rivers crashing, resisting and then merging. On the basis of the secondary data sources, it was revealed that of all the districts in Uttarakhand, Rudraprayag was worst affected (National Institute of Disaster Management, 2014). There was a need to select the specific villages from the entire district, which is a very large area.

Ukhimath block is the region which covers the Kedar Valley, the starting point of the devastation in 2013. At that time, it was estimated that there

were a total of 74 cutoff villages, the ones where the access was detached due to severe damage to road networks for about 3 to 4 months. The study sites selected fall under that category. Dewali Bhanigram was highlighted as the village of widows in the media, where it was stated that 52 men died in the catastrophe of whom 32 were married. The village as a whole underwent a deep emotional breakdown. Kalimath on the other hand is religiously associated with the female deity *Kali Devi* and is a tourist place, frequently visited by large numbers of people every year. According to the statistical data collected from District Disaster Management Office, Rudraprayag, Kotma faced major losses in terms of livelihood during the 2013 disaster.

Perception and the Context

Based on the narratives and responses, the perception of the community was understood under three contextual frames that emerged. They are area, experience and gender. All these factors are intertwined and one factor derives the other. The area factor covers the aspects of the geographical characteristics and cultural significance, while within those boundaries, the experience and the social role based on gender play their part.

Area, Ecology and Religious Beliefs

Kalimath is recognised as an abode of the female deity. The respondents from the village had religious sentiments towards the occurrence of disaster. A female respondent from the village affirmed nature's motherly instinct to tame the deviant children, the humans who had been nothing but selfish about their own aspirations. She explained how the decision to construct the hydro dam project while relocating the deity's idol forced nature to turn her back and deliver the most dreadful backlash on the humans. The construction site was demolished with the force of the water. However, the risk factor according to her was intact because the construction had restarted.

Murray Bookchin, while explaining the theory of social ecology, associated ecological crisis with

the deep-seated social origins and that is why in order to solve the problems with ecology, one has to understand the background supported by the social structure (Bookchin, 1982). Drawing from his theory, the root cause in the current study, associated with the society, covers how the society promotes unsustainable practices while giving it the term of development. Nature knows how to backfire, because just as humans affect the existence of the environment, the environment in turn lashes back and affects the existence of human life (Tucker, 2010).

Disaster Impacts, Loss and Risk Perception

A respondent from Kotma Gram Panchayat expressed his fear about the impacts that a disaster can have on one's life. Looking at what happened in the 2013 incident, he identifies a secure source of livelihood within the perimeter of the village rather than choosing the risky job of going towards the valley for an extra source of income. Due to fear, he kept his needs limited and decided to sustain with whatever was available around him rather than risking his life to travel. Similarly, when the loss was as huge as his young son dying, the emotions overlapped the motivation to survive and it all came down to fear. This female respondent from Kotma believed that any risk that existed could not be a threat to her life; she would accept it with "open arms" and be a part of it. The disaster that came as a painful experience destroyed the feelings and risk became meaningless to her. Losing a family member creates a complex situation in the life of the surviving victim. The suffering and mental pain affect the overall life of an individual. These are nothing but the emotions that are associated with the loss and come as a reaction to the risks that will be perceived (Linda Steg, 2012).

Village Trail and Jeep Trail

The interpretations of the existence of hazard risk had a close connection with the social roles that the respondent played which were based on gender. The understanding of risk zones as a trail through the village was well understood by the females who worked within the periphery of the village boundary,

whereas the males who functioned outside the village for their livelihood followed their jeep's trail, the road they took to commute. They identified the risk zones along the path where the road could be in a threat or a landslide-prone zone on the way.

Conclusion

Studying the risk perception of the people of the villages in Rudraprayag covered a lot of aspects that came along while trying to know why it is being perceived in such a way. Any risk perception study aims to carefully analyse what the people are trying to express based on their thoughts, beliefs and opinions and several other factors. Their opinion matters because they are the real bearers of the risk. This study was aimed at understanding that perception, which can be a first step to try to understand what will work and what will not. It aimed to understand what response a risk perception can generate and how one can learn to survive from it despite all the challenges. It can be understood through the findings and discussion that a risk perception is influenced by several factors which are equally important in their respective places and therefore it is important to consider all of those. The web of connections goes on to include the physical hazard, how people see it, the belief systems (scientific as well as nonscientific) that exist about such hazards, and how a culture influences the perception as well as behaviour of the people towards the existing risk, which includes both actual risk and perceived risk. It also includes the religious beliefs which are strongly embedded in the mindset of the people. Factors such as economy and the political discourses also influence the response and the perception of the people. It was enlightening for me to know these angles which can have a strong influence on the perception of the people, and those perceptions can help in overall understanding of the existing risk in a disaster-prone area.

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Notes

- ¹ Rudraprayag district is home to one of the four Hindu religious temples:- Kedarnath.
- ² A Hindi term for pilgrimage.
- ³ Villages without access and communication for 3 months

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Women's Hygiene and Sanitation during and after the Kerala Floods of 2018

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ABSTRACT: Floods affect all citizens to differing extents; however, vulnerable groups are most threatened. Women are among the groups that are heavily impacted by natural disasters due to their roles in the household and other responsibilities. Women are not only vulnerable but also resilient in the face of disasters. Women's sanitation and as a result health are at particularly high risk, especially in rural communities due to the lack of infrastructure and awareness and the high impact of flooding experienced in these regions. Women experience the ill effects of physical wounds and are regularly ousted from their homes because of disaster. These are issues identified with women's personal and social roles. Numerous poor women stay jobless amid and after a vulnerable situation. This investigation looks at disaster-initiated vulnerabilities among women in affected areas of Kuttanad, during the flood that devastated Kerala in August 2018. The study aims to evaluate the sanitation and hygiene practices of the women who live in villages that have been affected by the flood. It is also of interest to include recommendations for better practices to maintain the sanitation of the women during these unpredictable and volatile times. A total of 132 semi-structured individual interviews were conducted among flood-affected women. Five group discussions were organised. In addition, a field survey, interviews and group discussions were undertaken for this study. Approximately 87 per cent of the women surveyed faced widespread health scarcity during and after floods. Women are also particularly vulnerable to menstrual management problems, since limited opportunity exists to find proper facilities when forced from home. Most women had minimal access to proper sanitation facilities due to structural flood damage. Most of the women reported that they stayed on a liquid diet and ate only bread as intake of other food items would force them use restrooms more often, leading to digestive problems. Regarding the sanitation practices of the women, 90.9 per cent of the women participants disposed of their sanitary products in the backwaters or washed their reusable sanitary products in the backwaters. By looking at the idea of vulnerabilities, it can be seen that flood is a likely occasion that can cause extreme network interruption and disengagement and lead to numerous issues among poor and vulnerable women in the studied community. There is a need for more consideration of women-sensitive issues such as bathroom facilities, availability and disposal of sanitary napkins and so on and behaviour change regarding menstrual hygiene management and menstrual hygiene. Addressing these types of issues takes time. There is a need for more awareness campaigns, with the support of local authorities. The

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findings are relevant for public policy and community development. However, this cannot be generalised and further research is needed to determine how to address the problems.

KEYWORDS: Kuttanadu, floods, women's hygiene, sanitation, India, Kerala

Introduction

The occurrence of natural disasters has both long-term and short-term devastating outcomes. Social, economic and health-related consequences are experienced by those directly and indirectly affected by floods. However, the 2018 Kerala floods were the most devastating so far in the century. Vulnerabilities and risks of such disasters vary widely among different sections of populations. Women are among the groups that are heavily impacted by natural disasters due to their social roles in the household and other responsibilities (Azad, Hossain & Nasreen, 2014). It is important to note that women are not only vulnerable but also extremely resilient when faced with disasters (Nasreen, 2012). Women's hygiene and sanitation and as a result, health are particularly threatened, especially in rural communities due to the lack of infrastructure and awareness and the high impact of flooding experienced in these regions. This paper discusses the impact of Kerala floods on parameters that can affect the vulnerabilities of women during floods.

The study aims to understand the sanitation and hygiene practices of the women who live in villages that were affected by the Kuttanad flood in 2018. It is also of interest to include recommendations for better practices to maintain the sanitation of the women during these unpredictable and volatile times. The study was done among the women from the self-help groups (SHG) in the villages.) A self-help group (SHG) is formulated from a group of women, usually between 10 and 200 individuals, who gather on a regular basis with an objective of women's empowerment and livelihood development. It is a form of support system for women in rural communities.

Review of Literature

From critically analysing numerous studies, a general theme of women's vulnerability in a situation of

natural disaster was evident. For instance, the flooding in Pakistan resulted in overall devastating outcomes and a nationwide public health crisis (Warraich, Zaidi & Patel, 2010). Various relief groups surged to the forefront of the disaster for disaster relief efforts, among them government forces, non-profit organisations, independent physician groups and civilian volunteers who were not affected by the flood. Many consequent waterborne diseases emerged among the members of the population in the following months, which were traced back to the effects of the 2010 floods. From this experience, future relief efforts should focus on preventing further spread of infectious diseases as well as using the tools available to predict and monitor higher-risk areas in order to address their needs as promptly as possible. It is important to note that the majority of individuals displaced into camps were women and children. This resulted in an increased health risk due to pre-existing malnutrition, lack of safe drinking water and an unhygienic environment (Warraich, Zaidi & Patel, 2010).

Another study that assessed the vulnerability of women in Bangladesh during the flooding noted the significant socio-economic impacts of natural disasters on the livelihood of individuals affected (Islam, 2017). The methods of the study include the completion of qualitative surveys through questionnaire, Focus Group discussions (FGD) and informal dialogue among the inhabitants of the study area. It was found that the social roles and responsibilities that the women held in their communities resulted in increased vulnerability to flood-induced consequences, among them poor sanitation, health outcomes and unemployment. The poor sewage system contaminated the water that is used for cooking, drinking, bathing and other daily activities. Low literacy and knowledge resulted in poor adaptation measures regarding the flood. Overall, the women subjects in the study were most affected (Islam, 2017).

Although elders and children were found to be at increased risk of psychological and physical health

before, during and after floods, women appeared to be at greater risk during floods (Dianne Lowe 2013). Dianne Lowe's study (2013) finds greater risk of psychological health effects among women. The same study also mentioned other risk factors including previous flood experiences, greater flood depth or flood trauma, existing illnesses, medication interruption, and low education or socioeconomic status. The need for children- and women-focused disaster risk reduction (DRR) and a climate change adaptation (CCA) approach and projects is discussed in detailed in the study on "Assessment of Disaster Impact on the Health of Women and Children" (Azad, 2015). Disasters have a horrendous impact on children's and women's rights, their security, sustenance and nourishment, access to safe water, sanitation and hygiene, and well-being.

Biswas et al.'s (2013) study is titled "Flood-Induced Vulnerabilities and Problems Encountered by Women in Northern Bangladesh". This investigation looks at flood-induced vulnerabilities among women in northern Bangladesh. Poor women are more helpless against disasters than men due to the conditions that incline them to extreme disaster impacts. Women experience the ill effects of physical injury and are frequently removed from their residences because of flood. Troubles in finding a secure location, nourishment, safe water and fuel for cooking, as well as issues in maintaining home hygiene and sanitation, keep women from fulfilling their standard jobs at home. Numerous poor and marginalised women remain jobless amid and after surges. Women likewise experience the ill effects of abusive behaviour at home and are vulnerable to harassment when taking shelter. These specific vulnerabilities and issues interfere with women's improvement activities and adjustment limits in disaster hazard decrease.

Lack of gender sensitivity in disaster response and relief activities often diminished the effectiveness of disaster management (Dainella 2017). The Manila flood-based study on gender dimensions and women's vulnerabilities in disaster situations revealed that institutional interventions failed to mitigate the adverse effects of disaster. The author attributes this to lack of gender sensitivity in disaster management, the existence of politically induced discrimination and

the inadequacy of the services of the government. The interplay between natural and socioeconomic conditions is also discussed (Daniella 2017).

Krishnan et al. (2016) developed the study called "Menstrual hygiene: a 'silent' need during disaster recovery". Post-disaster help and recuperation activities rarely spotlight women's needs with respect to menstrual hygiene. There is expanding attention to consolidating comprehensive, participatory and sensitive methodologies for usage of programmes. This article presents experimental discoveries identified with Menstrual Hygiene Administration (MHM), showing it is vital to women's security and wellbeing during recovery. Utilising contextual investigations from India, on the 2012 Assam floods and 2013 Cyclone Phailin in Odisha, this article investigates menstrual hygiene in a post-disaster setting. There is a requirement to address MHM with a sensitive and comprehensive methodology. This article draws functional and strategy inductions from the examination for more grounded methodologies towards initiating change in MHM, and tending to mentalities and learning with respect to menstrual hygiene.

Kerala is found on the southwest side of India, along the coast of the Arabian Sea. Its landscape and geographic peculiarities result in high vulnerability to flooding during the monsoon season (Singh & Kumar, 2017). In 2018, rainfall reached 2,087.67 mm between June 1 and August 15, about 30 per cent higher than the average rainfall level of 1,606.05 mm (Doyle, 2018; Dutta, 2018). The rainfall in 1924 still remains at a record high at 3,368 mm, which resulted in almost complete flooding of Kerala (Dutta, 2018).

Methods

The 2018 flood had the most devastating outcomes thus far. Floods affect all citizens to differing extents; however, vulnerable groups are most threatened. As part of the Live-in-Labs[®] programme (Ramesh, Mohan and Menon, 2016), field research was conducted in villages that were affected by the Kuttanad flood in Kerala. Medical camps were conducted by the Amrita Institute of Medical Sciences (AIMS), which is affiliated with Amrita Vishwa Vidyapeetham, Kerala, India.

Villages were visited to interact with women from self-help groups (SHGs). Individuals in the same self-help groups usually have the same social and economic background and are involved in similar economic activities. Qualitative as well as quantitative data was collected regarding women's sanitation and the overall health impact during and after the most recent flood. Women were the main focus of the research because they are regarded as among the most vulnerable population subgroups.

In India, each district is further divided into a Taluk and a Panchayat. The panchayats are further divided into wards. This is to allow easier division of regions for administrative purposes. The study was conducted in the panchayat Kainakary of Kuttanad taluk in Alappuzha district, which is located at a latitude of 9.562 N and longitude 76.474 E. This area consists of 5 rivers originating from the Western Ghats and the Pamba River and Vembanad Lake (map of India, 2015). Many wards in this panchayat were visited. The medical camps were conducted in the following wards: Kainakary, Pathilpalam and Kuttamanjalam. Unstructured interviews were administered to the women who visited the medical camps. Additionally, the self help groups were in the following wards: Bajanamadam, Kandukrishi villages, Pallamthuruth and Arunutampalam. They participated in group discussions. On average the group discussions and the informal interviews were of a length of 10 to 15 minutes and they ranged from one on one to groups of 20 people at the same time. The questions asked were specifically referring to their use of latrines, the state of their household after flood, the sewage system, their methods of disposal of sanitary products, and their nutrient consumption. All notes from the interviews were written after the conversations were over and were then reflected upon by members of the team on a daily basis to critically evaluate the data collected. Finally, detailed observations were made by members of the team during the village visits using the AEIOU framework (Activity, Environment, Interactions, Objects and Users) to gather as many details as possible regarding the interactions. This framework helps in analysing the severity of a situation by keen observation and understanding what is affected and how severe it is.

Results

The Kainakary area was significantly affected by the rain and the dam openings because of its geographic location and the many water bodies that surround it. It's geographic position results in high vulnerability to flooding during the monsoon season (Singh & Kumar, 2017). In 2018, the rainfall reached 2,087.67 mm between June 1 and August 15, about 30 per cent higher than the average rainfall level of 1,606.05 mm (Doyle, 2018; Dutta, 2018). During our visits we were able to converse with 132 women in total, which spans the self help groups and the medical camp visits.

Ward name	Number of women visited
Kainakary	20
Pathiripalam	12
Kuttamangalam	5
Bhajanamadam	20
Njandukrishichira	38
Pallamthuruth	37
Total	132

Among the participants that were interviewed, 100 per cent of women and their families were affected by the flood to varying extents. Some were completely evacuated from their homes, while others remained in their community but had to make alterations to their lifestyle, and others were only minimally affected. Most women had minimal access to proper latrine facilities due to flood damage. One respondent reported that two latrines were shared among 160 individuals. Another participant reported that for 8 consecutive days since the beginning of the flood, no outdoor latrines (biotoilets) were installed by the government and so members of that community had to travel longer distances to use washroom facilities. Transportation was yet another problem faced by the people of Bhajanamadam. In Bajanamadam, 15 women reported having paid 10 to 12 rupees to take a boat to access the nearest latrine, and it should be borne in mind that their economic state was very poor due to loss of jobs as a result of the flood. Most of the women reported that

they stayed on a liquid diet and bread consumption as intake of other food items would make them have to use restrooms more often, leading to digestive problems. Contamination water with waste in drinking water canals was yet another problem faced by the people of Njandukrishichira, which resulted in skin diseases and vector-borne diseases. In Pallamthuruth, people faced loss of income as their harvested crops were washed away during floods. Due to this reason, the panchayat gave free food kits to the affected people.

Women expressed that they experienced looseness of the bowels, while more than 62 per cent suffered a viral fever. The women additionally experienced cholera, skin maladies rashes, jaundice ophthalmia and conjunctivitis. The women also experienced hypertension, colds and cough, stomach issues, migraines and typhoid, among other afflictions. Like women, men experienced the ill effects of these ailments. Sickness creates additional worry for the flood-affected women's lives on the grounds that, despite weakness, they are still in charge of doing tasks and keeping the family unit working, which regularly require consistent consideration.

In reference to the sewage framework, Bhajanamadam noted that it is legitimately kept up while in other towns it is incompletely (Kainakary) or not kept up legitimately. Making reference to about the strategies used to arrange about the napkins, Bhajanamadam said that they consumed the napkins, Njandukrishichira said that they either dump into the water or put away the napkins which they will consume later once the surge seriousness is diminished. Pallathuruthy, Kainakary, Anjooranpalam and Island made reference to that dump clean napkins into the water. As for drinking water, many families did not have proper access to clean drinking water and if they did have access they would conserve it for their male counterpart as well as for their children. Boiling the water was very difficult due to limited access to kitchen facilities as well as fire during the flood.

Discussion

The flood had devastating outcomes for the livelihood of many individuals as well as the hygiene and sanitation practices of the women. Many medical

camps were conducted throughout the district of Alappuzha, however, male community doctors dominated during these camps. There were 70.9 per cent of female patients and this situation resulted in questioning whether the females attending the medical camps felt comfortable sharing information regarding their menstrual cycle and their hygiene practices with the doctors. There is a requirement to address MHM with a sensitive and comprehensive methodology (Krishnan et al., 2016). There is also a requirement for female doctors and setting up a private room, which will build a sense of belief and motivate them to seek help.

The results we obtained allow the conclusion that the flood had dire consequences for many families and especially the sanitation practices of women in the village. It is also very important to note that our visits to the village occurred after the first flood and before the second one. The outcomes of the second flood were significantly more devastating than the first one, with drastic consequences for the livelihood of the village people, especially since more families were displaced and water levels were higher. The current count have reached 800,000 displaced individuals from their homes to shelters, relief camps or relatives' homes. In the flood-affected regions several of the respondents experienced physical injury while most individuals were influenced by water-borne ailments, for example, diarrhea, fever, and skin rashes because of utilising flood water. Flood is a customary occurrence in Kuttanadu and it has various devastating consequences for individuals. These effects incorporate death toll, an increase in illness, misfortune and devastation of property, and harm to horticultural products, all of which result in vulnerability and an expansion in women's vulnerability.

Women are also particularly vulnerable to menstrual management problems, since limited possibility exists to find proper places for this when forced from home (Azad, 2013). All participants interviewed were affected by the flood, which indicates an increased need for proper infrastructure in order to present this outcome in the occurrence of future floods, especially since Kerala is regularly affected by the monsoon rains. Women likewise experienced insecurity, issues in cleaning up, obstructions in getting their youngsters

to class, shortage of work, powerlessness to oversee sterile pads (material) or napkins to retain menstrual flow, misconduct by shield staff or suppliers, clashes with neighbours, development issues, loss of poultry, and ousting dangers from the places where they took asylum.

Regarding the sanitation practices of the women, 90.9 per cent of the women participants disposed of their sanitary products in the backwaters or washed their reusable sanitary products in the backwaters. Only the inhabitants of Pathilpalam ward, 12 participants, did not partake in this behaviour because they were not as severely affected by the flood and thus they were still able to burn their garbage. This behaviour was not a result of lack of knowledge of disposal methods and their effect on the environment. These specific vulnerabilities and issues interfere with women's improvement activities and adjustment limits in disaster hazard decrease (Biswas et al., 2013). It was instead consequential to the stresses of the flood and was among the changes in daily practices and adaptations that were made to continue daily life.

By looking at the idea of vulnerabilities, it can be seen that flood is a likely occasion that can cause most extreme network interruption and disengagement and lead to numerous issues among poor and vulnerable women.

Recommendation

Overall, what is needed is a more holistic approach, integrating all the relief requirements as part of the Sendai Framework for Disaster Risk Reduction (Mohan and Menon, 2016). Some of the recommendations that can be implemented to prevent the practices described in this paper from continuing include the installation of a biomedical incinerator for waste burning in the neighbouring area as the result shows that they are not able to dispose sanitary napkins during this time. After hitting of floods in Pakistan in 2010, relief agencies were the World Health Organisation (WHO), the United Nations Children's Fund (UNICEF) and the United States Agency for International Development (Warraich, 2010) so likewise Government and other support systems in India should ensure that the facilities provided

for women are reaching and helping them properly and also link with international relief agencies. Consideration of women-sensitive issues such as bathroom facilities, and availability and disposal of sanitary napkins and so on are lacking implementation in Kerala as in Orissa and Assam, but after the disaster they are initiating behaviour change in MHM, menstrual hygiene management, and addressing attitudes and knowledge regarding menstrual hygiene (Krishnan, 2013). Awareness campaigns are under way to promote and develop knowledge related to women's hygiene. Based on the researcher's observation from the medical camp women were reluctant to share about their personal hygiene and therefore conducting medical camps which are women friendly as they hesitate to share their personal health problems with male doctors would be recommended. Also equal concern should be given to the mental health of women.

Conclusion

A disaster that affected and shattered all the people in Kuttanadu had the most immense effect on women, who are considered to be among the most vulnerable groups. Women's sanitation and wellbeing are at especially high risk, particularly in provincial networks because of the absence of awareness and the high effect of flooding experienced in these areas. Women are more influenced by flood-instigated vulnerabilities, encountering deficiencies in nourishment, clothing, sanitation, incidents of sickness presentation, water quality issues and hence issues related to hygiene. Women in flood-affected networks endeavour to build up their very own alleviation and adjustment techniques to diminish flood hazards and revamp homes, secure property and guarantee employment security.

This paper sheds light on the findings of this research, amassing various factors that affect the health and hygiene of women residing in flood-prone areas, lack of facilities for disposal of sanitary napkins, not properly using sanitation facilities, improper intake of diet and diseases arising due to contaminated water. Therefore women's hygiene and sanitation is an issue to investigate further.

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Children and Disaster

Experiences and Prospective for Addressing Child Malnutrition through Community-Based Management of Children with Acute Malnutrition (CMAM): Case Studies of Rajasthan and Odisha¹

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ABSTRACT: Global transition from the Millennium Development Goals to the Sustainable Development Goals has in a way united the North and the South for combating development challenges and its rising burden on mother earth. India is a leading participant in all such global efforts. As such, since the largest democracy has embraced economic growth wholeheartedly with its emergence as a lead economic corridor in South East Asia and one of the global platforms for international relations and business worldwide, it is expected that India will supersede many developed nations in terms of economic growth achievements in the foreseeable future. However, the issue of poverty eradication on one hand and tackling disproportionate growth on the other poses several threats to the nation, the burden of malnutrition, for example.

Against this backdrop, this paper² deliberates regarding the emergence of new trends in public health modelling with particular respect to the social inclusive policy prescriptions emphasising community as central to health-specific programme planning in general and through Community-based Management of Acute Malnutrition (CMAM) in particular. That said, this model is a worldwide adopted approach for addressing the issues relating to acute malnutrition in the child population aged 6 to 59 months. India is no exception in this direction and tried the piloting of this approach in 2009 in Bihar (Burza et al. 2015; Sachdev et al. 2010). To further detail the context, this paper also highlights the trends attached to the emergence of this model in India; experiences of certain state governments in India that have adopted CMAM; and the significance of the community model for durable solutions to persisting malnutrition-driven health challenges.

KEYWORDS: public health, child malnutrition, community-based treatment, participatory learning and action, ask them model

Introduction

Disasters can give us perspectives. This may sound strange but it is true. Unlike prevailing high mortality rates due to health poverty conditions in many developing countries, increased life expectancy and

health challenges resulting due to this has been a much talked about topic in the post-millennial era and so are nutrition, health and demographic dividend. Whilst a country like Japan has to be prepared for policies and actions in favour of old age population management, love for the hi-tech lifestyle and growing

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attachment to negative consumption habits have posed another health challenge for youths in the North, over nutrition and lifestyle diseases per se. The main agenda of development is not only to bring balance through mainstreaming attention to diverse problems of this enormity but also to tackle them in such a way that sustainable development agendas are achieved without moral corruption (Global Nutrition Report 2018). The emphasis of this paper is on community modelling for durable solutions to one such challenge, malnutrition in newborns and its detrimental effect on the human life cycle; in today's world.

Malnutrition-driven public health hazard is a long-standing fight but first invited global attention during the Second World War. Theoretical manifestations from two centuries ago have proven serious interrelations among food availability, nutrition and health (Golden 2002). The link between malnutrition and high mortality and the resultant cascade effects are more evident in case of displaced and refugee populations (Mason 2002).

Literature Review

High occurrence of mortality and diseases in displacement-impacted and refugee populations due to the malnutrition-led health burden is a global concern (Global Nutrition Report 2018; IFRI 2016). Deficiency in micronutrients is mostly an outcome of inadequate food availability in resettlement areas (Benoist and Prinzo 2002). According to the World Health Organization, "...malnutrition, in all its forms, includes undernutrition (wasting, stunting, underweight), inadequate vitamins or minerals, overweight, obesity, and resulting diet-related non-communicable diseases" (WHO 2017:01). Among all forms the impact of undernutrition on children and women is rampant (Nisbett et al. 2015).

However, malnutrition is not an exclusive manifestation of deficit food supply. Societal and cultural conditions in which survivors of war and conflicts and displacement due to development inducement, especially along with communities impacted because of economic opportunity shortfalls, are supporting reasons for which structural

transformation in overcoming malnutrition impacts is taking so long (Dreze, 2017; Verhart et al. 2016; Dreze and Sen 2013). Disproportionate distribution of poverty along with slow fiscal reforms across countries and regions is equally fatal for the overarching recovery process in tackling malnutrition (United Nations 2018). We see it this way: growth-governed gain is for everyone while poverty remains an uninvited guest in regions hit hard by disparity of all sorts for decades. Redistributive justice requires deliberate actions but addressing climate change still remains a negotiable topic for advanced nations, and health financing is an urgent call for action, whereas countries like India suffers from ill-investments in restoration of compartmental politics.

Context and Research Problem

Understanding of public health science has serious interrelations with all other branches of study available in the knowledge kingdom. Our contemporary world has embraced an automation mode of survival with increased emphasis on information technology-driven growth and lifestyle. However, the main crux lies in diminishing attention to quality of life, whereas quality outcomes of development inputs are often immeasurable; major sections of the world's poor population have deficient access to food and public health services and live in scenarios that shorten their life span (Global Nutrition Report 2018; Dreze 2017). Malnutrition is more acute (United Nations 2018). Nearly 124 million people in 51 countries are trapped in food insecurity disasters either due to conflict or drought and famine situations arising in the regions (Global Nutrition Report 2018).

Among malnutrition-impacted regions, low- and middle-income countries are severely susceptible to undernutrition as this is a leading cause of death of nearly 45 per cent of children who have not reached their fifth year of life (Dhirar et al. 2018; WHO 2017). However, whether due to specific reasons or because of underlying factors, malnutrition persistence is antithetical to the foundation of a healthy society. Table 1 illustrates various forms and features of malnutrition for ready reference.

Table 1: Forms and Features of Malnutrition

Forms and Prevalence Scenario	Features	Causes	Possible Hazards
Undernutrition			
Wasting (globally: 50.5 million children under the age of 5 years in 2017)	Low weight for height	Insufficient food, infectious diseases	Fatal health conditions
Stunting (globally: 150.8 million children under the age of 5 years in 2017)	Low height for age	Poverty, socioeconomic hindrances, poor maternal health	Significant impact on achievement of mental and physical potentialities
Underweight (may be stunted or wasted or both) (462 million adults worldwide in 2014)	Low weight for age	As applicable to cases of wasted and stunted	
Micronutrient deficiency-based malnutrition (globally: 2 billion in 2017)	Inadequate vitamins and mineral intake	Imbalance in hormone and enzyme secretion	Improper growth and development
Overweight and obesity (globally: 38.3 million under the age of 5 years in 2017 are overweight)	Heavy weight for height	Imbalance in required energy and actual intake (when it exceeds then required)	Non-communicable lifestyle diseases like heart attack, high blood pressure

Source: Global Nutrition Report 2018 and WHO 2017

In addition, persistence of dual conditions of malnutrition results from either shortage or excess of nutrients in individuals making them malnourished or over-nourished. India has witnessed both burdens in excess with children under five suffering from undernutrition and a high number of people being overweight and obese. Overweight and obesity is basically excess of accumulation of fat impairing the functioning of the body and is computed through body mass index (BMI). Obesity is an underlying cause of non-communicable diseases like diabetes and high blood pressure with a burden of 422 million population who are diabetic and 1.1 billion with high blood pressure globally. Recent data also suggest that these conditions are a leading cause of mortality around the world with 41 million deaths out of 57

million deaths in 2016 worldwide (Global Nutrition Report 2018).

Why Is a Nutrition Agenda Important?

It is well known that lifestyle diseases are mostly the outcome of irregular dietary practices and consumption of food which is not processed in healthy cooking conditions or is highly energy-dense and have largely impacted the economically better off population (Global Nutrition Report 2018). Whereas malnutrition persists in the face of food shortages and in particular absence of nutrition-rich food and even constrained access to basic food (availability cut) for consumption in the economically poor community settings (United

Nations 2018; Bhutta et al., 2008). Undernutrition (which impacts every third woman) and anaemia (which impacts every second woman) prevalence are visibly acute in India, impacting children and new-borns (Government of India, 2010). However, what is contradictory is the severity and magnitude of impact in both the conditions.

Emergence of Community-based Management of Children with Acute Malnutrition (CMAM)

Severe acute malnutrition (SAM) is a prominent form of nutrition disorder (WHO 2017). Twenty-one per cent of under-five populations are wasted in India as per NFHS 04 statistics (IIPS 2016). Also, around 50.5 million children are wasted around the world and approximately 26.9 million of these are living in South Asia (Global Nutrition Report 2018).

The prevention of death and treatment of children with SAM were restricted to facility-based care services until this health concern received worldwide attention in the last four decades. After intensive research and development, health scientists suggested a treatment model, namely Community-based Management of Acute Malnutrition (CMAM), to deal with SAM conditions at the household level instead of depending solely on the facility-based care system. This treatment model has two objectives of prevention of mortality in children and to increase the coverage area for treatment of SAM children (USAID, 2014). This model was first piloted in an emergency crisis situation in 2000 (Collins and Sadler, 2002). Later, CMAM got endorsements from various United Nations (UN) agencies in 2007 (WHO, WFP, UNSCN, UNICEF 2007).

For prevention of deaths due to SAM, specialised treatment along with prevention interventions are required with strong food security and feeding drives. Programmatically, it is helpful to categorise children with SAM into 'complicated and uncomplicated' cases based on clinical criteria and they can be managed through (i) facility- or hospital-based care for SAM children (with medical complications) (ii) household-level or community-based care for SAM children (without medical complications).

According to the Joint Statement of WHO, WFP, UNSCN and UNICEF (2007), summarisation of the findings in CMAM state that

- Children with SAM can be identified in the community before the onset of medical complications.
- Ten to fifteen per cent of children with SAM need facility-based treatment.
- Eighty-five to ninety per cent of children with SAM, without medical complications can be treated at home with therapeutic food and counselling.
- Community or home-based management with therapeutic food as a component of a holistic approach has a major public health impact.

(Interpreted from WHO, WFP, UNSCN, UNICEF, 2007)

Doable Model for Implementation of CMAM in India: Experiences from Rajasthan and Odisha

Rajasthan

Proactive and optimum care of children, through Social-Household Approach for Nutrition (POSHAN), a Government of Rajasthan initiative, started in 2015 to treat children with severe acute malnutrition through Community-based Management of Acute Malnutrition (CMAM) (Government of Rajasthan 2016). The initiative was led by the National Health Mission with support from technical partners like UNICEF, GAIN and ACF. In Rajasthan, children with severe acute malnutrition were treated through facility-based care at 147 Malnutrition Treatment Centres (MTC) across the State. However, with the high case load of 222,000 children with SAM (RSOC, 2014) and limited bed capacity of 1042 beds across the state and high dropout rates from the treatment provided at MTC, the Government looked for alternate ways of treating children and saving lives, which gave birth to a special drive called POSHAN. This programme was implemented as a pilot project in 13 districts including 10 high-priority districts and 3 tribal districts of Rajasthan. The project had a 3-phase approach including screening, treatment and post-treatment.

Table 2: Outcomes in Brief: POSHAN – Rajasthan (10 Dists)

Recovery = \geq 15 per cent weight gain/ \geq 12.5 cm MUAC	4 weeks	8 weeks	13 weeks
Weight gain, n (per cent)	n= 5355	n= 4963	n= 4763
< 10 per cent	2994 (55.9)	1042 (21.0)	837 (17.6)
10 per cent to < 15 per cent	929 (17.4)	811 (16.3)	656 (13.8)
15 per cent to < 20 per cent	546 (10.2)	810 (16.3)	729 (15.3)
\geq 20 per cent	886 (16.6)	2300 (46.3)	2541 (53.4)
MUAC \geq 12.5cm (n = 5863)	721 (12.7)	3669 (68.0)	4640 (87.7)

Source: Government of Rajasthan, 2016

The project adopted a cohort-based approach by identifying children with severe acute malnutrition through active screening at community level by ASHA (Accredited Social Health Activists) using MUAC (Mid-Upper Arm Circumference) (< 11.5 cm) followed by verification by ANMs (Auxiliary Nurse Midwife) at a sub-centre to segregate children with SAM with or without complications. ANMs conducted the anthropometric assessment of children and appetite test and based on assessment children without complications were enrolled in POSHAN and with complications referred to MTC. WHO standards of enrolment and discharge were adopted (WHO 2013). The project followed a fixed day, fixed site approach by organising POSHAN Day at the sub-centre: the enrolment day was named ZERO POSHAN DAY. On the day of enrolment children and the caretaker were provided with a Medical Nutrition Therapy (MNT) kit, including Energy Dense Therapeutic Food (EDNS) (UNICEF 2013), antibiotics, deworming tablet, a plastic container, sealing clip, journey book (record book of POSHAN Day attended and visits undertaken by Poshan Prahari) and a pictorial guide for the caretaker. Poshan Prahari was an elected female from the community (mostly ASHA, in the absence of ASHA, an Anganwadi worker/helper). The treatment phase of the project included daily visits by Poshan Prahari to children, weekly check-up at sub-centre on POSHAN Day, and monitoring and supervision of growth of the child. And in the post-treatment phase periodic visitation by Poshan Prahari was done to

check the health and dietary practices of the child (Government of Rajasthan 2016). Table 2 depicts the outcome of the programme.

Odisha

From 2013 to 2015, Government of Odisha piloted three different strategies to identify the most cost-effective, feasible model of implementing CMAM. The project was piloted in all 12 blocks of Kandhamal, led by Department of Women and Child Development with technical support provided by Valid International and financial support by the Department for International Development. The project was a quasi-experimental intervention comparing the three approaches for treatment of SAM and was started in November 2014 (Government of Odisha 2016). The three approaches included:

- Hot Cooked Meal (HCM): Age-specific meals served 4 times a day at Anganwadi Centre of one block.
- Modified Take Home Ration (THR): Weight-appropriate (200 Kcal/Kg/Day) THR packets (unfortified blend of whole wheat, Bengal gram, groundnut, sugar and ghee) were provided on a weekly basis by the Anganwadi Centre of 5 blocks.
- Energy Dense Nutrient Rich Food (EDNRF): Packets of ready to use formulation as prescribed by WHO and UN agencies were provided by the Anganwadi Centre (6 blocks) on a weekly basis according to the body weight of the child (200 Kcal/Kg/day).

Table 3: Outcomes in Brief: CMAM in Odisha

Approaches	8 weeks		12 weeks	
	n	n recovered (per cent)	n	n recovered (per cent)
HCM	56	11 (19.6)	55	14 (25.4)
MTHR	135	29 (21.5)	131	36 (27.5)
EDNRF	179	65 (36.3)	176	73 (41.5)
Total	370	105 (28.4)	362	123 (34)

Source: Government of Odisha, 2016

Ask Them³ Model for Community-level Performance of Health Programme

3 As Assess Accredit Audit	3 Bs Behaviour in health Burden (disease & cost) Budget
3 Cs Community capital Cooperation Capacity	3Ds Deprivations Disparities Decisions

Explanations

3As: Convey Assessment, Accreditation and Audit of the context in which community-level malnutrition treatment shall take place.

Assessment of malnutrition prevalence in the community in context may be done using tools such as mass screening of children using WHO-recommended Mid Upper Arm Circumference (MUAC) tapes.

In addition, assessment of the context should also consider the prevailing family-level conditions with respect to health and coping strategies to deal with burden of diseases, economic conditions and so on.

Accreditation, on the other hand, in this model emphasises the need for family-level acceptance that persistence of malnutrition is actually a grave situation and does impact the bodily and overall growth of the children at stake over the years. It is seen in various CMAM programmes that in the absence of such realisation, any amount of community mobilisation and behaviour change inputs produces the least intended results. However, having accreditation of

the problem by the targeted families is essential for the pathways to achieve planned results through the programme in place.

3Bs: Include behaviour in health, burden in terms of diseases and costs of expenditure incurred and budget. Health-seeking behaviour of the population plays an important role both in the pre- and post-implementation phases of health programmes (Burtcher & Burza 2005). In the pre-programme situation, it is essential that the assessment covers such aspects in order to plan workable strategies to address the needs of behaviour change and communications. In the post-programme situation, it offers us knowledge on the patterns of shifts in terms of adoption of positive health behaviour through acceptance of recommended interventions relating to breastfeeding promotion, 'Infant Young Child Feeding' (IYCF) practices, 'Water, Sanitation and Hygiene' (WASH) and diarrhoea management.

Although community-based management of malnutrition conditions in children neither ignores nor recognises the costs of expenditures on existing allied diseases in the family, the Ask Them model recommends recording these aspects during the assessment sessions is an essential step.

Budget is a crucial component both for nutrition-sensitive (indirect interventions) and nutrition-specific (direct interventions) programmes. The Ask Them model recommends exploring local sources of funding irrespective of programmatic financial inputs. This is essential in the pursuit of sustainability.

3Cs: Include community capital⁴, cooperation and capacity. Community-based treatment of malnutrition largely depends on the responses received from the targeted community itself. While, CMAM advocates

for therapeutic treatment of the beneficiary children, emphasis on the prevention aspects throughout the programme period actually would infuse a sense of ownership in the community (Aguayo et al. 2018). Therefore, the Ask Them model considers the role of existing capital and the community's capacity very vital in terms of cooperation and execution of the practices in the post-programme phase.

3Ds: Relate to deprivation, disparities and decisions. Though not directly related, income and food insecurities are two major drivers of malnutrition prevalence in almost all contexts in the world (Aguayo & Menon, 2016; IFPRI, 2016). Household-level health disparities can be found in many forms and therefore malnutrition treatment programme need to work in conjunction with other health sector programmes. Therein lies the significance of the welfare state's decision to roll out the community-based treatment model in convergence with other welfare schemes.

Propositions

The Ask Them model actually emphasises the building of a grass-roots cadre of social engineering and foundation of pathways to create locally perceived models of nutrition sustainability. All the above pillars of the Ask Them model act together wherein community is central to their functioning and responding.

Also central to the responses of all the pillars is the presence or absence of development carriers, such as community-based organisations, civil societies, non-government organisations, and their ad hoc roles as influencers of the programme. The Ask Them model emphasises the strength of the communities, that is, barefoot nutritionists, educating them and focusing on channels of inspiration. This also seeks to concentrate on the local sourcing of funds for nutrition financing at the micro level involving available seed and corpus money at the self-help group level.

Strength and Limitation of the Model

Researchers may ask how the Ask Them model differs from 'participatory learning approaches' (PLA) in rural development. There are many opportunities for ambiguously interpreting the Ask Them model.

However, the basic distinction between Ask Them and PLA lies in their intrinsic values: Ask Them sought for doable actions the health safety net programme whereas PLA emphasises more the assessment of the conditions in the communities to offer contexts in which actions can take place. That apart, the Ask Them model offers four important peripheries (pillars) for the doable actions to actually happen. In contrast, participatory learning approaches often confuses beginners, especially in social sciences development practising fields, with multiple ways of doing things, and offer a complex view of simply doable actions. Nevertheless, the limitation of this model lies in its complexities of understanding and bridging the gap between the four pillars of plausible conditions. While some of these sub-pillars mean to offer the context in the communities before the start of the programme and in order to make preparations for conduct, others are outcomes of such assessed context and should form part of the analysis during the programme planning. Since nutrition as a topic of care is not seen as significant in Indian families, how far the development partners, carriers and dispatchers would participate in the health programme is critical to the adoption of this model.

What Is Critical to the Up-Scaling of the CMAM Approach?

The implementation of the CMAM approach across the globe witnessed piloting in many countries over the years. Our experiences from the pilot projects in Odisha and Rajasthan in India and existing evaluation reports of leading implementing agencies suggest that CMAM is a doable model using existing infrastructure. The need is to focus on application of recommended procedures by enhancing the capacity of field-level programmatic carriers such as ASHA, ANMs and so on.

The World Health Organization-recommended protocols are often adopted by these pilots. However, adhering to all the protocols of treatment by the World Health Organization has remained a challenge in community settings. This is mainly because of the ways and means of trickling down of the messages and standard norms as mentioned in the protocol. For example, understanding the level of the service

boundries like frontline workers plays a pivotal role in implementation of the recommended protocols. Mostly, these human resources are overburdened with many other deliverables and adopting CMAM remains equivalent to a generic activity they undertake as part of their duties. This is also prone to loose end monitoring of the programme and lack of seriousness in conducting regular supervision.

Although the World Health Organization's recommendation on standard protocols remains central to the CMAM driven approach, every country has a given health structure, needs and capacity in order to adopt the approach. India has witnessed increased emphasis on the community-level treatment model in the twenty-first century. But, to overcome malnutrition, involvement of leadership in each stage of action and dependable financing in nutrition sector promotion still remains the challenge (Global Nutrition Report 2018).

However, there are examples of countries that have overcome other health crises in limited resources settings. For instance, countries like Uganda, Senegal and Thailand overcame the AIDS crisis in the 1990s largely due to strong and undivided leadership in action even with constrained resources (World Bank & UNAIDS, 2004; Pothisiri et al. 1999; UNAIDS, 1998). India needs such a revolution and CMAM as an approach would have the challenge of effective delivery until incorporated and integrated in the current public health scholarship and leadership. The Indian state of Maharashtra reduced child undernutrition in a span of six years from 2006 to 2012 through the Nutrition Mission. Strong political willingness combined with policy push and improved performance of field functionaries through capacity building for addressing the issue resulted in timely implementation and thus reduction in childhood stunting from 39 per cent in 2006 to 24 per cent in 2012 (Nisbett and Barnett, 2017).

Remarkably, nutrition policy and actions have found a place on the mainstream national agendas of many countries (Global Nutrition Report 2018; United Nations 2018; Nisbett et al. 2014). But policies are often polity outcomes. While development narrations, through practitioners and aid agency lenses, focus on nutrition-specific and nutrition-sensitive interventions, we think that integration of this domain and treating it like any other development programme might hamper

the outcomes. Like an emergency situation, impetus to implement nutrition-specific programmes should take off as early as it can, be it in national policing or locally implemented programmes. Notably, this is essential as a proportion of demographic phoenix is high and human capital growth has been significant in many countries (United Nations 2018). This is also the case for nutrition sensitive programmes for which strengthening the existing structures requires long-term pursuance and push through nutrinomics, meaning bringing in nutrition agendas in the economics of development platforms. Our experience suggest CMAM as a strategic sphere to promote these realistic notions.

Notes

- ¹ Any opinions stated herein are those of the authors and do not necessarily represent the opinion of the organisation they are affiliated or working with. Examples cited from their field experiences were during involvement in implementation of CMAM projects in the past.
- ² This is the second amended version, with new insights, of the original paper presented at another international conference in 2017 at Kakatiya University, Warangal, by the authors.
- ³ The author is very grateful to Professor Robert Chambers, University of Sussex, for inspiring her to come up with this model in recognition of the community's role in rural development.
- ⁴ Adopted from Jacobs, "The Community Capitals Framework" (2011).

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Looking Beyond Disasters: Reflections on Impact of Disasters and Resilience among Children Affected by Floods in Ernakulam, Kerala

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ABSTRACT: Disasters and hazards, both natural and man-made, leave behind bruises that challenge individual resources. The psychosocial impact of disasters on children has long been a concern for researchers. While studies primarily have focused on measuring the impact of disaster on children, the need for examining resilience among children is strongly felt, especially in disaster-prone areas. The study involved school students as respondents ($n=100$) selected by non-probability sampling from schools of Puthenvelikkara and Vadakkekara Panchayats, which were among the worst affected panchayats in Ernakulam district. The Impact of Event Scale–Revised (Weiss & Marmar, 1997) and a semi-structured questionnaire to measure resilience and factors that promote resilience were the tools used to collect data.

Results indicated that the mean score of impact of events among children was 36.19, which indicated a probable diagnosis of PTSD among children. A good majority of respondents, amounting to 52 per cent, reported a score above 37, indicating that the event would have an impact lasting for over 10 years. On exploring the relationship between resilience and individual protective factors, it was identified that family support and sound socioeconomic status ensures resilience among children ($r=.312, p \leq .01$). Community participation was also found to be significantly related to community support with regard to disaster ($r=.281, p \leq .01$).

KEYWORDS: children, recovery, natural disasters, resilience

Introduction

Over recent decades, the world has witnessed a series of natural and man-made calamities. With every successive catastrophe, its long-lasting impact on children has also been a matter of growing concern. As per records, tens of millions of children are affected by disaster every year, which not only alters their status quo, but leads them to be displaced (UNHCR, 2010; UNICEF, 2012). With regard to disaster and its devastating impact on children, we also see a paradigm shift from impact-oriented, pathological research

studies to empirical literature based on child resilience-focused studies. This paper attempts to highlight the findings of a study conducted among children affected by floods in Ernakulam district of Kerala.

Disaster and Its Impact on Children

Children are considered to be most vulnerable in the wake of a disaster, as they are highly dependent on adults for their survival and support. Calamities not only uproot the existing support systems available for the children but also compromise their future well-

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being. Studies have shown that exposure to natural disasters in past months is associated with physical illnesses like acute respiratory illness and diarrheal diseases, growth parameters as well as compromised medical care and immunisation coverage (Datar et al 2014; Kousky 2016).

Psychological disturbances amounting to pathologies like anxiety, depression and PTSD have been reported by several studies that examined the aftermath of disasters among children (Math et al 2008; Kar et al 2007; Lai et al 2017; Becker-Blease et al 2010). Separation anxiety, clinging behaviour and aggression (among older children and adolescents) are some of the behavioural symptoms reported as an impact of disasters on children (Osofsky et al 2007; Becker-Blease et al 2010). Apart from its adverse effects on health and displacement, Kousky (2016) also outlined how disaster alters education and its continuity for children.

Resilience

Analysing the literature on resilience among disaster-affected victims, one would find that this is very scarce among adults, and even more so among children. Only over the last few decades do we find a resilience orientation towards children affected by disasters. Resilience has been defined as the capacity of individuals to successfully adapt to the disturbances that threaten their systems function, viability or development (Masten, 2014).

It therefore holds the other extreme of a diagnosis or problem-oriented paradigm which views children as passive recipients of a disastrous event. Resilience research entails how children actively make sense of events surrounding the disaster and how interactions with various systems help them to function effectively towards recovery.

Demographic factors like age, education, gender, availability of social support, absence of life stressors or previous traumatic experiences and support from community systems, have been directly associated with high resilience (Freeman et al 2015; Bonnano et al 2007).

Conceptual Framework

A disaster is an event that challenges the existing coping capacity of an individual, a system or a government. The study is conceptualised using the systemic perspective of resilience adopted by Masten (2010) which proposes an interplay of individual, micro system (family, peer group, community) and macro system (national policy, socio-cultural contexts) in building resilience. As evident in the impact of disasters at all these levels, the interaction of children during the phase of recovery is also bound to build resilience.

Research Question

Adopting a resilience-based approach, the research question was framed in order to understand how floods had impacted the children of Kerala and how the experiences surrounding the flood had helped them build their resilience. Based on the literature review, the study also aimed to see if various protective factors (family, peer group, community) as mentioned in the literature were contributing to building resilience among children.

Material and Methods

The study was conducted in Puthenvelikkara and Vadakkekara Panchayats of Ernakulam district, which were among the worst hit by the flood. Using Purposive Sampling two schools were selected out of which students from secondary classes were selected as respondents. Informed consent was sought from parents and respective class teachers were present at the time of data collection. A total of 100 students were included as respondents and they were administered the Impact of Event Scale developed by Weiss & Marmar (1997) along with a self-constructed questionnaire on resilience that included items on factors that promote resilience.

Results

The age of participants ($n=100$) ranged from 14 to 15 years. Scores on the Impact of Event Scale-Revised

showed a mean score of 36.19 while 52 per cent of the respondents showed a tendency to score more than 37, which is indicative of a PTSD diagnosis. The results corroborate the findings of literature on the psychological impact of disasters on child mental health. On calculating the responses to the resilience questionnaire, it was found that 40 per cent of the respondents reported that they felt extremely confident in facing future problems because of past experiences.

About 49 per cent of the respondents reported feeling strong and confident to face any problems in future. However, responses on self-harm/aggressive behaviours met with mixed tendencies with 34 per cent and 25 per cent of responses clustering around 'moderately' and 'to some extent'.

Friends and peer groups were reported as a strong protective factor by 52 per cent of the respondents. A strong majority of the respondents opined that they feel free to share their concerns with their family post-disaster and a sizeable 70 per cent of respondents reported that family's socio-economic status will be detrimental in handling any crises in future.

Community participation among children was met with a mixed response, with the majority being clustered between 'quite a bit' and 'extremely well'. Perceived support of the community members also met with responses ranging from moderate to extremely well.

Pearson's Correlation was used to explore the relationship between resilience and individual protective factors, and it was identified that family support and sound socioeconomic status ensures resilience among children at a .000 level of significance ($r = .312, p \leq .01$). Community participation was also found to be significantly related to community support with regard to disaster (at .000 level) ($r = .281, p \leq .01$).

Discussion

While preliminary findings of the Impact of Event Scale suggest the presence of morbidity among children, one of the major contributions of the study lies in highlighting the association between protective factors and resilience among children. The study findings corroborate prominent findings of other literatures pertaining to resilience among disaster-affected

children. As highlighted by the results, community involvement and participation of children becomes a determining factor to resilience. This can also be utilised in implementing Child-focused Disaster Risk Reduction and ensure children's right to participation in local disaster risk reduction plans. (Back et al, 2009).

There is also a need to equip the schools and curriculum with disaster risk reduction and resilience paradigms. The findings also suggest areas for developing community and school-based interventions to build resilience and models of paediatric disaster preparedness.

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Social and Psychological Impacts of Natural Disaster on Children: 2018 Kerala Floods

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ABSTRACT: During the southwestern monsoon season of 2018, Kerala, India, experienced unprecedented rainfall, causing landslides and extensive flooding. The purpose of this paper is to analyse the social and physical impacts that the children in the area experienced due to exposure to the natural disaster. UNICEF identifies that children are highly vulnerable to disasters. This is in part because of their particular stage of physiological and social development. Powerful forces of nature such as earthquakes, cyclones and tsunamis can have serious immediate and long-term impacts on human health, property and livelihoods, which can have devastating consequences for children and their future life. Key vulnerabilities of children and their families are low income, poor housing infrastructure or high population density. Thus children will be more vulnerable after a disaster. They rely on caregivers, who may be unprepared or overwhelmed. Very young children may not be able to communicate necessary information if they become separated from their caregivers. Though little research has examined whether living in a highly disaster-prone area has any effect on children, some studies have explored how living with risk can affect households.

In August 2018, the Kuttanad area in Kerala was significantly affected by flood, causing children to become absent from school for a period of nearly one month. An exploratory research method was adopted, using a mixed methods approach. To learn about the impact of children in the flood-affected area, a semi-structured interview was created and administered to 95 children between the ages of 4 and 15. In addition to the interviews, observations of the interactions with the children were recorded using an AEIOU framework (Activities, Environment, Interactions, Objects and Users). Throughout the data collection process, one of the ways that the psychosocial impact of flooding on the children was assessed was through the creation of artistic drawings related to water. All information was recorded manually at the time of data collection and analysed using the statistical method. Our research found that every child was impacted by the school closures, which caused a significant decrease in their physical activity and emotional well-being. It is easy for parents to

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identify their child's physical needs: nutritious food, warm clothes when it's cold, bedtime at a reasonable hour and so on; however, this will not fulfil the desire of the children of younger ages, as they need more involvement from their environment. This is disrupted when a child is faced with disasters. The study helps to identify the changes in the physical activities of children before and after a natural disaster and its impact on the child's social relations. The unpredictable context of research, during a major flood, has impacted the data collection. Therefore the findings cannot be generalised. Regarding the qualitative explanations of impacts that children provided during the interview process, additional time and resources would have allowed for a deeper understanding of the interviews assessing psychosocial impacts. Future studies could include data collection regarding the health implications of children playing in flooded water in their communities. This could be studied to gain a greater understanding of five- and ten-year's worth of impacts on the children's future health and well-being as flood victim survivors.

KEYWORDS: flood victims, physical activity, child health, Kerala flooding, natural disasters

Introduction

Children and adolescents are especially vulnerable to the social and psychological impacts of natural disasters (Stafford et al., 2006). In the state of Kerala, India, one of the most common natural disasters is flooding. Webster's Dictionary defines a flood as "rising and overflowing of a body of water especially onto normally dry land" (Flood, 2018). Flooding can result from heavy rainfall causing overflow of water from dams, rivers, lakes or oceans, leading to an efflux of water from its usual boundaries. Children that have been previously exposed to adverse experiences are particularly vulnerable to emotional and behavioural disorders following a natural disaster (Stafford et al., 2006). It has also been found that a well-intended but poorly timed intervention can cause a disruption of the natural healing process. For this reason, our study was designed to be observational. The objective of the study was to investigate the impact of flood-affected children in Kuttanad, Kerala, India, during the unprecedented monsoon season of 2018.

Kuttanad is widely recognised as the "rice bowl" of Kerala (George et al., 2014). It is one of the few places in the world where agriculture, specifically rice cultivation, is practised below sea level. Kuttanad has four major rivers: Menachil, Manimala, Pampa and Achenkoil. The region is located in the Alleppey district of Kerala, with a population of over 15 lakhs or 1.5 million (George et al., 2014). In Kuttanad, most

people live below the poverty line, and most citizens rely on daily wages, fishing and agriculture (Prakash, 2009).

The southwest monsoon season of 2018 in Kerala saw unprecedented rainfall, triggering a statewide state of emergency due to extensive flooding and subsequent landslides. The predicted rains from August 9 to 15, 2018, were 98.5 mm, but the state received a total of 352.2 mm. More than 220,000 people were displaced from their homes into 1500 refugee camps (*Times of India*, 2018). The destruction was widespread, with over 10,000 km of roads damaged, and hundreds of homes lost or damaged. The Kerala flood disaster claimed 483 lives, and the estimated value of destruction was more than the annual outlay of the state. A total of 57,000 hectares of agriculture crops were destroyed.

Background

Children caught in natural or man-made disasters can suffer from trauma and bereavement far longer than adults realise, and this can affect not only how well they perform at school but also the trajectory of their lives, researchers have noted. Floodwaters eventually recede, power is restored, buildings are repaired and daily routines begin again, but many children struggle, finding it difficult to concentrate, do schoolwork and sleep. Some are scared to leave home for school, fearful that something would happen to them or their families (Strauss, 2017).

According to Rush (2018), UNICEF identifies that children are highly vulnerable to disasters because of their particular stage of physiological and social development. Natural disasters can have serious long-term impacts on human health as well as material properties. They can have long-lasting effects on livelihoods, and devastating consequences for more vulnerable populations like children. The impact of natural disasters is even more severe in areas already affected by low income, poor housing or high population density.

According to Kousky (2016), there are three ways in which natural disasters can impact children with potentially long-lasting effects. First, they can affect their physical health. They could be injured, killed, suffer from malnutrition or get contaminated by diseases due to difficult access to medical care. Second, disasters can cause mental health problems. Disasters themselves can cause trauma. Children can suffer psychological harm due to the loss of their loved ones and possessions, from being forced to migrate, and broadly speaking from disruption in their usual social networks and neighbourhoods. Third, disasters can interrupt children's education by destroying infrastructure and affecting families. Children unable to go to school are more prone to be pushed into work, to support their family in difficult times.

Carolyn (2016) adds that children may be more vulnerable after a disaster. Their family may not be prepared to face a disaster, and may not know how to take care of them in such situations. Young children may not be able to communicate their feelings and emotions, and may be all the more affected if there is disruption in the family. According to Carolyn (2016), studies have explored how living in a risky area can have impacts on household income and consumption choices of the families. For instance, in risk-prone areas some may choose to grow safer crops but those may also give low returns. However, living in riskier areas can be a conscious decision to allow children to access specific benefits like better education, or employment.

According to Sonykutty George, a Child Protection specialist for UNICEF, the flood-affected areas of Kerala are being reviewed to assess the impact of disaster on

affected people. "The waters have receded and camps are closing. People who have returned to their houses in Paravoor realise the challenges ahead. They find heaps of slush inside their houses and no water to wash it out. No furniture left. No electricity. No utensils. No books and toys for children. An experience of total loss. People return to find their cattle tied in the cowshed, the dog in chains and the chicken in the cage, all just 'carcasses'. Then there is the accompanying stench; yet you cannot bury them because the water has not fully dried up" (George, 2018).

"I was not having any problems till yesterday. When I saw my parents return last evening from the visit to our house, their tears and sorrow broke my heart," said Saraswathy, a 12-year-old girl from Paravoor, cited by George (2018). As per the data collected by UNICEF during the floods, it was identified that the impact of natural disasters on children was very high. The data addressed educational aspects of and other major shocks to the psychological as well as physical health of children during and after disasters.

Our study is on the attitudes of children before and after the onset of flooding in Kuttanad, with particular focus on the occupations of the parents of the children in the area, the changes in the recreational activities of the children after the disaster, and also the attitude towards schools and the impact on education of children.

Methodology

As part of the Live-in-labs[®] programme (Ramesh Mohan, and Menon, 2016) the team adopted an exploratory research methodology. Throughout this paper, statistics about the subjects who were interviewed will be included, along with specific examples of impacts on children who were interviewed, to illustrate the severity of the psychosocial impacts of becoming flood victims.

The locations where the children were interviewed include nine different emergency disaster relief medical camps, three village schools in the area and eight rural village communities. Medical camps were conducted, serving various rural communities in

Kuttanad viz. Kainakary, Pathilpalam, Kuttanj'aanau, Kuppaparaten, Kannadi, Essa, Thalavady, Pacha and Thankageu. The schools were located in the following panchayats: Kuppapuram, Thotuvathada and Government Lower Primary School Theradishaun. Interviews were conducted during the exceptionally rainy first and second weeks of August, 2018 and in the presence of school teachers. The study examined the differences in the attitudes of children before and after the onset of the episode of flooding in Kuttanad, with further inquiries on the occupations of the parents of the children in the area, the changes in the recreational activities of the children after the disaster, and also the attitude towards schools and the impact on education of children.

To learn about the impact of children in flood-affected areas, a semi-structured questionnaire was created and administered to 95 children between the ages of 4–15. Kuttanad was significantly affected by the flood, causing the children to be absent from school for a period of nearly one month. Of these 95 children included in our research, 52 were male and 43 were female, clustered into the following three age categories: kindergarten to second grade school are 4–7 years old (group one; 19 children), third grade to sixth grade school going are 8–11 years old (group two; 44 children), and seventh grade to tenth grade in school are 12–15 years old (group three; 32 children). In addition to the interviews that were conducted, observations were recorded on the interactions with the children using an AEIOU framework (Activities, Environment, Interactions, Objects and Users). All information was recorded manually at the time of data collection.

Results and Discussion

Table 1: Demographics of Flood-Affected Children Interviewed

Age Group	per cent of Children
4–7	20 per cent
8–11	46 per cent
12–15	34 per cent

Table 2: Occupation of Parents of Flood-Affected Children

Occupation of Parents	Percentage
Fishing	55 per cent
Agriculture	16 per cent
Fish processing	7 per cent
Daily wages	13 per cent
Private jobs	5 per cent
Camerman	1 per cent
Auto driver	1 per cent

Table 3: Preferred Recreational Activity of Children Before and After Flood

Before the Flood	After the Flood
GAMES PERCENTAGE	GAMES PERCENTAGE
Cricket 22 per cent	Indoor games 7 per cent
Football 20 per cent	Social media 25 per cent
Hide and seek 23 per cent	Caroms 7 per cent
Social media 10 per cent	Nothing 31 per cent
Others 25 per cent	Others 27 per cent

To analyse the psychosocial and physical impacts on flood-affected children in Kuttanad, we interviewed 95 individuals aged 4–15. Schools across all 14 districts of Kerala were closed during the flooding (BBC, 2018). Our research determined that children in the 8–11 age group experienced a significant disruption in their typical recreation, and all age groups were vulnerable to feelings of sadness during the flood. The psychosocial impacts and physical health risks of children and adolescents during natural disaster situations are well documented. The degree of impact depends on the duration and severity of the disaster exposure, the amount of social support received during the disaster, and the level of personal loss and disruption (Stafford et

al., 2006). Additionally, the child's developmental stage and reliance on their caregiver play a role in the adaptive behaviour of the child. Intense and/or persistent disaster situations can cause the development of adaptive behaviour that leads to significant mental health issues that can chronically

impair cognitive development (Stafford et al., 2006). The key to proper management of these reaction responses is early treatment and appropriate emotional and physical support. Working to quickly restore a sense of safety and routine can reinforce feelings of self-efficacy.

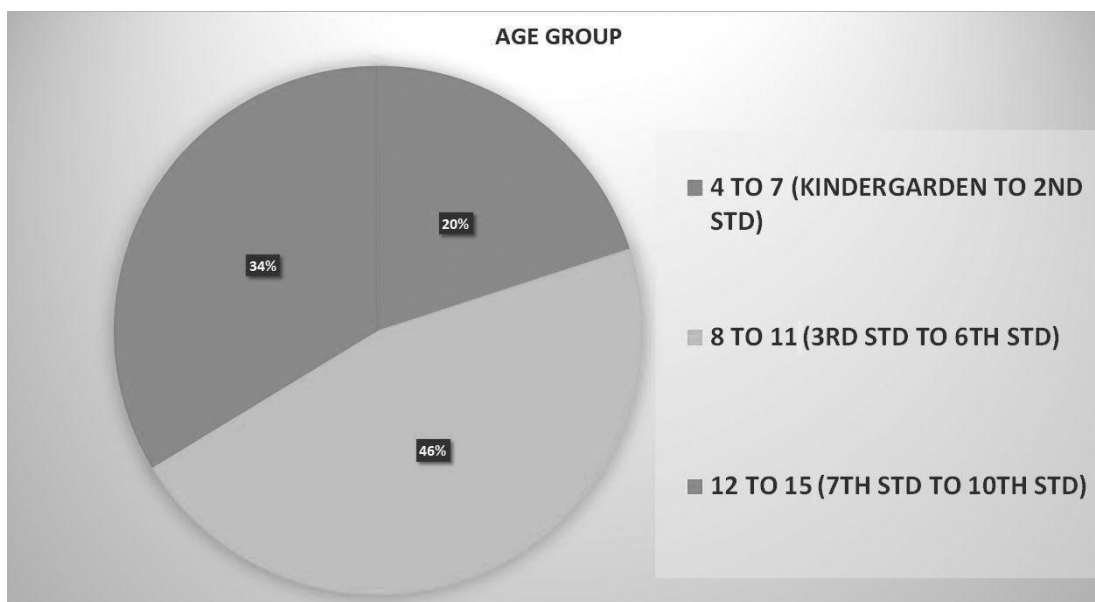


Chart 1: Age groups of flood affected children interviewed

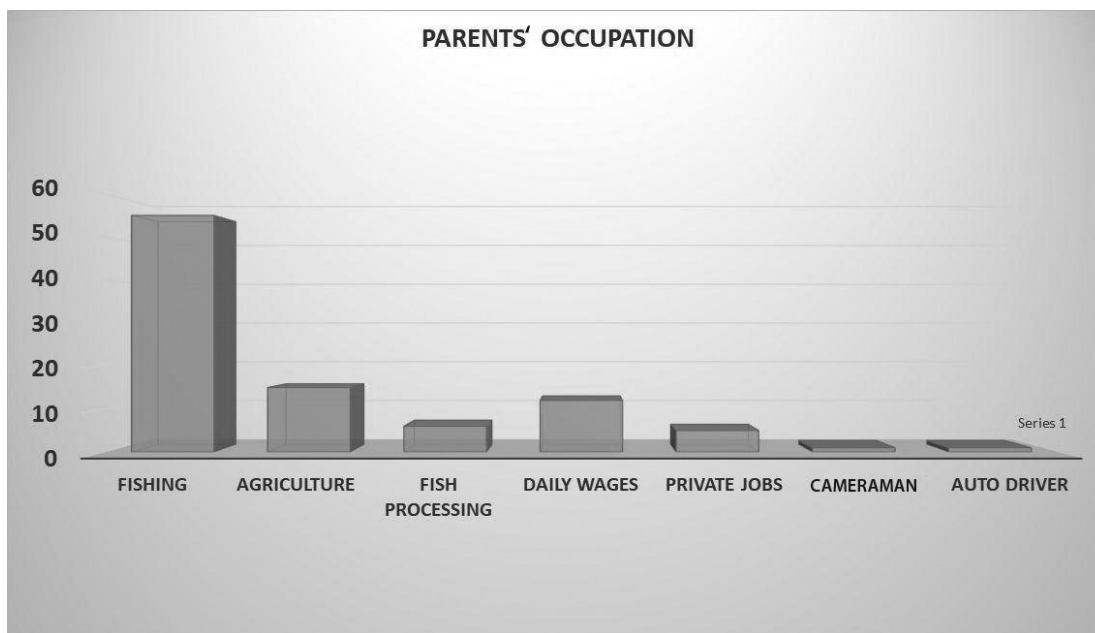


Chart 2: Occupation of parents of flood-affected children

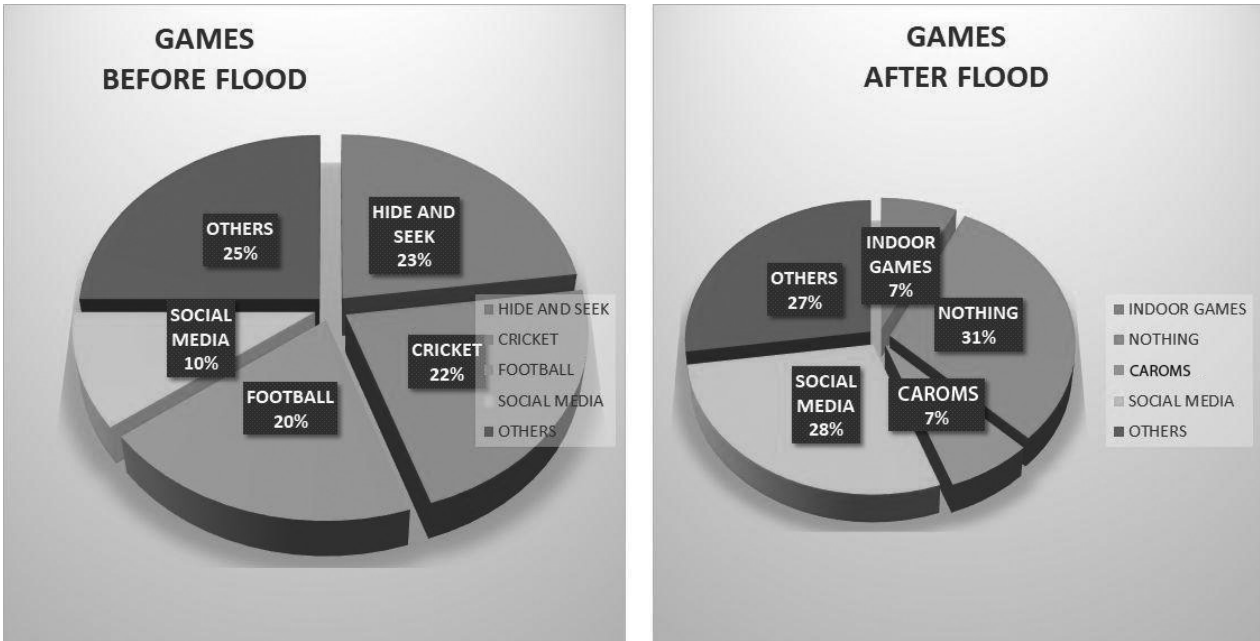


Chart 3: Comparison of recreational activity before and after flood

Chart 1 indicates the age group of children interviewed. An age range from 4 years to 15 years was studied, with the age group division of 4 to 7, 8 to 11 and 12 to 15 years old in the data collection. The first range category is children from kindergarten to 2nd standard, the second range from 3rd standard to 6th standard and the third range from 7th standard to 10th standard. The data collected from the 95 children for the data resulted in 20 per cent of the children found in the first category, 46 per cent in the second category and 34 per cent in the third category.

Chart 2 indicates the parents' occupation of the children who were interviewed. Fishing, agriculture, fish processing, daily wages, private job, cameraman and auto driver were the major jobs of parents. This resulted in 55 per cent in fishing, 16 per cent in agriculture, 13 per cent in daily wages, and less than 10 per cent in other occupations such as fish processing, private jobs, cameraman and auto driver.

Chart 3 indicates the difference in activity level before and after the flood. Before the flood, 23 per cent of children used to play hide and seek, 22 per cent played cricket, 20 per cent played football, 10 per cent used social media and 25 per cent reported playing other games. After the flood, the games played by the children completely changed. The use of social media

increased from 10 per cent to 28 per cent, and there were such changes in games reported as follows: 7 per cent of caroms, 7 per cent of indoor games and 27 per cent of other games. It was also found that 31 per cent of children were sitting idle without anything to engage them during the flood-affected times.

The study found that the children faced significant impacts on their lives in psychosocial aspects. The findings of the research determined that children in the age group of 8–11 were the most significantly affected overall. Children were forced to stay away from their loved ones, and being forcibly disconnected from their social circles and from school impacted their psychosocial health. As indicated in the review, the breakdowns in social networks, neighbourhoods and local economies seemed to have made them more vulnerable to emotional distress when floodwaters eventually receded, power was restored, buildings were repaired and daily routines resumed. Many children struggled to reconnect, finding it difficult to concentrate, do schoolwork and sleep. Many reported a fear of leaving home for school, fearful that something would happen to them or their families.

Analysis of the data collected indicated that 100 per cent of all children interviewed in August 2018 experienced interrupted education during the monsoon

season in Kerala. At the time of data collection, the longest reported period of interrupted education was one month, across all three age group categories. The majority of students interviewed expressed sadness regarding separation from their friends during the flooding, and happiness at being reunited with their friends when they were able to safely return to school.

Of the 95 children who were interviewed, two from group one shared their experiences of household relocation due to flooding, and one child in group two experienced household relocation due to flooding. No children in group three reported household relocation.

Pre-flood, many children in group one reported playing games such as hide and seek and running, while the older children in group three reported mobile and social media usage more frequently. Social media activity increased by 300 per cent between pre- and post-flood conditions. Students were engaged with their mobiles more frequently to view media reports about flooding.

Post flood, there was a significant decrease in outdoor activities. There were many reports of children across all groups adapting typical play to their impacted environments. For example, some children reported playing cricket and football pre-flood, and indoor cricket post flood. One explanation of the significant change in activities pre- and post-flood would be due to those children experiencing forced household relocation due to flooding.

Our most significant finding was that group two reported a 100 per cent impact on their activities post flooding. In group one, nearly 90 per cent of all respondents experienced impacts on activities, with nearly 60 per cent of group three's activities impacted due to flooding. This suggests that the 8–11 age group of children are the most vulnerable to the impacts of natural disaster.

One of the more concerning reports came from an 8-year-old boy; before the flooding he reported playing typical popular games such as football, cricket, badminton and arts and crafts. He was the only respondent who reported his post-flood activities as “making a paper boat to play in the flooded waters that surrounded his home and community”. A similar report came from a 6-year-old boy. Before the flood, this boy reported his favourite activities as the popular games

listed above. After the flooding, he named playing in the flooded water as one of his main activities. The researchers of this paper are concerned about the possible future health complications of playing in contaminated flood water, and made note of this at the time of observation.

In group two, there were reports of change in activities, suggesting a loss of childlike innocence after this natural disaster in their community. One 11-year-old boy whose father was a fisherman reported being engaged in popular outdoor games pre-flood such as football and cricket. After the flooding, he reported fishing as his go-to activity, which was interesting as he took on his father's profession. Another 11-year-old boy whose father was also a fisherman engaged in similar activities pre-flood. He also provided an unusual report in the form of “helping his parents” as his post-flood activity. This may indicate an accelerated rate of maturation due to the increased responsibility required to support the family during a time of calamity.

All three age groups discussed the severity of flooding in their respective communities throughout the interviews. Many mentioned the depth of the water, with children pointing to areas of their bodies where the water level reached, often knee-deep in many locations. As a first-hand observer interviewing a group of three children in group two, one of the most challenging interactions was questioning one particular child to describe the experience of witnessing their home's complete destruction in front of their very eyes. The children in this group who were interviewed expressed their hopes and desires of being able to return to these homes eventually, to the comforts of their family environments.

Limitations and Further Research

The data collection process was impacted when the research team was emergency evacuated from the base camp in the village communities due to flooding. The unpredictable monsoon flooding in the area was the most significant impact affecting our research project, and all subjects interviewed throughout the data collection period. It would have been beneficial to have more time and resources to spend with the children in their home communities to understand the

depth of the impacts of the flooding on the research subjects. As we were unable to gather further data from more children and schools, one limitation of our research study would be the inability to accurately make statistical generalisations of the impact of flooding on many rural communities affected in the area. Regarding the qualitative explanations of impacts that children provided during the interview process, additional time and resources would have allowed for deeper understanding of the interview subjects in assessing further psychosocial impacts.

Throughout the data collection process, one method used to assess the psychosocial impacts of flooding was the creation of artistic drawings related to water. Further research could include psychological analysis of the drawings collected to determine further conclusions about mental health implications. Regarding the older children interviewed in group three, one way to further assess social media usage around flooding and natural disasters would be to analyse social media habits to determine if the significant increase in usage was directly related to following up with family and loved ones, as hypothesised by the research team. Additionally, future studies could include data collection regarding the health implications of children playing in flooded water in their communities. This could be studied to gain a greater understanding of five and ten years' worth of impacts on the children's future health and well-being as flood victim survivors. From a meta perspective, the findings of this paper could be compared with other findings of short- and long-term natural disasters occurring around the globe. Further research should explore how to integrate that in a more holistic approach to disaster relief, addressing the key points of the Sendai Framework (Mohan and Menon, 2016).

Conclusion

This research has focused on the social and physical impacts on children in the flood-affected area of Kuttanad region in Alappuzha district in Kerala, India. It is evident from the research that children between the ages of 4 and 15 who are flood victim survivors are

significantly impacted in the areas of their physical activities and well-being. Our research determined particular impacts on lifestyles, such as regular access to education and friendship bonds that are formed in institutional environments. Of the age categories that were studied, it is clear that children between the ages of 8–11 are most significantly impacted, as 100 per cent of all respondents reported changes in their pre- and post-flood daily activities. As a final note, our research team would like to acknowledge the resiliency and resourcefulness of the communities we encountered during our study at this difficult time in their state's history.

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Disability and Disaster

Inclusion of Physically and Mentally Challenged Persons in Disaster Risk Reduction and Management

Priti Dilirao Pohekar^a

ABSTRACT: Disability itself is a disaster particularly in the low and middle income countries. Vulnerable is always a victim of the situations. An attitude towards disability is very unfair in the developing and undeveloped countries. There is a huge gap and discrimination with the people with disability which starts from access to daily needs and services and continues up to education, job and earning facilities even though the governments have many more policies and efforts undertaken for mainstreaming the vulnerable. Discrimination in accessing human rights is experienced very commonly.

About inclusion of disabled person in disaster management effort, the Disaster Management Act, 2005 is silent. National Disaster Management Policy, 2009 and National Disaster Management Plan, 2016 have proposed provisions for rescue of disabled person. The both documents stress on priority in rescue of disabled persons; but, rescue and relief is not sufficient in disaster management. Rights of Persons with Disability Act, 2016 make a provision for auditing of disabled persons for the first time. Section 8(3) of the Act mandates to the district authority to maintain record of details of persons with disabilities in the district and take suitable measures to inform such persons of any situations of risk so as to enhance disaster preparedness. Section 8(1) of the Act makes a provision, “..the persons with disabilities shall have equal protection and safety in situations of risk, armed conflict, humanitarian emergencies and natural disasters.” Off course, protection, safety and rescue are important. But the same is silent on preparedness.

After Hyogo and Sendai Framework the world paradigms of disaster management are shifted to disaster risk reduction from relief and rehabilitation.

Yokohama Strategy, 1994, Hyogo Framework, 2005, Sendai Framework, 2015 and Sustainable Development Goal, 2015–30 any of these international efforts or Disaster Management Act, 2005, National Disaster Management Policy, 2009, National Disaster Management Plan, 2016 and Rights of Persons with Disability Act, 2016- any of national documents have not given a ray on disaster education, capacity building or empowerment and resilience of disabled person in disastrous situation. In the 2030 agenda for sustainable development ‘Persons with disabilities’ or ‘disability’ are specifically mentioned eleven times and ‘Persons in vulnerable situations’ are specifically mentioned six times. But the document is not sufficient for inclusion of disabled persons in pre-disaster management.

This paper focuses on the both aspects; (1) When disaster occurs does disabled person given a priority in rescue and relief in practice? (2) There are many more categories under disability, how it is possible to provide disaster education and training to disabled person? How capacity building and empowerment of a disabled person for disaster is made?

Physical disability, Intellectual disability, Neurological disability, mental disability, Mental behaviour, Multiple Disabilities are the specific categories of disability, several types come under each category, e.g.

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locomotor disability, visual impairment, hearing impairment, speech and language disability are the types of Physical disability. It is not possible to adopt the same method of education and training for each category. This paper gives suggestions for each category separately.

KEYWORDS: disability, inclusion disaster management, visual and hearing impairment, challenges, disaster risk reduction, disaster management

Introduction

Disability itself is a hurdle in living and surviving. In developed countries situation is better than developing or under-developed countries. The vulnerable are always a victim of adverse situations. The attitude towards disability is very unfair in the developing and undeveloped countries. There is a huge gap and discrimination against disabled persons which starts from access to daily needs and services and continues up to education, job and earning facilities even though the governments have many more policies and efforts undertaken for mainstreaming the vulnerable. Discrimination in accessing human rights is experienced very commonly.

It is not that no government is keen on disability-related issues. Many acts and policies try to include disability in their development plans. But it observed that disabilities are often excluded from emergency planning and programming by governments.

About inclusion of disabled persons in disaster management efforts, the Disaster Management Act, 2005 is silent. National Disaster Management Policy, 2009 and National Disaster Management Plan, 2016 have made provisions for rescue of disabled persons, but rescue and relief is not adequate in disaster management. The concept of disaster management has a paradigm shift from the erstwhile relief-centric response to a proactive prevention, mitigation and preparedness-driven approach for conserving developmental gains and for minimising loss of life, livelihood and property.¹ It has phases of and risk reduction, preparedness, response and recovery-immediate restoration to build back better. According to Sendai Framework its priorities are, understanding disaster risk, strengthening disaster risk governance, investing in disaster risk reduction for resilience and enhancing disaster preparedness for effective response and to “Build Back Better” in recovery, rehabilitation and reconstruction.² The conceptual

expansion of disaster management is inclusive and leads ‘Leaving no man behind’. Inclusion of physically and mentally challenged persons in DRR has been focused upon after 2013.

Disaster creates a new generation of survivors with physical, sensory and psychosocial impairments.³ When one person is killed in disaster, another three are injured or left with impairment. Aging and disability are linked with each other, and many persons develop disabling conditions as they age including limited mobility, low vision and hearing difficulties.

This paper deals with the effects of disaster on physically and mentally challenged persons and their inclusion in disaster risk reduction and management. It focuses on physically and mentally challenged persons by birth or after birth, and those due to disaster or aging.

Meaning of Disability

Disability is a physical or mental condition that limits a person’s movement, sense or activity. According to the Washington Group, disability, as an umbrella term, refers to problems such as impairment, activity limitation or participation restrictions that indicate negative aspects of functioning.⁴ It is defined as a condition or function judged to be significantly impaired relative to the usual standard of an individual or group. Disability is conceptualised as being a multidimensional experience for the person involved. There may be effects on organs or body parts or minds.⁵ The *Cambridge English Dictionary* defines disability as the state of having an illness, injury or medical condition that makes it difficult to do the things that other people do.⁶ Disability is an evolving concept, capturing the interaction between those with a long-term physical, mental, intellectual or sensory impairment and societal barriers hindering their full and effective participation.⁷

Table 1: Classification and Types of Disability⁸

No.	Classification of Disability	Type of Disability	Sub-type of Disability
1	Physical disability	Locomotor disability	1) Leprosy-cured person 2) Cerebral palsy 3) Dwarfism 4) Muscular dystrophy 5) Acid attack victims
		Visual impairment	1) Blindness 2) Low vision
		Hearing impairment	1) Deaf 2) Hard of hearing
		Speech and language disability	--
2	Intellectual disability	Specific learning disabilities	--
		Autism spectrum disorder	--
3	Mental behaviour	--	--
4	Disability caused due to	Chronic neurological conditions	1) Multiple sclerosis 2) Parkinson's disease
		Blood disorder	1) Haemophilia 2) Thalassemia 3) Sickle cell disease
5	Multiple disabilities	--	--

Types of Disability

The Rights of Persons with Disabilities Act, 2016 in India has classified the types of disability under main categories, which are indicated in Table 1.

Social Attitude Towards Disable Persons

The vulnerable are always a victim of adverse situations. The attitude towards disability is very unfair in the developing and undeveloped countries. Disabled persons are looked upon as a burden in any society.⁹ There is a huge gap and discrimination in India against disabled persons. Discrimination in accessing human rights is experienced very commonly. The Indian society for a long time was behind in inclusive education and inclusive professions. Very slowly it is experiencing the ailments, feelings, emotions,

needs and problems of the disabled. In earlier days, with respect to some disabilities, such as leprosy-cured person (LCP), cerebral palsy (CP) and multiple disabilities, the affected person was either killed or left to die very commonly. Thankfully in the era of protection of human rights, disability is given special attention by the UNO and the rest of world. A normal man slowly has started to open the doors of the world of disabled persons and include them as a part of the whole society, though the conditions are not yet best, but definitely better than previous. The RPD Act is a safeguard of the right of persons with disabilities to live in the community.

The World Report on Disabilities¹⁰ estimates that 15 per cent of the global population experience disabling conditions. The number of persons with disabilities is expected to rise in the next decades due to a range of factors, including the increase in natural and human-induced disasters.¹¹

Problems Faced by Disabled Persons

The United Nations (United Nations Office of Disaster Reduction, UNISDR) pointed out that people with disabilities are disproportionately affected “due to a range of factors including exclusion from decision-making processes, often poor living conditions, inadequate infrastructure, income inequality or undiversified sources of income, and limited access to basic services, especially education and information”.¹² Together these individual, environmental and societal elements interact to produce negative outcomes for many people with disabilities. They face inequalities in access to education, health care conditions, employment and sustainable livelihoods, asset accumulation and opportunities for social, civic and community participation.¹³ Societal stigmatisation, poor housing facility and very low possibility of getting a life partner are the other problems faced by physically and mentally challenged persons.

In India, as per the 2001 census, there are around 2.19 crore disabled people, constituting 2.13 per cent of the total population of the country.¹⁴ In 2011 out of the 121 crore population, 2.68 crore persons were estimated to be disabled, which is 2.21 per cent of the total population.¹⁵ However, this figure can be estimated to be lesser than the actual number due to large-spread and prevalent under-reporting. It illustrates that nearly 3 per cent of the population live with disability and are not included in disaster management policy-making.¹⁶

Need for Disability-Inclusive Disaster Management

Basically, a person with disability (PWD) is distracted physically, socially and economically. Commonly such people are likely to be left behind or abandoned during evacuation in disasters and conflicts. Persons with disabilities face unique challenges during every stage of emergency and disaster management due to inaccessible warnings, evacuation, response (including shelters, camps and food distribution) and long-term recovery efforts.¹⁷ It has been observed that the shelters and rescue camps are not easily accessible to persons with disabilities; they may be unable to easily access food and water distribution centres. The volunteers or

other rescue operators are unaware of how to respond to their needs. This situation heightens their vulnerability in a disaster or emergency situation. Another factor is that injury in disaster causes physical and mental disability. The percentage of injury is thrice that of fatality in any disaster. Injury may bring impairment in vision/hearing/speech or loss of any body part or it can result in brain injury. A person faces post-traumatic stress, anxiety, depression and cognitive difficulties due to traumatic brain injuries, and many other psychological implications. Effective inclusion of disability in disaster risk reduction (DRR) could give relief to the large part of community.

There is no accurate area-wise data on classified disability. The paucity of statistical data on persons with disabilities and limited knowledge on how to respond to their needs are factors that heighten their vulnerability in a disaster or emergency situation.¹⁸ There has been a long-term negligence in including disability in disaster management. After 2013, the UN turned towards the issue. All the efforts made in this regard delimit up to rescue and relief. There is a lacuna of response, training, strengthening and capacity building, BBB and recovery of disability.

An inclusive approach to disaster risk reduction ensures the full and meaningful participation of all groups and individuals in identifying and reducing risk; promotes equality of rights and opportunities for them in the face of risk; appreciates and responds to their diverse characteristics, capacities and vulnerabilities; and contributes to resilience for everyone by removing barriers that keep excluded people out and transforms power relations.¹⁹

Disability and Disaster: A Few Experiences and Facts

A person with a physically and mentally challenged condition is always at high risk. It has been observed that the disabled person's life is at 80 per cent more risk than a normal person's life. A few incidents related to disability and disaster are as follows:

- According to the Indonesian Society for the Care for Children with Disabilities nearly 73 school children with disabilities were killed during the Indian Ocean Tsunami of 2004.²⁰

- Post Hurricane Katrina in 2005, many elderly individuals were found on wheelchairs and beds inside St. Rita's Nursing Home surrounded by floodwater.
- In Haiti, an estimated 1 million people with disabilities were affected during the 2010 earthquake, and falling buildings and other hazards caused spinal cord injuries and amputations that created new disabilities.
- In the Great East Japan Earthquake and Tsunami of 2011, the death rate of people with disabilities was two to four times higher than those without disabilities,²¹ and it was more than double that for the entire population.
- International relief organisations, including the International Federation of Red Cross and Red Crescent Societies, recognised that individuals with disabilities are ignored or excluded at all levels of disaster preparedness, mitigation and intervention. Emergency evacuation shelters did not appropriately respond to the functional needs of people with disabilities and the frail elderly.²² It has been observed that during disasters individuals with disabilities encounter disruption of support networks (which may be friends and family), loss and damage of assistive devices (e.g. wheelchairs), inaccessibility of emergency shelters and warning messages, and greater difficulty in accessing basic human needs.²³

Research Methodology

The very primary objective of this paper is to: (1) spotlight the current phase of inclusion of disability in disaster management (DM), and (2) provide a broad framework of effective policies, practices and strategies for inclusive disaster and emergency management.

The paper is based on primary and secondary data. Research articles, various international and national reports by advisory groups and discussion forums, acts, laws, policies, manuals and handbooks were very useful secondary resources. During September and December 2018, a survey was conducted to collect data. Table 2 shows the samples of the survey.

Table 2: Samples of Survey

No.	Type of Disability/Others	No. of Respondents
1	Visual impairment	5
2	Hearing impairment	2
3	Speech and language disability	3
4	Orthopaedic	5
5	Social activist (for disabled)	3
6	Tutor	8
7	Physiotherapist	2
8	Speech therapist	2
9	Total	30

The question set was prepared to gather information for the basic activities as well as for specific activities in the disastrous situation. It is made for the selected hazards: that is, earthquakes, floods, drought, tsunami, landslides, collapse of building, fire, road accidents, infectious diseases, bomb blasts and terrorist attacks. Samples are selected from all over Maharashtra.

Global Frameworks Supporting Disability-Inclusive Disaster Risk Reduction

UN Convention on Rights of Persons with Disabilities, 2008

The Convention on the Rights of Persons with Disabilities (CRPD) is the first international human rights treaty that specifically addresses the rights and freedoms of persons with disabilities. The CRPD was adopted by the United Nations General Assembly in 2006. The CRPD promotes the idea of universal design and accessibility. Importantly, CRPD Article 11 states that the State parties shall take, in accordance with their obligations under international law, all necessary measures to ensure the protection and safety of persons with disabilities in situations of risk, including situations of armed conflict, humanitarian emergencies and the occurrence of natural disasters.

UNISDR Survey on Living with Disabilities and Disasters, 2013

This is the first-ever global survey made of persons living with disabilities on how they cope with disasters. The results illustrated why they die, or are injured, in disproportionate numbers in disasters. It was conducted by the UN. Respondents were 5717 persons from all over the world. The most significant finding in the survey was that 85.57 per cent of the respondents from 137 countries stated that they have not participated in community disaster management and risk reduction processes in their countries because they have been excluded from the decision-making and planning of such processes. Around 72.20 per cent of the respondents said that they do not have a personal preparedness plan in the event of a disaster. Of the 29.29 per cent of PWDs who do have a personal disaster preparedness plan, the most important stated element of that plan is support from family. 50.94 per cent of respondents expressed a desire to participate in community disaster management and risk reduction processes.²⁴ Yet only 14.29 per cent of the respondents said that they are aware of a national disaster risk reduction plan in their countries.

Sendai Framework, 2015

The Third UN World Conference on Disaster Risk Reduction (WCDRR) 2015 held at Sendai, Japan, incorporated recommendation on a disability-inclusive disaster risk reduction framework and its implementation. The Conference itself initiated its recommendation by availing facilities to the physically challenged persons to attend the sessions. The venue and conference sessions were accessible to both participants and speakers with disabilities in attendance. Sign language interpretation was available on demand for various sessions. Venues provided wheelchair accessible transportation. Documents were in accessible format and blind participants were provided machines that displayed documents in Braille. Most significantly, thirty-four events addressed various issues related to disability, whereas more than 200 persons with disabilities actively participated as delegates, speakers, panelists or contributors.²⁵ People with disabilities presented their own expertise in disaster risk reduction (DRR).

SDGs 2015–2030

In the agenda for Sustainable Development Goals (SDGs), 2015–2030, persons with disabilities or disability are specifically mentioned eleven times and persons in vulnerable situations are specifically mentioned six times. But the document is not sufficient for inclusion of disabled persons in pre-disaster management.

Charter on Inclusion of Persons with Disabilities in Humanitarian Action, 2016

The 2016 World Humanitarian Summit endorsed a Charter on Inclusion of Persons with Disabilities in Humanitarian Action which pledged to place people with disabilities at the centre of humanitarian response, and to ensure they receive protection and assistance without discrimination.²⁶

Although the rights and needs of people with disabilities in disasters are increasingly being addressed through policies, standards and guidelines, much more needs to be done to remove the barriers to their inclusion in disaster risk reduction (DRR) and response.

Efforts Made in India

The National Disaster Management Policy, 2009 and the National Disaster Management Plan, 2016 have made a provision to provide assistance to PWD in rescue operations. There is no provision made for capacity building.

National Disaster Management Policy, 2009

The National Disaster Management Policy (NPDM) recognises, “Within the vulnerable groups, elderly persons, women, children - especially women rendered destitute and children orphaned on account of disasters and the differently abled persons are exposed to higher risks.” One of the objectives of the policy is “ensuring efficient response and relief with a caring approach towards the needs of the vulnerable sections of the society”.²⁷ Hence, there is a broad mandate to cover the needs of persons with disabilities.

Rights of Persons with Disability Act, 2016

As per Section 8(1) of the Act, “The persons with disabilities shall have equal protection and safety

in situations of risk, armed conflict, humanitarian emergencies and natural disasters. (2) The National Disaster Management Authority and the State Disaster Management Authority shall take appropriate measures to ensure inclusion of persons with disabilities in its disaster management activities as defined under clause (e) of Section 2 of the Disaster Management Act, 2005 for the safety and protection of persons with disabilities. (3) The District Disaster Management Authority constituted under Section 25 of the Disaster Management Act, 2005 shall maintain record of details of persons with disabilities in the district and take suitable measures to inform such persons of any situations of risk so as to enhance disaster preparedness. (4) The authorities engaged in reconstruction activities subsequent to any situation of risk, armed conflict or natural disasters shall undertake such activities, in consultation with the concerned State Commissioner, in accordance with the accessibility requirements of persons with disabilities.”

According to Section 9(1), “No child with disability shall be separated”.

These provisions are welcoming but not enough for response, capacity building and BBB. Dr. Manmohan Singh, ex-Prime Minister of India, has rightly stated that investing a rupee in preparedness is saving money invested in relief, rehabilitation and reconstruction. For every one euro spent on disaster reduction, four to seven euros are saved in disaster response.²⁸

Findings

Post-DRR efforts have a motto to include all and not to leave behind anyone from DRR. The documents are trying their best; what happens in the field is a question. This study accordingly has undertaken to find out whether these efforts are adequate for capacity building of disabled persons. The result of the survey made for this research discloses that 96.3 per cent of the respondents say that they are not aware of any act, policy or plan of disaster management or aware of inclusion of disability. Only a single person who is aware of it is a social activist. This pinpoints that no PWD respondent is aware. All the respondents told that they do not have any personal preparedness plan to save their lives. Almost 100 per cent responded that they are never included in disaster management policy framing

or planning. Only 3 per cent of the respondents believe that they could be preferred in rescue operations. As community treats them as an unimportant creature, they will not allow fighting to save their lives.

Around 66.66 per cent of the respondents told that they have heard about disaster management training. They have never thought of getting such type of training. They underestimate their self and feel that they are not able to acquire knowledge or training. They don't have any knowledge on how to release from emergency. All the respondents agree that PWD could not evacuate in any hazardous condition. Out of 10 visual, hearing and speech-impaired respondents, 90 per cent agreed that they can be evacuated with the help of others. All the respondents show readiness to get training of disaster preparedness in practice but there is a language barrier. Overcoming the barriers to inclusion identified is clearly a major challenge, but there are indications that progress can be made through the implementation of rights-based approaches and by developing and applying indicators of inclusion in humanitarian and DRR interventions.²⁹ Their tutors and social media could play a significant role in giving them an alarm, if there is trust.

Around 36.3 per cent of the respondents believe that they can get equal resources and aids in shelters or relief centres. And almost 90 per cent of the respondents express a desire to participate in local disaster management and risk reduction plans and processes.

All respondents have the same opinion that their inclusion is kept behind at local as well as national level. They also suggested that they should be offered teaching theory and practice of DM.

Suggestions

The inclusion of physically and mentally challenged in DM is a broad concept. It is the inclusion of the community which is at most risk. In India persons with disabilities are not included absolutely in emergency planning. There is a lack of adequate accessible infrastructure for inclusive policy:

- Inclusive DM: The post-2015 DM has experienced a paradigm shift in inclusion. Even though absolute inclusion is not possible, yet its root causes must be identified and barriers to active participation be

addressed. Disabled persons should themselves express their needs in front of other people in the community.

- Auditing: All governments have accurate and comprehensive statistical data on persons with disabilities in their respective country. Auditing of disability must be done with the addition of mapping. Disability differs from person to person; disability problems are different for each person. Type-wise auditing will be useful for framing disability type-wise policy so that no one will be left behind. Mapping of vulnerability, marginalisation and impoverishment of disabled persons should be done to define evacuation routes and safe areas as per their requirement. The persons who are registered for census are able to get state assistance and welfare. Accordingly, rescue and evacuation resources could be kept ready in particular disaster-prone areas.
- Training: For visually impaired persons training manuals must transformed in Braille language. For hearing-impaired persons training manuals must transformed in sign language. For intellectually disabled person training must be given to their tutors, especially speech therapist, so that they can teach every student as per his/her margin of disability. DRR practitioners must furnish with the training method for disability.
- Participation in DRR plans: PWDs must participate actively in the DRR plan and programme. The programme must be planned as per the needs of disabled persons. Representation to disabled persons and disabled people's organisations should be given in the disaster planning committee or decision-making bodies. Tutors and trainers must inform them their rights and roles in DRR.
- Disability organisations and special schools: Disability organisations and special schools can play an important role in framing disaster policy and plan. Tutors in special schools must train for DM so that they could teach it to the special students as per required style and method. A few special schools and organisations should take an initiative in organising DM training programmes.
- Shelters and rescue camps: Shelters and rescue camps must be accessible to the disabled persons. Minimum needs like medicine, health, food and clothes should be accessible.
- Budget: There must be a separate budget for DM training for disabled persons at the municipal level.
- Participation and response by the disabled person: Physically disabled persons must come ahead to take training, even though mentally challenged will not come at their own. Physically challenged persons can think and express which mentally challenged cannot do so properly. If training manuals are framed in their required language and style and consideration is given to their disabled organ/body part (such as disabled with arm, leg, eye, ear etc.), in that case they could participate and get training.
- Political support: A strong political willingness is needed for inclusive DM policy and plan along with its systematic implementation. Accordingly, the National Disaster Management Authority (NDMA) and the National Institute of Disaster Management (NIDM) must initiate and compel governments to do it. Governments must try to mainstream disability into all development programmes.
- Awareness among stakeholders: All stakeholders must change their mindset for inclusive DM. They must support for inclusion of disability. Whoever is trained should try to train physically and mentally challenged persons. Multi-storied building must be disabled-friendly. Public places and buildings must be equipped with ramps and important instructions must be displayed in Braille language.
- Media: The alarms and warning must be displayed in Braille as well as in sign language.

Notes

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Abbreviations

1. UNISDR: United Nations Office of Disaster Reduction
2. PWD: Person with Disability
3. CRPD: Convention on the Rights of Persons with Disabilities
4. DM: Disaster Management
5. P&MC: Physically and Mentally Challenged
6. NDMA: National Disaster Management Authority
7. NIDM: National Institute of Disaster Management
8. DRR: Disaster Risk Reduction
9. NPDM: National Disaster Management Policy
10. WCDRR: World Conference on Disaster Risk Reduction
11. LCP: Leprosy-Cured Person
12. CP: Cerebral Palsy

Safeguarding People with Disability at Kumbh Mela (The Festival of the Sacred Pitcher)

Kakoli Saha^a and Rachna Khare^b

ABSTRACT: Kumbh Mela (the festival of the sacred Pitcher) is an intangible cultural heritage whose origin dates back as early as the seventh century. It is the largest peaceful congregation of pilgrims on earth, during which participants bathe or take a dip in a sacred river. Because of its footfall, Kumbh Mela is always prone to man-made disasters such as a stampede or the outbreak of gastrointestinal diseases like cholera. Since pilgrimage in Hindu tradition is always seen as a form of penance and indeed even today imposed as punishment or relief for secular offences, persons with disability form a significant part of the pilgrims at Kumbh. This section of pilgrims suffers most during the stampede, like in a disaster, due to their movement restriction. In this paper, an attempt has been made to safeguard disabled people from disasters by mapping geospatial distribution of facilities and resources. Since *Purna* (full) Kumbh occurs every twelve years, recently held Kumbh of 2016 in Ujjain City, Madhya Pradesh, was taken as the case study event. Because the main purpose of the pilgrimage at Kumbh is to take a holy dip, the study was performed around a particular bathing *ghat*. The dynamic mapping will also help Kumbh authorities to plan for making Kumbh more accessible to people with disability, thus safeguarding them from potential disaster in large congregations. Moreover, the proposed technique may be adopted during other such religious events.

KEYWORDS: disability, disaster, kumbh mela, GIS

Introduction

Kumbh Mela (the festival of the sacred pitcher) is the largest peaceful congregation of pilgrims on earth, during which participants bathe or take a dip in a sacred river (Representative List of the Intangible Cultural Heritage of Humanity, 2017, UNESCO). Allahabad, Haridwar, Ujjain and Nasik (Fig. 1) are the locations for Kumbh Mela, and millions of people irrespective of caste, creed or gender attend the event. As it is held in four different cities in India, it involves different social and cultural activities, making this a culturally diverse festival.

Kumbh Mela has been more or less continuous since the Gupta period from the fourth to the sixth century (Merhotra and Vera, 2015). Perhaps the first historical description of a great mela in this region was in 643 CE, written by the Chinese Buddhist monk Hsuan Tsang, who had travelled to India to find Buddhist sacred texts. The first modern Kumbh Mela was likely in 1870 (Merhotra and Vera, 2015). Since the mid-nineteenth century, the festival has expanded in size and scope. Owing to its importance to Indian culture and the culture as a whole, UNESCO has inscribed 'Kumbh Mela' on the Representative List of Intangible Cultural Heritage of Humanity during its 12th session,

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held at Jeju, South Korea, from December 4 to 9, 2017. Kumbh Mela plays a central spiritual role in the country, exerting a mesmeric influence on ordinary Indians. The event encapsulates the science of astronomy, astrology, spirituality, ritualistic traditions, and socio-cultural customs and practices, making it extremely rich in knowledge. Its primary bearers, however, belong

to akhadas and ashrams, religious organisations or individuals living on alms. The teacher-student relationship of the sadhus in the ashrams and akhadas remains the most important method of imparting and safeguarding knowledge and skills relating to Kumbh Mela (Representative List of the Intangible Cultural Heritage of Humanity, 2017, UNESCO).

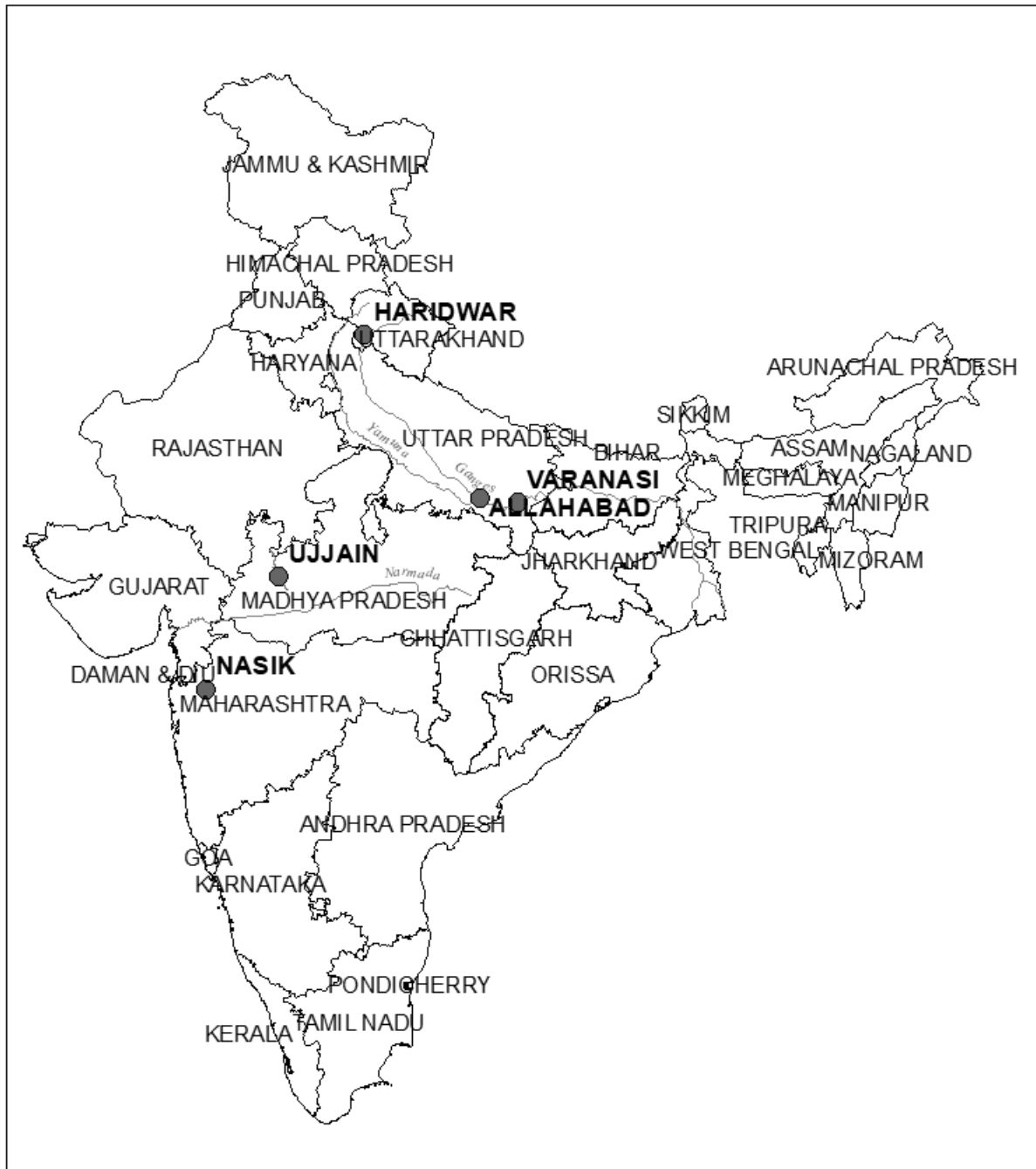


Figure 1: Locations of Kumbh Mela

Since pilgrimage in Hindu tradition is always seen as a form of penance and indeed even today imposed as punishment or relief for secular offences, persons with disability and the aged form a significant part of the pilgrims at Kumbh Mela. Persons with disabilities can be all persons who, owing to the environment being encountered, suffer a limitation in their relational ability and have special needs during travel, in accommodation and other services, particularly individuals with physical, sensory and intellectual disabilities or other medical conditions requiring special care, such as elderly persons and others in need of temporary assistance (UNWTO Manual, 2005).

The most recent Kumbh Mela took place from April 22 to May 21, 2016 in Ujjain with an estimated attendance of 75 million people. Because of the influx of millions of pilgrims, Kumbh Mela is always prone to man-made disasters. A disaster is a sudden, calamitous event that seriously disrupts the functioning of a community or society and causes human, material, and economic or environmental losses that exceed the community's or society's ability to cope using its own resources. Though often caused by nature, disasters can have human origins (IFRC). Merhotra and Vera (2015) have listed disaster risks at Kumbh in their book 'Kumbh Mela: Mapping the Ephemeral Megacity'. According to them, the biggest risk is fire, as everything is flammable, including frames and fabric of the akharas' tents and of course everyone's clothing. Among fuel sources, LPG is particularly flammable and not well regulated. Similarly, wet and slippery bathing ghats pose a risk of disaster. If there is a tragedy on a ghat, there is a chain reaction and people slip in. There is also a risk of stampedes at bottlenecks, where the input end is much smaller than the output end. The 1954 Kumbh Mela stampede has been the deadliest since India's independence, with an estimated 1000 deaths. The 2003 Kumbh Mela stampede killed 39 people in the city of Nashik, and seven were killed during the 2010 Kumbh Mela in Haridwar. Most recently, in the 2013 Kumbh of Allahabad, 42 people were killed and 45 people were injured due to stampede. Temporary bridges or platoon bridges can oscillate and become turbulent due to crowd rhythms, water movement or both. This may lead to mass drowning. Outbreak of gastrointestinal diseases due to the potential water and food contamination is also a potential threat at

mass gatherings like Kumbh. If any or multiple of these disasters happen, persons with disabilities are the most vulnerable lot, and their vulnerability increases in disaster situations. Given most people with disabilities are less able to flee to safety from disaster, they are probably disproportionately represented in the death toll. Following a disaster, the WHO estimates 5–7 per cent of people in camps or temporary shelters have a disability.

Addressing the special needs of disaster victims with disability and include them in the Kumbh's disaster management approach is the need of today. For that purpose, the meticulous attention to detail, from layout and geospatial distribution of facilities to resources, need to be mapped on a dynamic basis in response to ground-level clientele feedback. To learn from previous disasters, planners of Kumbh mela need to benefit from accessing the repository of past experiences. Unfortunately, due to periodic transfers of key appointment holders and inadequate record keeping of earlier kumbhs, there are no written manuals, work plans or codes of operation of previous Kumbh Melas (Merhotra and Vera, 2015). The present paper discusses how geospatial technology has been used to document facilities and amenities at the recently concluded Kumbh Mela of 2016 in Ujjain. Given the spatial expansion of Kumbh Mela, the study was limited to a bathing ghat only, where maximum footfall happens.

Background Study

Scholars have studied Kumbh in different perspectives. While some studied the origin and history of Kumbh (Bonazzoli, 1977, Dubey, 2001, Lochtefeld, 2004), some focused on utilisation of 'space' at Kumbh (Dubey, 2001, Maclean, K. 2001). A few scholars like Bagchi et al. (1967) and Sharma et al. (2012) studied health and sanitation factors of the Kumbh. Scholars like Maclean (2008, 2009) and Maheshwari (2009) studied Kumbh from the perspective of pilgrimage and tourism. Some scholars studied Kumbh in a holistic manner (Lochtefeld, 2004, Mishra, 2004). While Narain et al. (2010) dealt with the concept of spirituality associated with Kumbh, Merhotra and Vera (2015) discussed planning and architecture of Kumbh Mela, considering Mela as a "virtual mega city." Besides scholarly articles

and books, several films and videos have been made on Kumbh (Entering the extraordinary world: Initiation Rites Video, 2012; IRHA Symposium. Parts 1,2, and 3, 2011; Kumbh Mela. Michelangelo Antonioni, 1989; Kumbh Mela: Songs of the River, 2005; Kumbh Mela: walking with the Nagas. 2008; River of Faith, 2013; Short Cut to Nirvana: Kumbh Mela, 2004; worshipping at Kumbh Mela, 2013).

On the other hand, Indian people with disability as a disaster victim have been studied in the context of both natural and man-made disasters. The UN estimates that as a result of the tsunami of 2004, a 20 per cent increase in the number of people with disabilities happened. A third to half of all people affected by disasters suffer from mental distress. The earthquake in Kashmir in 2005 clearly demonstrates how people with disabilities end up as the worst victims of disasters, due to neglect in all phases of post-disaster initiatives. Moreover, a study of hospitals in Baramulla, Uri and Srinagar revealed that the nature of injuries that were being reported clearly indicate that in the coming days, there would be a big rise in the number of disabled people in the valley, besides further complications in the existing disability cases. Most of these injuries were caused by dislodged objects; there are cases of compound fracture that may get complicated, and some of the victims may even need amputation. The truth that appears after the above studies is that the real problems of people with disabilities are neither properly understood nor adequately

responded to by governmental, non-governmental and international agencies. The mechanisms for disaster management, disaster preparedness and relevant administrative structures are grossly inadequate. So far no study has been done to safeguard pilgrims with disability at Kumbh.

This paper presents how geospatial technology has been used to document facilities and amenities at Kumbh Mela of 2016 in Ujjain. Documentation done on a GIS platform is better for understanding and analysing spatial organisation of the characteristic features of the Kumbh. Geospatial maps will help organisers plan future Kumbh Melas more efficiently.

Study Area and Data Uses

The study has been conducted during the recent Kumbh Mela held in the Ujjain city of Madhya Pradesh (Fig. 2).

For the purpose of the Mela, approximately 3000 hectares of the area were acquired around river Kshipra (Fig.2). Given the spatial expansion of the Mela area a small test area has been selected (Fig.2). Since bathing/taking a holy dip is the most important ritual of Kumbh pilgrimage, an area around the bathing ghats, namely Ram Ghat, Narsingh Ghat and Chintamon Ghat, was selected for the purpose of the study. These ghats record the maximum number of footfall during the Kumbh.

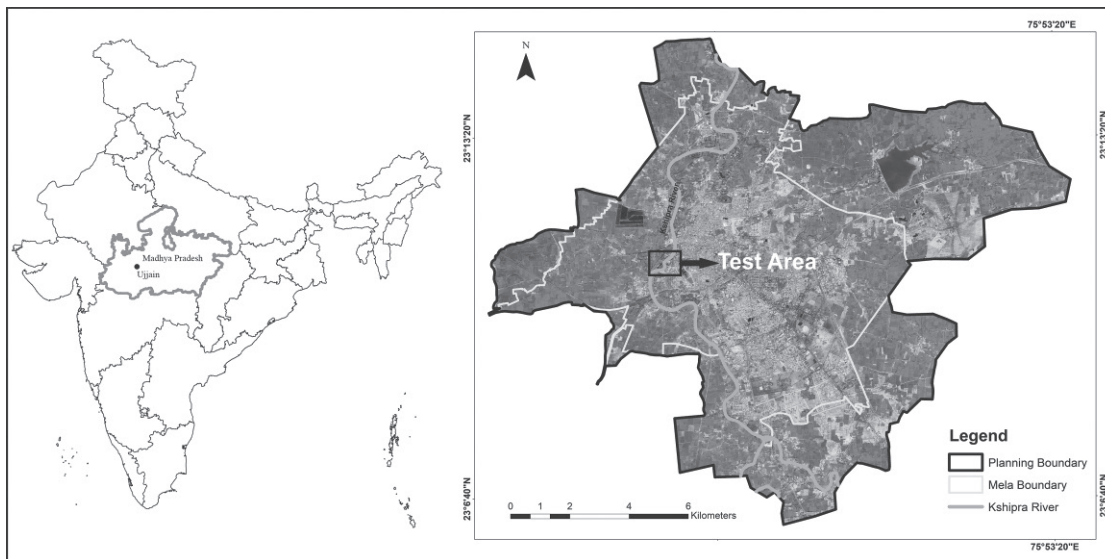


Figure 2: Location of Ujjain city and location of Mela boundary within Ujjain city

Data

Two satellite images acquired by a Linear Imaging Self-Scanning (LISS) IV sensor have been used in this research. One image was acquired on December 25, 2012, and another was acquired on April 8, 2016 (Fig. 3).

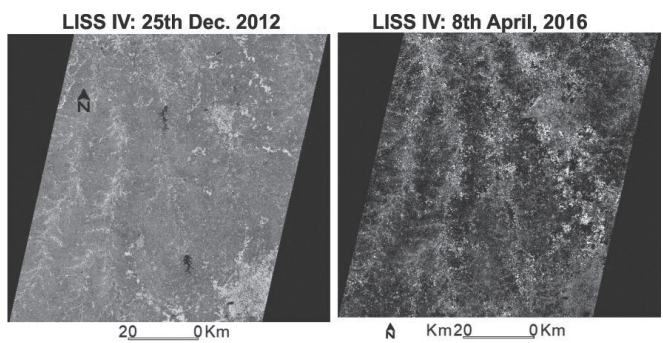


Figure 3: LISS IV data of temporal resolution

The time gap or temporal resolution of the images gives an idea about the spatial expansion of Ujjain city as well as of the study area. Other specific information about the data is given in Table 1.

Table 1: Details of Satellite Images used

Coordinate System	UTM, Datum-WGS1984.
Satellite ID	IRS-R2
Spatial resolution	5.8m
Lower-left corner	23.402000N,75.223000E
Upper-right corner	22.639000N, 76.045000E
Spectral bands (band width)	B2: Green (520–590µm), B3: Red (620–680 µm), B4: Near-infra red or NIR (770–860 µm)

Apart from satellite images, a detailed base map of the test area is also prepared on the GIS platform (Fig. 4).

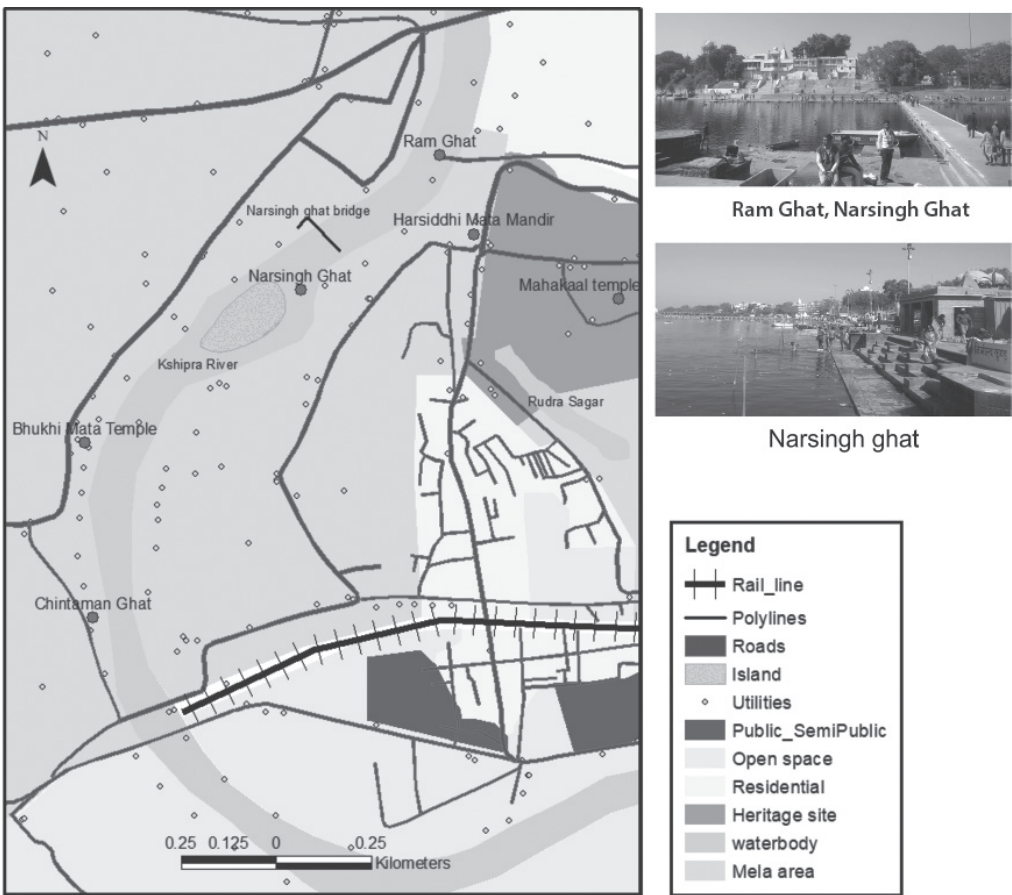


Figure 4: Detailed base map of the test area

Methodology

In this research, an approach of geospatial documentation and analysis was taken to safeguard the disabled from potential hazards at the Kumbh Mela. Since taking a holy dip is the most important event at the Kumbh, a bathing ghat and its adjacent area were taken as the test area. The assessment analysis was performed through several steps such as (1) temporal analysis of the test area, (2) construction of a flowchart showing activity chain in the test area, (3) documenting available facilities and amenities during the Kumbh in the test area using the Global Positioning System (GPS) and (4) spatial representation of GPS-collected data.

Temporal Analysis of Test Area

For the purpose of temporal analysis of the test area satellite images of temporal resolution were acquired (Fig. 5). False-coloured images were derived from satellite images and healthy vegetation is represented through the bright red colour. The image of 2012 shows the presence of agricultural fields on the west side of the Kshipra river. The 2016 image was taken just before the Kumbh and it can be seen that all agricultural lands were acquired for constructions of the Kumbh.

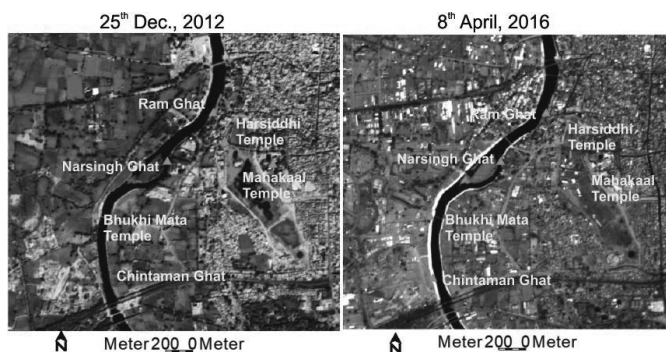


Figure 5: Temporal analysis of the test area

Construction of Flowchart Showing Activity Chain in Test Area

To understand services and amenities provided in the ghat area first an activity flowchart is constructed (Fig. 6).

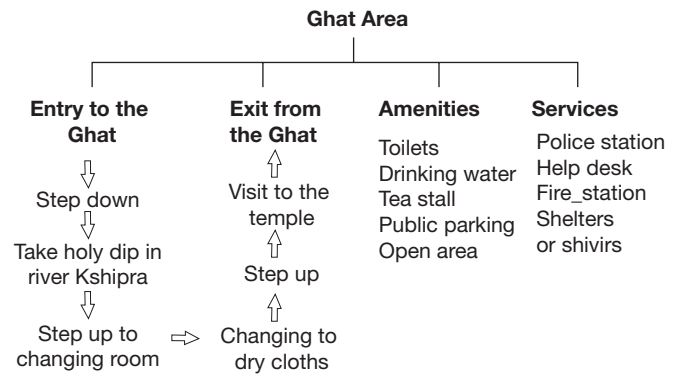


Figure 6: Activity flowchart of pilgrims in the test area

Documenting Available Facilities and Amenities During Kumbh at Test Area Using Global Positioning System (GPS)

On the basis of the activities chart constructed activities are classified into three categories such as: (i) activities related to taking a dip in Kshipra river and offering *puja* at the temple, (ii) activities related to availing amenities, and (iii) activities related to availing services. A group of SPA (School of Planning and Architecture) professors visited the Kumbh site in Ujjain in 2016 before and during the Kumbh and recorded the facilities and amenities with GPS.

Spatial Representation of GPS-Collected Data

After collecting data through GPS, the data is transferred on satellite images of 2016 (Figs. 7 and 8). In the satellite images the major landmarks that pilgrims usually visit are also marked. There are three temples in the test area, namely Mahakaal Temple, Harsiddhi Temple and Bhukhi Mata Temple (Fig. 7). Pilgrims who come to river Kshipra to take a holy dip also visit these temples. Figure 7 shows the location of the major landmarks, exits, changing rooms and amenities along with corresponding photographs. According to the photographs in Fig. 7, exits are spacious enough for moving of a wheelchair-bound person. A map showing the location of the ghats, changing rooms, exits and temples will facilitate a pilgrim with disabilities to plan his/her visit. On the

other hand, the location of necessary amenities like toilets and drinking water on a map will help pilgrims to understand their proximity to those amenities. According to the photographs, toilets are not accessible by wheelchair-bound pilgrims, but can be accessed by pilgrims with other disabilities.

Figure 8 shows the location of major landmarks and services along with corresponding photographs. The

location of police stations, help desk and fire stations will help pilgrims with disabilities to understand the proximity to these emergency services. On the other hand, the location of shivirs (shelters) and open space will provide the information on places to take rest or refuge in during an emergency. The location of public parking areas near ghats shows access towards the ghats.

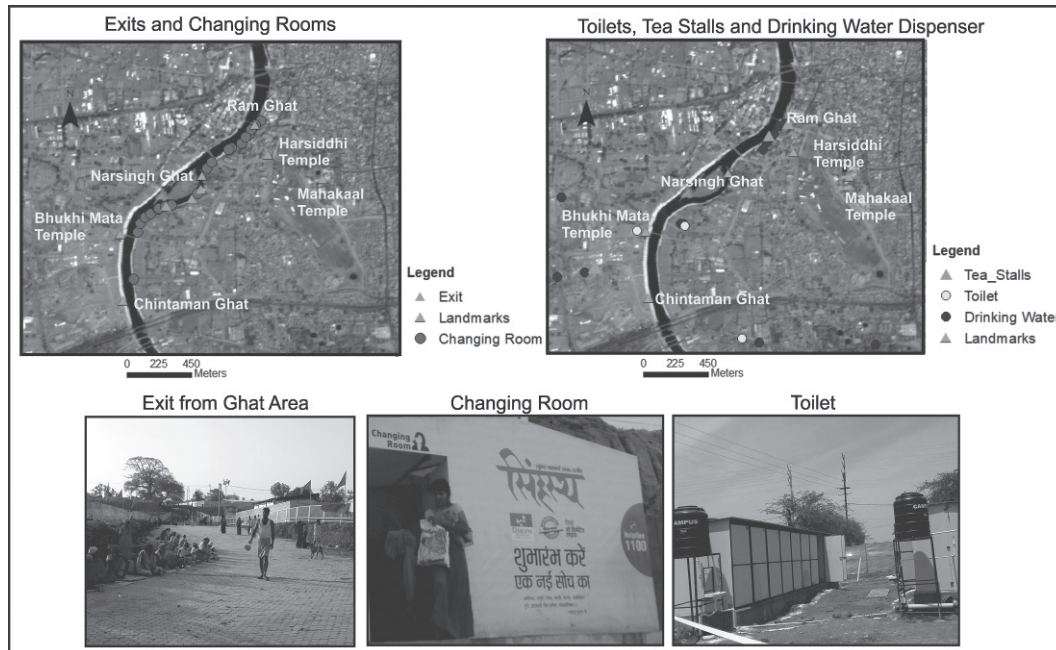


Figure 7: Location of exits from ghats and location of amenities around the test area.

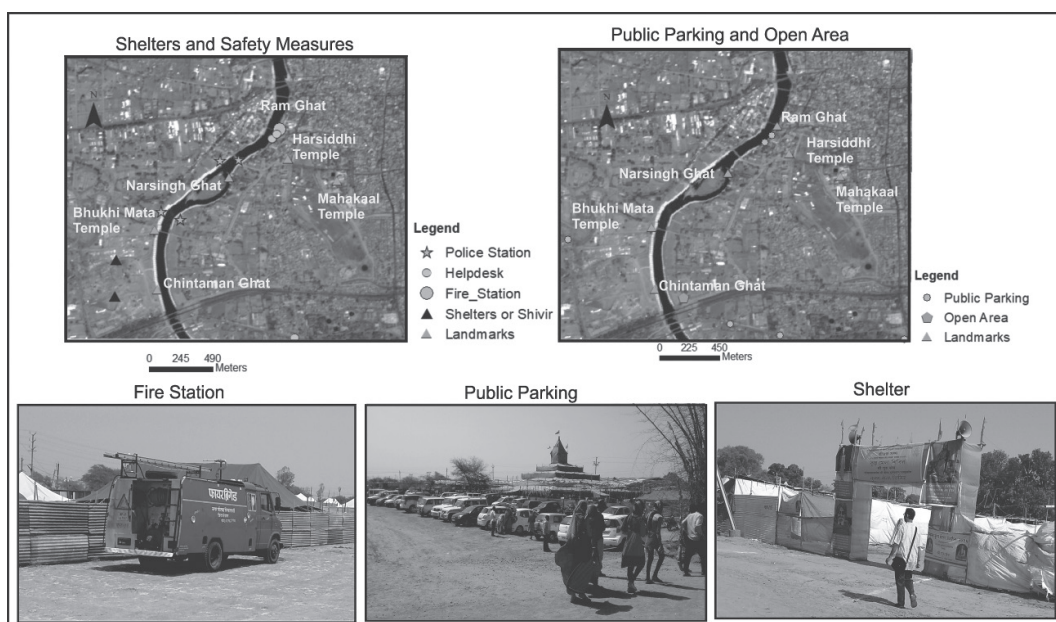


Figure 8: Location of facilities around the test area

Conclusion

Persons with disability form a significant part of the pilgrims at Kumbh Mela in India. Because of the influx of millions of pilgrims, Kumbh Mela is always prone to man-made disasters such as a stampede, outbreak of diseases, mass drowning and so on. If any disaster happens, pilgrims with disabilities end up as the worst victims of disasters. Addressing the special needs of disaster victims with disability and including them in the Kumbh's disaster management approach is the need of today. Unfortunately, due to periodic transfers of key appointment holders and inadequate record keeping of earlier Kumbh Melas, there are no written manuals, work plans or codes of operation of previous Kumbh Melas. This paper discussed how geospatial technology can be used to document facilities and amenities at Kumbh Mela of 2016 in Ujjain. Documentation done on a GIS platform are better for understanding and analysing spatial organisation of the characteristic features of the Kumbh.

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Disaster and Communities

The Interplay of Social and Economic Factors Shaping the Vulnerability of Communities to Natural Disasters: A Case Study of Alappuzha District, India

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ABSTRACT: Global warming disrupts the hydrological cycle and contributes to rising sea level, causing more devastating floods worldwide. There is a pressing need to develop disaster management policies in developing countries. As per the Sendai Framework, the first step is to understand disaster risk. This study explores the first steps to develop a field-based approach to understand disaster. Primary data were collected during the flood that devastated the Indian state of Kerala in 2018. It shows how socio-economic factors interact with each other and the environment in the studied community to shape its vulnerability. Using mixed-methods and a system thinking approach, this study proposes the outline of a dynamic approach to understand the vulnerability of places. Further research is needed to see if this approach could work in a different context. This pilot study should be expanded to a more holistic level, covering all priorities of the Sendai Framework.

KEYWORDS: disaster management, vulnerability assessment, community study, system thinking

Introduction

It is a widely accepted prediction that with global warming natural disasters will increase in number and scope/intensity (Mora et al., 2018). In developing countries where inequalities are high, disasters have a multiplied impact, directly affecting populations with long-term consequences.

The world agenda for disaster risk reduction is ruled by the Sendai Framework, which was signed in 2015, and sets priorities and targets until 2030 for UN member states to substantially reduce disaster risk and losses in lives, livelihoods and health, and in the economic, physical, social, cultural and environmental assets of persons, businesses, communities and countries (UNISDR, 2015).

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The Sendai Framework highlights four priorities for action: (1) understanding disaster risk, (2) strengthening disaster risk governance to manage disaster risk, (3) investing in disaster risk reduction for resilience and (4) enhancing disaster preparedness for effective response and to «Build Back Better» in recovery, rehabilitation and reconstruction. All four priorities are important, but the first goal is vital: in order to manage risk disasters, it should be understood in all its dimensions. It includes vulnerability, capacity, the exposure of people and their assets, but also the characteristics of the hazard itself and the environment in which it occurs (UNISDR, 2015).

In the past 10 years there has been a growing number of natural disasters (Mora et al., 2018). Most of these disasters can be traced back to human-related causes. Drought can be explained by global warming, but also by deforestation and land use. Floods are obviously due to heavy rains but also due to increasing urbanisation. SE van der Leeuw (2001) considers that there is no environmental problems as such, but rather problems created when human society interacts with its environment.

Understanding human societies should therefore give a better understanding on how to address environmental problems and natural disasters. Human societies are complex and dynamic in nature. Unlike machines, humans can be unpredictable. There can be multiple factors at play. For instance, they can be self-organising, which means that their dynamics may not be determined by their context alone (SE van der Leeuw, 2001).

The vulnerability of a place is shaped by the way factors interact with each other, and with the environment. This will determine how severely households and communities will be affected in the advent of a disaster (Reyes & Lu, 2017). Knowing that in advance could potentially help in the long-term to build up the resilience of these communities.

To better understand this complex question, many scholars use the lens of system thinking to synthesise problems by identifying loops of dynamics, linking multiple causes with multiple effects. According to Meadows (2010), any system is defined by several key attributes. Two of them are resilience and vulnerability,

which are also central to human societies and disaster risk.

Vulnerability to risk is shaped by many factors nested in the difficulties communities face on a daily basis.

The objective of this study is to address the first priority of the Sendai Framework, by identifying characteristics of the community environment which are shaping the vulnerability of the place.

It will especially focus on understanding the socio-economic factors and their interactions with the natural environment and human constructions.

Literature Review

After the adoption of the Sendai Framework, India was one of the first country to implement its own disaster management plan (NMDP) in 2016 (Mohan and Menon, 2016). But Kerala is a multi-hazard state. It is prone to eight types of disasters: floods, landslides, droughts, lightning, earthquakes, coastal erosions, tsunami and cyclones (Sarun et al., 2018a).

Disaster studies on Kerala have focused on one type of disaster, such as tsunami (Arya et al., 2006; Saizen, 2015), floods (Kalayathankal, 2010; Santha, 2014) or cyclones (Roshan, 2018). The overall disaster profile of the state has already been studied using a geographical approach (Sarun et al., 2018a). The central issue of vulnerability has been studied from a territorial standpoint with respect to climate change (Shyam et al. 2014, Sarun et al., 2018b). However, the vulnerability to natural disaster from a community point of view has not been studied much in the literature.

In Kerala some of the most socio-economically and environmentally fragile regions are located by the coastline (Sarun et al., 2018b). The Alappuzha district in particular is prone to multiple disasters. It was hit by a tsunami in 2004, and its unique geography with canals and below-sea-level rice farming makes it an especially flood-prone area. However, it has rarely been studied with that focus. Notable studies recently done in the area are Santha (2014) and Shyam et al. (2014).

Santha (2014) uses participatory techniques and in-depth interviews to collect data from fishermen communities in the Alappuzha district. It aims at

understanding how the local communities' traditional knowledge system helps them to predict natural disasters, and in a way to build a stronger resilience. However, it is not focused on understanding the component of their vulnerability.

On the other hand, Shyam et al. (2014) studies the vulnerability of several Alappuzha villages using quantitative methods. But it focuses on the fishing communities' perception of climate change, not on their vulnerability to disasters.

In the reviewed literature, no studies have analysed the components of the vulnerability in the Alappuzha district from a community perspective. The present study will therefore try to address that gap.

Previous studies on vulnerability and risk assessment have mostly used analytical methods. These mechanistic methods are also called reductionist, because their approach is to break down problems in smaller parts, which are easier to address (White, 1995). However, history has shown that it does not prevent disasters from happening. In a context of increasingly complex socio-technical systems, it was argued that the mechanistic approach failed to understand that problems were emerging from a whole system (White, 1995). Some critics were calling for a more holistic approach (Mohan and Menon, 2016). System thinking has emerged as an alternative way to address risk and vulnerability assessment. It considers the problem in a holistic way, by investigating its environment and taking multiple partial views to reconstruct a complete representation of the system (White, 1995). In the past decades, system thinking has been applied successfully to a variety of disciplines and domains, because the core ideas and principles are broad enough to be applied in any complex environment (Mingers & White, 2010). In this paper we will therefore use the system thinking approach to understand the vulnerability of a place.

Methodology

Between June and August 2018, Kerala faced its most disastrous monsoon in more than a century. The whole state was flooded, but the Alappuzha district was the first to be seriously affected. An exploratory field study

was conducted in the most affected area of the district, called Kuttanad, for two weeks in August 2018 as part of a Live-in-Labs® project (Ramesh, Mohan and Menon, 2016). The project team visited 12 communities located in the area most affected by the flood. Consent from the community leaders was obtained by the university prior to entering the villages.

In each community the team collected data by doing a naturalistic study, using observations; unstructured interviews and group discussions in an informal manner were also conducted with community leaders, local residents and self-help group (SHG) members. Interviews were held either in community spaces, medical camps, or the villagers' homes; questions and answers were translated from English to the local language (Malayalam) and vice versa.

The interviewers consisted of a multidisciplinary team of international and local students and faculties. The team was trained for three days prior to going to the field. Interviewers were briefed on the background of the Kuttanad area using secondary data. The media team from the university also collected video footages of the affected area, which were useful to prepare the team in advance on what to expect once they start the fieldwork. They kept field and reflective journals to acknowledge subjective biases that may have arisen during data collection. At the end of each day, the team would do a debriefing of the day.

All collected data, being qualitative in nature, were coded afterwards. Observations were classified in several categories corresponding to the socio-economic factors most affecting the communities. During that process, two communities were removed from the sampling since they did not give enough meaningful data.

For the remaining 10 communities the common factors were grouped into bigger categories. A total of 16 factors were identified, and grouped into four main categories: Social, Economic, Water, Health.

Then those subfactors were ranked. For each community the subfactors were marked from 0 to 5 based on their perceived importance as described by the qualitative. Here 0 means there were not enough data to rate, 1 means it did not have a significant importance and 5 means it had high importance.

The score is given if there are quotes allowing to evaluate directly the importance of the subfactor, or the interplay between factors. Sometimes quotes relate to something but we know it will impact something else even if it is not said directly by the respondent.

Then subfactors within each category were summed up in order to select the best score (most affected category) and least score (least affected category) for each community.

To do so, only categories where at least two subfactors out of four were measured (meaning, not being ranked with a 0) have been considered. The qualitative nature of the unstructured answers meant that sometimes people were talking more about some aspect and not about others. For some categories, there were a lot of data to evaluate some subfactors but not enough for other factors. In those cases the latter were ranked with a 0 and not taken into consideration since they cannot be compared with others.

Results

Community-Specific Qualitative Results

All communities showed specific assets and weaknesses points. Although they all live in the same area, they do not necessarily communicate with each other. The project team has identified good practices which could be replicated from one community to the other in order to build up a better resilience in the long-term:

- Pullinkunna: People have varied activities, they still practise agriculture but do not rely only on that. Some also go to town to work.
- Pullinkunna and Kainakiri island: Some people practise rainwater harvesting. They were less affected by the lack of clean drinking water.
- Pallamthurutty: People made a collective effort to protect the canal bund from the flood. This community showed a great sense of solidarity, and was at the time of our visit one of the least affected. Fields were inundated by rain water but not by the canal water overflow, and very few houses were inundated.

- Pazhupallam, Kainakary, Njandukrishithara: Villagers had sent elderly people, children and handicapped to other relatives living on the mainland or in least flood-prone areas before the flood came. They were informed by the media and took the initiative to do it by themselves, thereby suffering less stress, tension and casualties even though their houses were flooded.

Village Name	Source of Info.	Number of People Interacted
1. Pazhoor palam, Kainakary	Pilot medical camp beneficiaries	86
2. Pathilpalam, Kainakary	Pilot medical camp beneficiaries	34
3. Kuttampalam, Kainakary	Pilot medical camp beneficiaries	14
4. Kuppapuram, Kainakary	Pilot medical camp beneficiaries	12
5. Kannadi	Medical camp beneficiaries	290
6. Pallathuruthy	SHG/home visit	45
7. Njandukrishithara	SHG/home visit	28
8. Pathiripalam	SHG/home visit	18
9. Thottuthandam school	Children school visit	23
10. Kayalchira	SHG/home visit	16
11. Thakazhy	Medical camp beneficiaries	42
12. Era	Medical camp beneficiaries	23
Total		787

Overall Qualitative Results

Qualitative data from all communities were classified into four main categories, with four subcategories in each.

Social	Education
	Reliable mean of transportation
	Social support
	Fragile vulnerable population
Economic	Employment
	Debt trap and financial issues
	Other source of economic activity
	Infrastructure
Water	Access to clean drinking water
	Access to clean water for other purposes
	Access to sanitation
	Water pollution
Health	Access to health care
	Psycho-social (fear/trauma)
	Nutrition
	Diseases and insecurity

Economic Factor

All the communities we visited were depending on agriculture as their major source of income, up to 90 per cent. The remaining is made up of people working in industries such as boathouses, resorts and construction jobs in the city. The daily wage of a field worker on average was 300–400 rupees per day, which is not sufficient for a family to survive and meet daily necessities. Most of the villagers are then relying on banks, local money lenders and even their neighbours to get cash. Over-indebtedness is common: most families have at least two loans. They also mentioned that they were not able to save any money in their accounts.

Since the flood led to the destruction of agricultural land, people faced high levels of unemployment and financial crisis. The flood also destroyed the cattle and kitchen garden that villagers were using both for their own subsistence and for generating a side income.

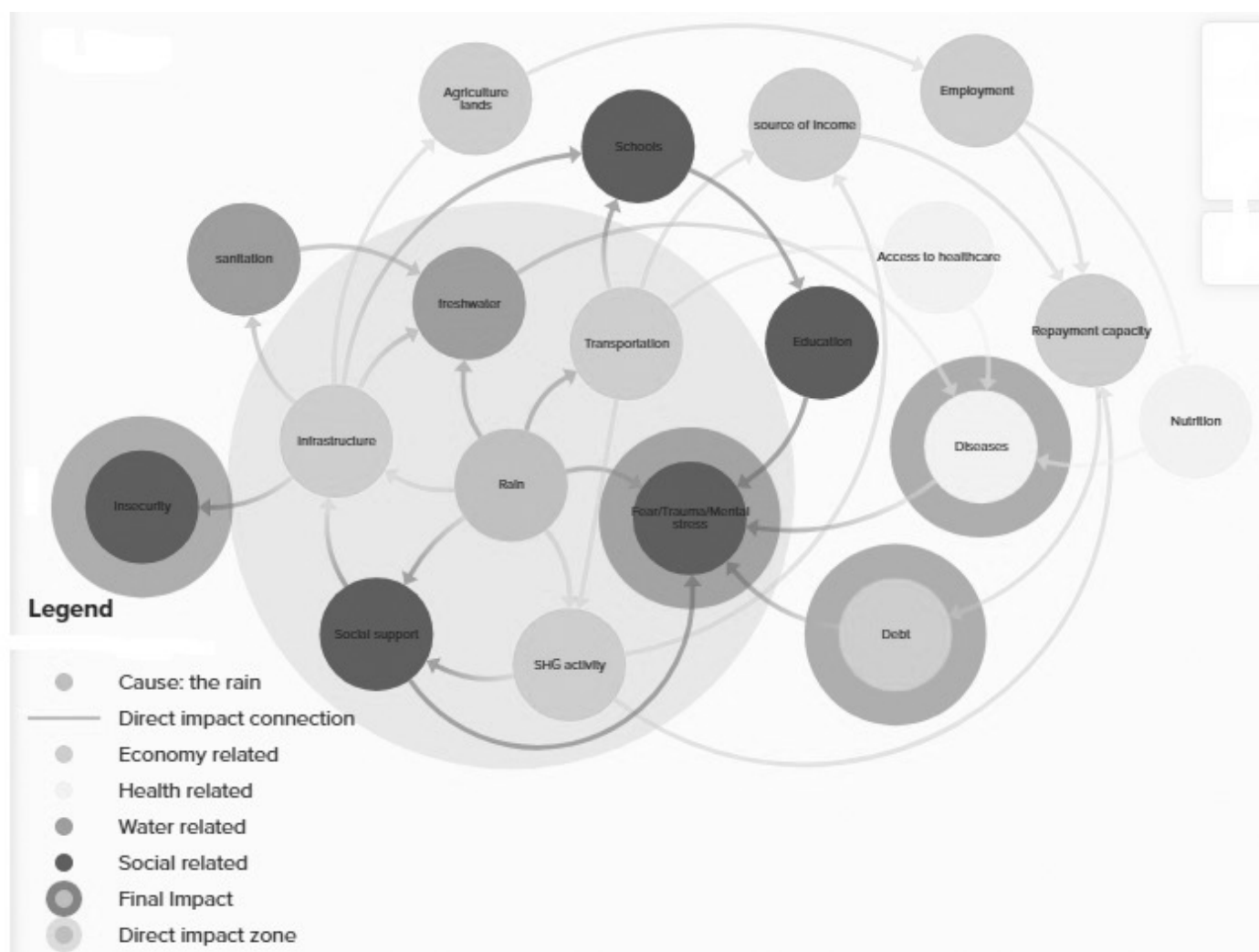
The flood also impacted transportation and infrastructure. Many areas of Kuttanad are accessible only by boat. Rising water levels made it very dangerous to travel even short distances. Therefore, people could not go to the town for work, or had to take bigger boats, which are very expensive (600–700 Rs. instead of 12 Rs. for a bus).

Few banks were kind enough to give a deadline extension, but that was more of an exception.

We met nine SHGs in the affected areas. These supporting groups are part of the AmritaSREE network. They focused on the empowerment of women by taking loans for developing small-scale income generation activities. They are repaying the loans with the profit generated. This would provide women a source of income to support family expenses and some funds for unforeseen circumstances in hard times or when they are not employed by the agricultural work. Unfortunately, due to the flood, the women were not able to meet and work, which affected their repayment capacities. They were not able to produce anything, and even if they were, they could not take it to the customers as the means of transportation were cut.

Social Factor

Some of the immediate action taken by the Indian government included evacuation of residents from inundated areas and ensuring the affected residents had access to clean drinking water and food in designated camps. Evacuation was accomplished quickly mainly by using boat transportation, or assistance from relatives, and was efficient. The government also made bio-toilets available, as residents were typically experiencing backflow in their bathrooms or were unable to access these facilities within their homes. Most primary needs were addressed by the government (housing, food and water). Despite the government-funded relief, the villagers were exposed to secondary challenges as a result. The camps where food and water were provided were communal, requiring resources to be shared among 20+ families. Although this brought community members together, some felt that the individual supplies that could be obtained from the ration shop for eligible families living below poverty level were not sufficient to feed a single family in one month. Furthermore, obtaining supplies from the ration shop or support agencies posed transportation-related challenges, as going there was far and expensive. All shops were closed. Some people reported to have no other choice than swimming for more than 1 km to access the camp. Elderly people with difficulty in walking were especially affected, as the water level in their surroundings made it difficult for them to go around.



Other reported social concerns were for the children and families. Those who could see the flood coming had time to take their children to relatives living in safer areas. Others had to stay at home with their children and face the disaster. Children could not go to school anymore, as most of the schools were converted into camps for displaced people, and the children reported missing their friends. Lack of social and physical activity was their main concern. Most communities reported similar stories on how the flood came suddenly and affected them. However, not all communities responded in the same way. Some people reported they felt alone, with very little support from others apart from the government. On the other

hand, community 3 explained how the people worked all together to strengthen the bunds using whatever they had, to avoid the canal water to flood their fields and houses.

Water Factor

Kuttanad is a touristic route for houseboats, but the boats discharge diesel directly into the canal water, thus polluting the water. Canal water is usually polluted and improper for household consumption. Canal water is also polluted with pesticides from the fields, which was clearly visible from the yellowish colour of the canal water in some communities. In

this context of mass flooding, access to clean drinking water became a major concern of all communities. People reported not having clean drinking water for the past two months. The water had washed away the fields, inundating the houses, including toilets and septic tanks. Dirty water from the toilet got mixed with the flood water, impregnating the whole houses and surroundings. The government provided bio-toilets to most communities, but it was usually one to three toilets for the whole population, which is not enough. Many people still had to defecate in the open – in the flood water itself. Similarly for washing dishes, the project team saw many villagers rinsing the plates directly in the canal water. Bore well water was equally affected. For drinking water people had to rely on the government supply in the camp. They had to queue for long hours from early morning onwards to get their share. Very few houses, especially in the isolated island areas, were practising rain water harvesting, which protected them from acute water stress. Most of the communities relied on boiling the flood water before drinking it.

Health Factor

This enormous amount of water led to many health issues. The flood also exacerbated the problems related to access to health. This is in terms of both the financial ability to avail the services and simply to physically go to the health centre. As the rising water affected transportation, people were not able to go to medical centres or hospitals, as boat transportation is very expensive. They still had to pay to go there in case of emergency, and had to wait for medical camps provided by the government or NGOs for other issues. In the medical camps where the project team conducted fieldwork, villagers mostly reported to have hookworms and skin problems because they were constantly living in dirty water. Their health was not severely impacted by the flood at this stage. However, people were very affected mentally. They were fearful and traumatised by what had already happened, and were even most fearful about what will happen post-

disaster. Diseases will come out, and that will become a big problem in the long-term.

System Thinking Map

Finally, based on the qualitative inputs collected from the villagers, a system map showing all the interrelations between the social and economical factors was created.

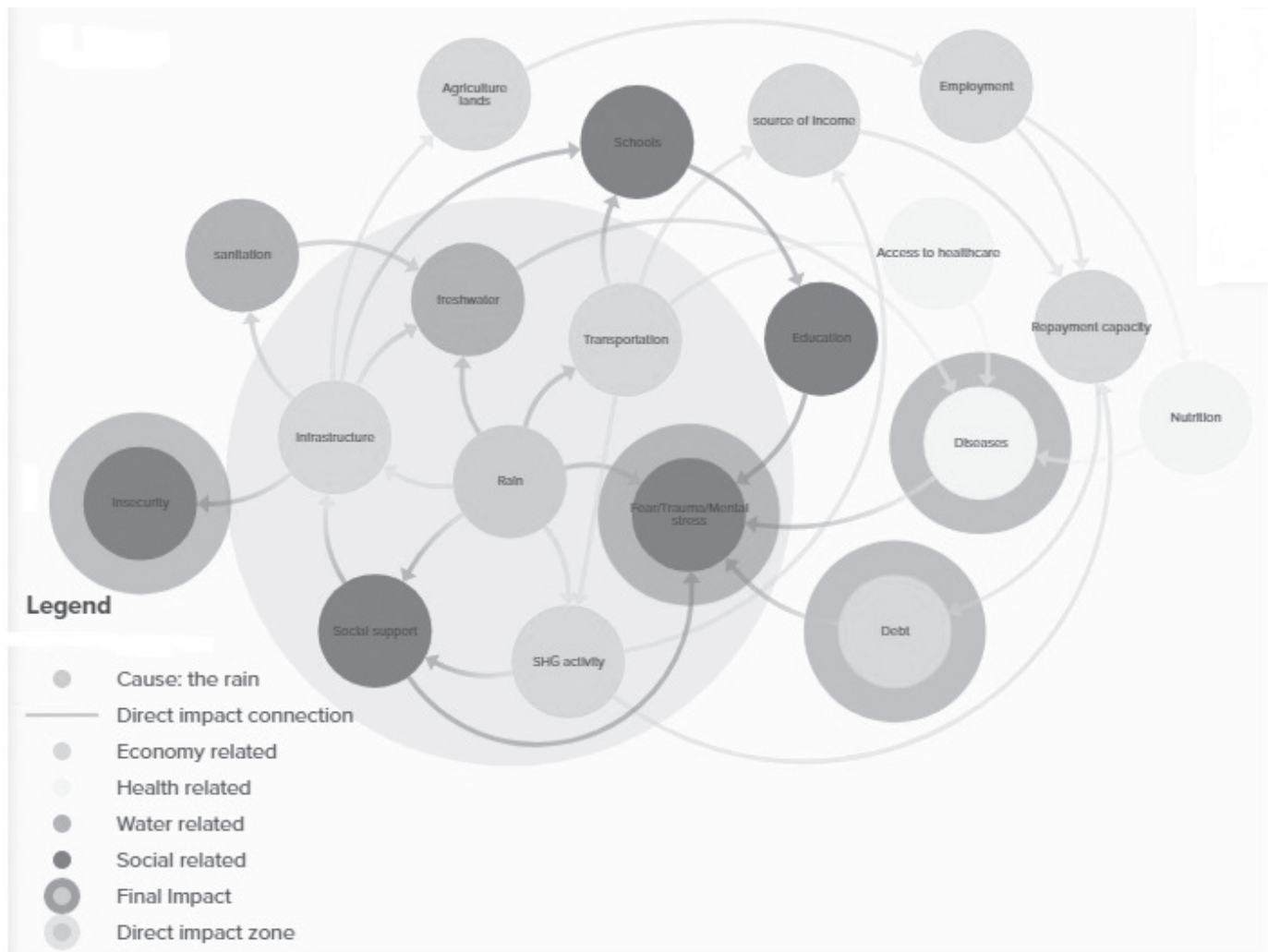
The core of the system map shows that the flood had a direct impact on transportation (cutting roads, destroying boats and bridges) and infrastructure (destroying houses, toilets, flooding community centres).

The flood directly contaminated the water bodies by washing away the fields and bringing pesticides, mud and other visible and invisible contaminants in freshwater.

It caused direct stress and trauma to the people and altered their capacity to support each other by affecting the whole community at the same time, and cutting all means of transportation. For this reason, it also stopped the economic activity of SHGs. Ladies were all too busy trying to help their own family to have time to meet each other. Hence, economic activity suffered.

Infrastructure is an important node. It includes canals, bunds, toilets and houses, which were all impacted in some ways during the flood. Bunds broke under the flooding water pressure, which inundated the fields and had a dramatic economic impact. Canals, bunds and toilets were damaged, which caused toilet water and sewage to mix with the flood water, and contaminate everything and everybody, with terrible health consequences for the community.

At the end of the different loops we can see emerging patterns of problems from the map. All causes impact each other in a chain of events leading to four main impacts: a feeling of insecurity, mental stress and trauma, the advent of health problems and diseases, and financial crisis, as all economic activities and sources of income were put on hold for an indefinite duration.



Weighting the Factors

Using the method presented earlier, these factors were ranked based on the qualitative content collected. Economic factors were the most affected factor which came the most: five times, in Community 1-2-6-9-12. On the other hand, health was the least affected factor which came the most: 6 times, in Community 1-2-4-6-9-11.

Economic factors and health factors with their respective subfactors were checked together for consistency using the analytic hierarchy process. It gave a consistency rate of 9.7 per cent, which is good. The resulting weights of criteria based on pairwise comparison confirm that economic factors had more importance, which confirms the face-value observation

done on the qualitative data. The top three factors are loss of employment, debt and financial issues, and loss of source of income. They account for 75.4 per cent of the total.

Discussion

Our study aimed at understanding how the vulnerability of communities is shaped by local socio-economic factors and their interaction with the environment. Here the environment is an actual natural disaster. We used a mix of participatory methods and quantitative assessment. In the studied communities we found that economic factors lead to more losses, and health factor to comparatively less losses. Shyam et al. (2014) also found that villagers, fishing activity was mostly

impacted by economic and environmental factors. Social impact was the least important factor. Even though their study had a different focus, there seems to be a similar pattern for the communities of this territory, which should be studied further.

Our results show similarities and differences with what Saizen (2015) found from studying coastal communities affected by the tsunami. In Saizen (2015), communities were giving the last priority to disaster risk awareness and preparation, since they were striving on a daily basis for basic necessities. In our study even though communities were also living below poverty line, they clearly expressed the need for better preparedness to disasters. They did give priority to basic necessities and economic resilience, but were also demanding of better disaster preparedness. In Alappuzha, people were asking for canal bunds to be reinforced and for toilets and houses to be built higher than the canal level. The reason for that may be that the Alappuzha area is prone to floods. People may be more aware because the risk is also part of their daily life.

Our method used a system thinking approach. It allows to see how the factors are interrelated. This is an important step in understanding the components of the community's vulnerability. Since data were collected when the community was impacted by a natural disaster, the system map is mostly composed of negative loops, or vicious circles, in which components are negatively reinforcing each other. The main outcomes of these loops are insecurity, mental stress, diseases and financial crisis.

However, understanding what leads to these outcomes can help to decide where to start an intervention. Addressing the right parameter could turn the loop into a virtuous one. That loop can positively impact all other factors and contribute towards strengthening the community. For instance, here it seems more relevant to plan an intervention addressing economic factors. It could be agriculture, an activity to generate short-term income, rebuilding infrastructures and loan repayment facilities over longer installments for affected people.

Conclusion

In this paper we discussed how the socio-economic factors nested in the communities daily life interact with each other to shape the vulnerability of communities in the flood-prone area of Alappuzha, Kerala. Using mixed methods with a system thinking approach, we were able to identify the main factors in the context of a major natural disaster. We also mapped them to see how they relate to each other. The findings help to understand the constituents of the community affected by a natural disaster. They can be used by local governments and policy makers to plan interventions.

The value of this study comes from the fact that it was done in the context of an actual natural disaster. This allows to get unique data to understand first hand the actual impacts from the people who experienced it. The findings are relevant in that extent.

However, this type of data collection can also be a limitation. Since the findings are context specific, they are oriented more towards an immediate solution rather than a long-term developmental approach. Further research should be done to see how a system thinking approach could be used in addressing the other priorities of the Sendai framework and propose a complete solution.

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The team would like to acknowledge support of Mata Amritanandamayi Math, Amrita Institute of Medical Science, the district administration and AmritaSREE Self-help Group, Alappuzha district, for being part of these camps and for the help provided in data collection. We also acknowledge village panchayats of Kainakary, Kannadi, Thakazhy and Era for providing an opportunity to work in disaster-affected areas.

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Taking Everyone on Board

Amelie Yan-Gouiffes^a

ABSTRACT: North Korea (DPRK) 2013: the beneficiary of a reforestation project implemented by the Red Cross is asked how she manages the tedious aspect of the seedling activity and she answers: “I have contributed to deforest so the minimum I can do is to contribute to reforest”.

One of the most inspiring, spontaneous and authentic expressions on social responsibility I have heard.

How many people feel responsible for their actions and omissions - in the vulnerable communities that are benefiting from DRR projects and also in the communities and countries with developed welfare and safety nets programmes?

We, disaster risk reduction practitioners and policy-makers involve communities that are exposed and vulnerable – the beneficiary community, we work to enable government’s ownership and accountability and what about the rest of the world? Our friends, families, the people we do not know who are not direct beneficiaries, direct stakeholders but whose decisions and lifestyle impact on the risk positively or negatively, people who may become direct beneficiaries one day, people who can mobilise resources and influence leaders but who are not included in our discussions, barely aware of what they could contribute with the bridge the gap between promises and actions.

How do we expand the notion of “Leaving no one behind” to “taking everyone on board, in the sense that we all hold a social responsibility, whether we are individuals or companies. They may not live in the most vulnerable communities, they may not be government officials, not even disaster risk reduction practitioners but as citizens they have a role to play because they belong to the same planet and impact it as well.

To bridge the gap in a sustainable way, we have to involve everyone.

In one of my recent Speak and Live Your Legacy workshop, a 72-years old Spanish lady, active and activist in citizens forum was saying that we clean and maintain our house beautifully and yet we do not do the same with our country nor the planet which are our homes too.

I want we engage ALL citizens onto our journey towards resilience to disasters because ALL have a responsibility by being on this Earth and ALL impact climate and ALL influence decision-making and leadership.

The paper will develop on the benefits we will harvest from this “taking everyone on board” and I want to bring a very practical approach with exploring the HOW can we mobilise, involve and gain Resilience champions.

KEYWORDS: vulnerable communities, disaster risk reduction, risk management, disaster management

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North Korea (DPRK) 2013: the member of a community involved in a reforestation project implemented is asked how she manages the tedious aspect of the seedling activity and she answers: “I have contributed to deforest so the minimum I can do is to contribute to reforest.”

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Our friends, families, the people we do not know who are not direct beneficiaries, direct stakeholders but whose decisions and lifestyle impact on the risk positively or negatively, people who may become direct beneficiaries one day, people who can mobilise resources and influence leaders but who are not included in our discussions, the businesses not always aware of what they could contribute with, all these missing links are additional challenges for us to bridge the gap between promises and actions.

How do we take everyone on board, in the sense that we all hold a social responsibility, whether we are individuals or companies. They may not live in the most vulnerable communities, they may not be government officials, not even disaster risk reduction practitioners, but as citizens they have a role to play because they belong to the same planet and impact it as well.

To bridge the gap in a sustainable way, we have to involve everyone. Easy to say but how easy is it to materialise?

We have been able to “sell” the concept of DRR to some businesses but missing to reach out to many who are not sensitive to these arguments for various reasons; same for the citizens who are not directly embarked on DRR projects and expecting their governments to take care of that aspect without foreseeing any role for them.

Influencing people and businesses to contribute can become a huge investment in time and resources, what about we barter purpose for contribution?

What about infiltrating DRR into corporate social responsibility (CSR) from the purpose angle? Studies show that nowadays talented young adults will choose first a company with a strong CSR portfolio; retention and motivation of employees fly proportionally to the visibility and the solidity of the CSR projects and similar patterns are seen among clients and potential clients preferring an engaged company.

DRR is then not only integrated into operations for preventing the impact of disasters on the business and limiting the negative impact but becomes a way to contribute to society and to touch people, to get people on board of the company but also the topic of DRR to become a topic of contribution for the company and the general public.

How? Bringing DRR to business and people through three issues that are essential nowadays for survival and motivation: money, purpose and communication.

Money

“Today, making money is very simple. But making sustainable money while being responsible to the society and improving the world is very difficult.”

– Jack Ma, Chinese businessman and founder of Alibaba.

Check out what are the names that come up to your mind when you vibrate with admiration for business people: aren’t they all people who have achieved something beyond than making only money, aren’t they people who have come from nothing and accomplished and encourage others to go further and further? Aren’t they people who are engaged in giving to those who do not have?

Today, making money is very simple. But making sustainable money while being responsible to the society and improving the world is very difficult: the day we will depart from this life for good, what will our heart, mind and soul crave for? The very simple or the very difficult? I feel like giving a little twist to the quote:

Today, making money is very temporary. But making sustainable money while being responsible to

the society and improving the world is your footprint and every footprint is permanent.

Let us strategise with businesses around making money, making a difference. Let us bring our technical expertise and let them convert this into money and together we will make the difference.

Purpose

“Humans are meaning-making machines” – Viktor Frankl, psychiatrist and Holocaust survivor

If we look at ourselves, we look at our friends, relatives and our businesses or professional practices, what are the moments where we have felt most alive, when we have achieved the most and wanted to do more for oneself but also for others?

When we are filled with purpose, when we know why we are doing this job, making that decision and walking that path, aren't those the moments that make sense?

We are constantly searching for meaning and when we lose this quest, we lose the meaning we used to give, we feel like animals, doing things because they have to be done to cover basic needs but there is no motivation and spirit.

How would a business flourish with an extra inch of purpose? Employees would not only go to work, they would go to fulfill their mission or part of it, the management would look at strategies and plans of action as legacy instruments.

Let us make this purpose be saving lives and protecting livelihoods, are they more exciting purposes than this one?

Let us barter purpose for contribution and disaster risk reduction not only saves the lives and protect the livelihoods of those at risk but our lives and our business, transcending them with a sense of purpose.

Communication

How do we speak about money, purpose and disaster risk reduction?

“Aims at preventing new and reducing existing disaster risk and managing residual risk, all of which contribute to strengthening resilience and therefore to the achievement of sustainable development” is the definition of disaster risk reduction by UNISDR.

For us, practitioners, it englobes the different aspects of the topic but for general public, how appealing is this definition? Do you think they will feel it will bring purpose to their businesses, to their lives and to the world? Can that definition make a heart beat, some eyes shine?

And even for us, spending so many hours and days and months outside the field, only managing concepts and numbers, as dry as this definition, how do we keep up our sense of purpose?

I am blessed to be a tutor and consultant for the online Master on Humanitarian Aid KALU, students are both professionals and recently graduated persons, so they are used to jargon and abbreviations. I will never get used to it, I think I sort of rebel against it because when I speak about DRR, I want to see the faces of the women, men and children I am talking about, I want to visualise the rivers, the volcanos, the landscapes I am thinking about.

When I am working with KALU on a module, I can size every time the expansion of the level of engagement when I share a field-based story, leaving aside the terminology and bringing humanity, when I recall the “Why” they got onto this Master and connecting and reconnecting them to their purpose and the purpose of humanitarian action and disaster risk reduction.

Let us communicate on the “Why”, let us talk about humans and let us speak a common language.

Building resilience and bridging gaps in disaster risk reduction is possible getting more hearts, more heads and more hands onto the task.

Take everyone on board!

Eroding Lives of the Musahars: Lived Experiences in the Context of Flood and Riverbank Erosion in Bihar

Siji Chacko^a

ABSTRACT: While the phenomenon does not spare any, the impacts are further alarming and distressful for communities such as Musahars who already suffer from poverty, social-exclusion, marginalisation and inequalities. Also considering the vulnerability implicit in 'everyday life' is essential to understand disaster and its impact, this study enters into the 'life-world' of the Musahars exploring their experiences with recurrent floods, katav and multiple displacements. Using a qualitative phenomenological paradigm this study looks at how recurrent floods and katav leave a long -lasting adverse impact on their lives. Vulnerability in a disaster context is a person's or groups' capacity to anticipate, cope with, resist and recover from the impact of a natural hazard (Blaikie et al.)

While literature on vulnerability highlights the differential impacts of disasters on the poor and vulnerable and the role of assets in the ability to recover, there exist many gaps in studies in the context of social exclusion-led post-disaster impact on the marginalised. Within the broader framework of vulnerability and disasters, this study explores how the already existing vulnerability of the Musahars due to their poor socio-economic-cultural context, further escalates their vulnerability making katav a hazard which has a long -lasting adverse impact on their lives. The study also looks at their experience of the state in the context of disasters. For this study, twelve Musahar hamlets that have experienced katav were studied from five consecutive blocks where the river Gandak flows (Bagaha-1, Jogapatti, Takarahan, Bairia and Nautan). Thus, year after year people live in constant fear of floods, katav, displacement and continued insecurity.

'Band ki patari' a literal translation of the same would mean 'life on a log of wood' expresses the many untold sufferings of the Musahars who with no other option, take shelter on embankments or roadsides and continue for many years, often without being resettled by government, in spite of several attempts as long as 40 plus years. Musahars- 'Unequal Citizens' in an 'Equal State' The government of Bihar prepared the 'Roadmap for Disaster Risk Reduction 2015-2031' defines vulnerability as "as conditions arising from social, physical, economic and environmental factors that increase the susceptibility of individuals or communities to the impact of hazards. In order to support the the katav (river bank erosion) affected people, the GOB came out with a significant resolve from the 'Sahay and Punarwas Department' (Number: 4/Docu 07/2003/2156/Sa. Pu of 16-8-2003 original in Hindi) with the subject: In relation to flood/katav displaced families being allotted land and houses.

The people feel that the government keeps promising land to the katav-affected but at the end very little happens concretely. Discussion: The Vulnerable's Experience of the State Partha Chatterjee (1997a) and Sudipta Kaviraj (1991) suggest that there is a difference in ways the government agencies are seen by different groups of people within the rural poor. What is obvious from Musahar's experience of the state which finds expression mostly through the government functionaries such as bureaucrats, government officials and elected representatives is that of continued neglect of the community and apathy towards their concerns.

KEYWORDS: social vulnerability, floods and river-bank erosion, response of the state, resilience

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Introduction

Bihar is one of the most flood-prone states in India, with 17.2 per cent of the flood-prone area in the country. Almost 76 per cent of the population of the state, and 73.06 per cent area is under the recurring threat of flood devastation.¹ West Champaran² district of the state is highly hazard-prone, with 80 per cent of the area vulnerable to floods. 17 out of 18 blocks and 178 out of 315 panchayats are highly flood-prone,³ making the district fall under the category of 'vulnerable' in the latest parameters of the State.⁴ Of the 18 blocks of the district 10 have high flood and erosion risks.⁵ According to the 2011 census, there are 118 uninhabited villages (out of 1483 total villages) in the district.⁶ The non-inhabitation is mostly due to the erosion of the river banks, a phenomenon that is explored in the study and is very much a concern in the disaster context of the district.⁷ In 2017 heavy rains and high water discharge level in Gandak affected 13 of the 18 blocks of the district with 135⁸ panchayats, a total population of 5,42,000 affected, damaging 10,502 houses.⁹

The river Gandak, the most significant river of the district, originates near the Nepal-Tibet border at an altitude of 7620 m situated northwest of Dhaulagiri. The total length of the river is 630 km, of which 370 km lies in Nepal and Tibet. After travelling nearly 100 km in Nepal, it enters the plains of the West Champaran district of Bihar near Valmikinagar, at the Indo-Nepal border. Being snow-fed, the Gandak is a torrential stream until it leaves the hills, after which it becomes wider and less turbulent.¹⁰ Due to excessive siltation of the bed, the drainage capacity of channels of the river are disturbed, consequently, making the existing flow equilibrium difficult and disturbed. This changed situation forces the river to find new course, causing the floods to accommodate the excess drainage. Due to the special nature of this river with alluvial soil, along with flood comes erosion of the river banks, the phenomenon under study, known in the local language as 'katav'. It is acute in monsoon, resulting in physically displacing many families.

While the phenomenon does not spare any, the impacts are further alarming and distressful for communities such as Musahars,¹¹ who already suffer from poverty, social exclusion, marginalisation and

inequalities. Their pre-existing vulnerabilities influence their capacity to cope with and recover from the impact of the disaster. After having been victimised by recurrent floods and katav, having been displaced, the Musahars are either at the embankments, on roadsides, in helplessly occupied private mangroves, or in the land of a few landlords. They face many uncertainties and insecurities, going through traumatic experiences of survival and sustenance, including the struggle for identity. A few of them awaiting rehabilitation and resettlement from the government after almost four decades of living at embankments.

Theoretical Perspectives, Approaches and Methodology

Any disaster is a result of many processes (such as natural, social, economic, cultural) that are related to certain social structures and contexts (Cannon & Wisner; 1994). They are by-products of certain pre-existing vulnerabilities (Lewis, 1998; Bankoff & Frerks, 2006). Socio-economic status influences the capacity of the individuals and communities to cope with the losses from hazards (Peacock et al., 2000; Masozera et al., 2007; Morrow, 2007).

Vulnerability in a disaster context is a person's or group's capacity to anticipate, cope with, resist and recover from the impact of a natural hazard (Blaikie et al., 1994, p.9). Studies have revealed that vulnerability may be increased due to factors such as a person's class, race and ethnicity (Aptekar and Boorre, 1997; Morrow and Enarson, 1998; Peacock et al., 1997; Fothergill et al., 1999). Social vulnerability due to natural disaster results from poverty, exclusion, marginalisation and inequalities in material consumption (Singh et al., 2014). Scholars also express that vulnerability and consequences of disasters are potentially unevenly distributed across social groups (Quarantelli, 1998) and have found that similar disasters affected people with varied backgrounds differently (Gillespie, 2008b, 2010). Studies also reveal that vulnerable groups are disproportionately prone to suffer adverse consequences as a result of relocation.¹² In the context of any displacement caused by disasters, while all are affected, the poor and marginalised go through more suffering owing to their least capacity to recover.

While literature on vulnerability highlights the differential impacts of disasters on the poor and vulnerable and the role of assets in the ability to recover, there exist many gaps in studies in the context of social exclusion-led post-disaster impact on the marginalised. Though there have been a few studies in the context of Koshi river basin and embankments, this region and the subject under study have largely remained unexplored. It is envisaged that bringing to light narratives from the ‘periphery’ would help bring to the forefront their plight, thus enabling policy, programme and decision makers design plans accordingly to benefit those most affected.

Hearing the narratives of the victims themselves is extremely significant in any disaster context. Considering that the vulnerability implicit in ‘everyday life’ is essential to understand disaster and its impact, this paper enters into the ‘life-world’ of the Musahars, exploring their experiences with recurrent floods, katav and multiple displacements.

Within the broader framework of vulnerability and disasters, this study tries to understand how Musahars in the Gandak river basin experience and live with floods, katav and multiple displacement. It explores how the already existing vulnerability of the Musahars due to their poor socio-economic-cultural context, further escalates their vulnerability, making *katav* a hazard which has a long-lasting adverse impact on their lives. The study also looks at their experience of the state in the context of disasters. The attempt is to understand their struggle for survival and sustenance in the context of abject poverty and social context.

Using a qualitative phenomenological paradigm this study looks at how recurrent floods and katav leave a long-lasting adverse impact on their lives. An attempt is made to examine how responsive or non-responsive the state has been in responding to the disasters and their aftermath. Twelve Musahar hamlets were selected on the basis of their location at the Gandak river basin that have experienced katav and were studied from five consecutive blocks where the river Gandak flows (Bagaha-1, Jogapatti, Takarahan, Bairia and Nautan). Phenomenological in-depth interviews were used as primary tool of data collection. A total of 81 in-depth interviews were conducted with katav-affected people, social workers

and activists, NGO heads and representatives, elected representatives varying from ward member to Member of Parliament and nine government officials. Also, 16 focus group discussions (FGDs) were conducted. The data collection was carried out in different phases, during floods and katav (2012, 2014, 2017) and in the non-flood and non-katav times.

Musahars, the People Studied

As per the 2011 census of India, 3,057,396 persons reported as members of Musahar caste, accounting about 0.23 per cent of total population of India and 1.8 per cent of total scheduled caste population in the country. Musahars are mainly found in four states – Bihar (89.2 per cent), Jharkhand (1.7 per cent), Uttar Pradesh (8.4 per cent) and West Bengal (0.7 per cent). They live mainly in rural areas (96.3 per cent), and are agricultural labourers (95 per cent) and least educated (Illiteracy 79 per cent) (D.P. Singh 2016, p. 117). As per the data available with the *Mahadalit Mission*¹³ of the government of Bihar, Bhuiya and Musahar (based on the socio-economic survey) put together have a total population of 26,80,539, second after Chamars (4,090,070) in the state of Bihar. Of the total population of 3,58,725 SCs, in the district of West Champaran, 75,964 are Musahars.¹⁴

Musahars are socially and economically marginalised, one of the poorest amongst poor and the lowest rung of the Dalit hierarchy. It is a community that suffers much from untouchability, illiteracy, landlessness, infant mortality, and over all a group that has suffered many forms of structural violence that exists in the dominant hegemonic context of the country (Farmer, 2003; Herr, 1999; Kleinman, 2000; Scheper-Hughes, 1992; Herbert, 2010). As per the 2011 census, the illiteracy rate of the community is as deplorable as 78.14 per cent (with 83 per cent female illiteracy). As the statistics given in the report of the SC&ST Welfare Department of the Government of Bihar (2012) indicate, the literacy rate among the Musahars in Bihar is as low as 4.6 per cent (male: 7.7 and female: 1.3). It's a community that is economically asset less, socially ostracised, politically marginalised and culturally dehumanised. The landholdings of Musahar community are almost nil or meagre.

D.P. Singh (2016), while doing a demographic analysis of the Musahars in North India based on the census data of 1961–2011 concludes that the Musahars, who are socially economically ‘the most’ marginalised group, have not made much progress. In the deeply fractured social structure of Bihar around caste lines and financial status, they seem to suffer from denial of human dignity, citizenship rights, violation of human rights and chronic and abject poverty. It is said that ‘untouchability, deprivation and humiliation do not leave the Musahars. They carry the baggage of bondage right, from their birth. Musahars live in villages but are not a part of the village’s social milieu’ (Joshi & Kumar, 2002, p. 17). The contemporary Musahar identity is shaped by their constant search for livelihood, dependency on the dominant castes, fear of the powerful and so on. Musahar community’s belief system and behavioural patterns are shaped by deep-rooted fear, which they have collectively inherited from centuries of socio-economic and politico-cultural oppression.

A closer etymology on the name of the community is said to be ‘rat taker, rat killer and rat eater (Joseph, 2007). George Kunnath (2002) contends in his essay *Violence of Discrimination: An Ethnography of the Musahar Lifeworld* that among many things such as landlessness, illiteracy, infant mortality and so on, the name ‘Musahar’ is also an indication of the violence unleashed against the Musahars institutionally and structurally.

A Brief Profile of the Katav-Affected Musahar Hamlets in West Champaran

The hamlet of the participants could be grouped into four categories: (A) those who experienced katav in the past, have recurrent floods and katav currently, are at the threat of embankment breach and not yet resettled by the government, but staying on embankments or road sides. Rakhai, Srinagar and Siswa Mangalpur come under this category. (B) Those who do not experience katav as such currently, but are victims of recurrent floods, threat of embankment breach and again are not settled by the government but staying at a landlord’s land, embankment or road side. Asaram Patkhoulia, Ranha Bandh, Gambhirpur and Kalaiyastan come under this category. (C) Those settled by the government either by way of an established colony or if the people had occupied land sometime but the government has made it legal by giving them land ownership. But these hamlets are also victims of recurrent floods and under the threat of embankment breach. Bankatwa, Rajwatia and Bhediharwa come under this category. (D) Hamlets where people, after experiencing katav, stay on embankments for several years, have purchased certain piece of land by themselves (only 14 families in two hamlets). What is common to all of them is that they all experienced katav, were dislocated (as many as five times at times), but have been approaching the government for resettlement.

S.No	HAMLET NAME	FAMILIES	KATAV (EROSION)	PRESENT KATAV	RECURRENT FLOODS	THREAT OF EMBA. BREACH	PLACE OF STAY	RESETTLEMENT BY GVT
1	Rakhahi	26	1995	✓ □	✓ □	✓ □	Embankment	✗ □
2	Srinagar	132	2001	✓ □	✓ □	✓ □	Landlords	✗ □
3	Siswa Mangalpur	138	2001	✓ □	✓ □	✓ □	No legal Ownership	✗ □
4	Asaram Patkhoulia	102	1992	✗ □	✓ □	✓ □	Landlords	✗ □
5	Ranha Bandh	26	2002	✗ □	✓ □	✓ □	Embankment/Road	✗ □
6	Gambhirpur	125	1974	✗ □	✓ □	✓ □	Embankments	✗ □
7	Kalaiyastan	56	2010	✗ □	✓ □	✓ □	Roadside	✗ □
8	Bankatwa	53	1977	✗ □	✓ □	✓ □	Govt colony, a few not	Nitish Nagar 2007
9	Rajwatia	40	1975	✗ □	✓ □	✓ □	Govt Colony, a few not	Nitish Nagar 2014
10	Bhediharwa	65	1993	✗ □	✓ □	✗ □	Govt land, a few not	Govt allotted later
11	Pujaha Patijirwa	7	2003	✗ □	✗ □	✗ □	Own Purchased-No legal	✗ □
12	Samiya	7	2002	✗ □	✗ □	✗ □	Own Purchased-Legal	✗ □

People of all the Musahar hamlets are victims of *katav*. Gambhirpur, Rajwatia and Bankatwa had the earliest experience of *katav* and displacement, way back in 1974, 1975 and 1977, respectively (Patkhoul, 1992; Bhediharwa, 1993; Rakhai, 1995; Siswa Mangalpur and Srinagar, 2001; Ranha Bandh and Saraiya, 2002; Pujaha Patijirwa, 2003; and Kalaiyastan 2010). During floods almost every year the hamlets are under water and those days the only way to reach the location is via boats and the entire area would look like a '*dariyav*' (a sort of an ocean). To a few hamlets such as Srinagar, access to the location is always by crossing a river with the government or private-run boats, which the local people call as '*dhengi*.' Transportation of people, harvested crops and vehicles (including cycles, motor cycles and tractors) is often by these boats. For the Musahars of Srinagar, the block headquarters is just 10 km away if they travel by boat, but by roadways, they have to take a long as 90 km.

During floods the schools often do not run, as the students have to go across. Brahmadev enlists the underlying factors that results in dropout of children in school in Srinagar. "People of our community have a very poor educational status. The helplessness of our parents, extreme poverty, irregular teaching, constantly absenting teachers, poor infrastructure and other facilities result in massive dropout and irregularity among young children. Often the school buildings are used for marriage functions".

Inaccessibility of these Musahar hamlets makes them helplessly put up with irregular functioning of government programmes, adding to the existing hardships suffered by the community. One shares, "everything is going on as '*gopaniy*' (secret). Everything is done by '*Bichaulia*' (middle men). They know that these people (we) are not learned". It is ironic that amidst water in the surroundings, there are hardly any hand pumps (bore) from where the people could drink proper water. People got Indira Awas (in the old place), but those houses disappeared into the river. Chandrika Manjhi expresses his grievances by saying, "Officers do not come here. We do not exist for them. For the last three months we have not received the PDS. For the ration we have to go by boat and the whole day goes for the same. When we go there, we are not given the full quantity. Many people's names are neither in the voters list nor in the BPL."

Dhrupati Devi says, "*Beti ki biha kahi hota lekin bete khatir taklif ba*" (girl could be given in marriage anywhere, but it is difficult to get boys married). The main reason is that a girl's parents do not want the girls to be married in flooding areas, where their daughters would suffer much. One of the major concerns for women during floods is surrounding health and sanitation. During floods (or almost two months) in the absence of proper toilets above flood level, they have to manage many things on '*machaan*' (a raised bamboo platform) at times fixed on to branches of trees. In some of the hamlets most pregnant women face death during floods.

A Life on '*Bandh Ki Patri*'¹⁵

When a disaster is unwanted, unexpected, unprecedented and almost unmanageable, causing widespread disbelief and uncertainty (Smith, 2012, Rosenthal, Boin & Comfort, 2001; Stern & Sundelius, 2002 in Perry & Quarantelli, 2005), the recovery becomes all the more difficult. Usually, *katav* happens along with the floods eroding the river banks. For most of the hamlets studied, the first floods and *katav* were an unexpected one and created crises by taking away their houses and belongings. Jagan Manjhi (Saraiya) recalled the danger and unmanageable situation when his people saw the embankment where they had taken shelter had suddenly begun to collapse as it was getting eroded: "It was raining heavily. We ran and took shelter on a bund (embankment) and the embankment breached at once and began to collapse from one side as the water gushed in force. We began running from one end to the other without knowing which area would collapse first."

Chandrika Manjhi recalled, "As we opened and closed the eyes we saw houses no more. There was an eight Bigha (a Hindi expression for a measurement for land) Bagicha (mangrove). In such a short time, an entire area was drowned. All the houses and trees were gone into the water. We saw a huge '*Sisam*' tree disappearing falling into the river in a few minutes."

There are recurrent floods almost every year in almost all the studied villages. Generally, during floods, people stay on *machans* (raised bamboo platforms). Thus, year after year people live in constant fear of floods, *katav*, displacement and continued

insecurity. For almost two months, people leave their houses and move to the embankment or to the higher areas and return after the water recedes. During floods some people would take shelter at some government schools close by or others would stay at home with raised platforms, basically surviving on beaten rice and jaggery. After displacement and relocations, people have been dislodged from gainful employment. Therefore, in search of employment there is outmigration to states like Punjab and Haryana, and cities like Delhi and Mumbai.

Chandrawati and Panna Devi recall the death of a woman who died with delivery: "There were many situations where in the wooden boat a child was delivered. In case on the way it happens, then the boat returns. The boats man takes Rs. 1200 to take a woman for delivery." Pramila Devi (Srinagar), the mother in-law, of the lady who died with a delivery shares: "No boat was available in such a flow of current. She was such a young and beautiful girl. It was supposed to be the first child in our home. While taking her to the 'uprahat'(higher places) she died." Panna Devi (Srinagar) shared the difficulty in performing the last rights of this lady who died: "We had to push the body into the water as "Phuke khatira kono jagah na mili" (no place to cremate the body). What else could we do?"

In almost all the hamlets the living conditions are very poor. In Godayya, during rains with water flowing into their homes, they have no proper place to sleep. "When we sleep, different crawling creatures come on to our body. If we have house only we could think of protecting ourselves from rats. There are rats all over. During rain, all the water of the road also flows down into our house. Snakes come very often as there is field close by. We have a lot of problems" (Baidyanath Manjhi).

***Katthe Gaye-Hatthe Rahe*¹⁶: The Multiple Displacement Context**

Multiple relocations is a major concern. In Srinagar Musahars were displaced four to five times (in 2002, 2003, 2005 and 2007). From the year 2007 people of Mangalpur experienced floods and erosion and the phenomenon continues till date. The people of Saraiya

in Tulkaria Panchayat of Bairia experienced katav three times (though this location is far away from the river).

Once displaced with recurrent katav and floods, the Musahars have been struggling to find a 'space' of their own for immediate settlement and with multiple displacements for relocations later. After having lost the houses when the people come out to some common places (roadsides, common land etc.) even for a temporary stay, the people in the so-called host location resist not allowing the victims to put up their shanties. Based on their experiences, often they were condemned to stay and survive on embankments, roadsides, 'illegally' occupied common land of the government and so on.

Mangri Musmat (Srinagar) says that when her family wanted to settle in a common land of the government, the people staying close by literally chased them away. The same was shared by people in Godayya, Pujaha, Bankatwa, Siswa Mangalpur, Rakhai, Kalaiyastan and Rajwatia.

The place where the Godayya Musahars are settled belongs to a few landlords who own many acres of land in the entire area and also are very powerful and influential. According to Gamma Manjhi, the landlords do not even allow them to step into their land:

After the katav, when our villages got submerged into the river, out of helplessness, we all came to this *bandh ki patri* (embankment) and took shelter. None came to our support. We are staying in the land of a landlord. He told us not to put up any 'pakka' (concrete) constructions. We have no right over this land. Any time we could be sent out. But in turn, most of our people are working in his field providing hard labour at a cheap rate. We can't move into the adjacent land. These landlords do not allow our children and women, goats (mal-jal) or even a dog to get in there. They abuse us verbally and beat us if we get into their land.

'Band ki patari,' a literal translation of the same would mean 'life on a log of wood,' expresses the many untold sufferings of the Musahars, who with no other option, take shelter on embankments or roadsides and continue for many years, often without being resettled by the government, in spite of several attempts as long

as 40-plus years. The present place where the Musahars of Patkhouli are located is in a land belonging to a landlord.

One said in an FGD: “Kate gaye aur hathte rahe (kept eroding and we kept moving). Hamare charo taraf panihaiaur hum log bich me hai (all four sides we have water and we are right at the middle).” Shivnath Manjhi shared, “we had 30–40 families residing on the embankment after we were displaced. We stayed at an embankment until 2001 when the government came with police force and forced us to move out. When we objected, they began to pull down our houses with JCBs. They assured that they would ensure that we are given land elsewhere and would be settled. Now we are nowhere, neither on public land or on the embankment.”

One of the major problems faced by the katav-affected people is the struggle to maintain their identity of ‘legally’ belonging to some place. Once dislocated, often they lose their ‘address’, their voting rights, entitlements such as PDS and others.

Sukhram, an activist, explains the phenomenon as to how the katav-affected people struggle for identity and entitlements:

There is a ‘kahavat’ (popular saying), ‘Sadhu ka kutta, Na Ghar ka, nag hat ka’ (Sadhu’s dog is neither of the house and nor of the ‘ghat’. These people have their name in this panchayat and the names are in the voters’ list here in this panchayat. But when they are displaced and moving there, they won’t get the privileges and entitlements... From here to there the displaced Musahars are played around like a football. ‘Na ghar ka, na ghat ka.’

Many have been running from pillar to post to ensure that their voter IDs are shifted or changed to the new panchayat. The people generally think that this must happen with the support of local politicians or elected leaders. There are people who are not able to solve this problem for the last seven years. Ramesh (Pujaha) shares: “But we have no ration card. We only get kerosene. We are here for 7 years. Still we do not have a card. Our name is not in the voters list. Neither here nor there, we are hanging loose. We have to run to many places for availing these. We have

approached many government schoolteachers.” Kedar Manjhi (Saraiya) has been moving around knocking at different offices for the last seven years but he has not got the ration card. He says, “Mukhya told us that you have gone away. Now you get connected to this place. In the process, we don’t get from that place. For some years, 6–7 years, we did not get any ration here.”

Gamma Manjhi (Godayya) says, “This is not our panchayat. As of now we do not know where we belong as we are at an embankment which is located in two panchayats. Hum log, dusaro ke des mei aakar bas gaya (we are living in some other ‘des’ (country)).”

Katav Se Tang Bani San, Sarkar Se Tang Bani¹⁷

After floods and katav, most people of the other castes have shifted to ‘uparahat’ (a local usage for non-flood-affected areas). An apparent reason for Musahars not shifting to other places is their poverty and resourcelessness. The Mukhya of Srinagar, who stays 18 km away, says, “The Musahars have remained here, and not a single Musahar family has moved out. The main reason is that they do not have land nor have they money whereby they could make alternate arrangements.”

The rich who could afford bought land and settled but the Musahars being poor depended on the government to provide land. “During every flood season, we are staying in some government school or other. In the month of ‘sravan’, the entire area would be like a ‘dariav’ (ocean). Any time we would experience katav. Katav ‘khatarnak hai, katav barbadi hai (katav is dangerous and destruction). Without assistance of government we cannot buy land as land costs are too high and out of budget people who had money bought land in different location and settled happily,” said Bhadaai Manjhi.

Recognising the importance of systematically addressing disaster-related issues, the government of India (GOI) enacted the Disaster Management Act 2005. While the Act created systems, it laid down minimum standards of relief and assistance in the context of disasters and invited states to come up with policies and plans and make provisions and allocations.¹⁸ The definition (Section 2) captured well various dimensions of disaster, which included human suffering and coping

capacities of communities, which are noteworthy in the context of this study.

Bihar had already formulated its own state Disaster Management (DM) Act in 2004, prior to the National DM Act of 2005. In 2007, the state Act was repealed, and the National DM Act was adopted. In 2007, as the strategic institution for shaping DM policy, the State Disaster Management Authority (BSDMA) was set up (No. 3449 on November 6, 2007). Thereafter, the state DM policy was developed in line with the National DM Act, with the stated goal of moving from the traditional relief-centric approach towards developing a 'Culture of DRR' (Disaster Response and Relief).

Prior to all these, in order to support the the *katav* (river bank erosion)-affected people, the government of Bihar came out with a significant *resolve* from the 'Sahay and Punarwas Department' (Number: 4/Docu 07/2003/2156/Sa.Pu of August 16, 2003, original in Hindi) with the subject: *In relation to flood/katav displaced families being allotted land and houses*. Based on this document, the Musahars have been approaching the government for homestead land repeatedly, specifically one that speaks of resettling them with homestead land and basic housing.

Several times the Musahars approached the government for relocating them to higher places, often without any concrete results. Badi Devi says, "We have been approaching different government official for land. We went for protest too Garib keliye, koi gujara nahi khe' (for the poor there is no way to survive). Sarkar ke pas jamin ba, lekin hamni Musahar party ke pas jamin bilkul nahi khe (the government has land, but we Musahars have absolutely no land."

Lalmati Devi says, "While most of us are staying here, some of our people are still on the PWD road. Every year during floods we have waist-deep water here coming from the river as the river is just 400 metres away. For almost two months we are cut off from other areas. We cannot even see the road to walk through. In spite of several attempts, protests etc., the government has not resettled us. *Katav se tang bani san, Sarkar se tang bani* (we are frustrated with floods and government both)."

People express their disappointment and frustration with the government, stating that for the ordinary people do not exist. The government does not want to know that we are existing here. In Dhimi Manjhi

(Kalia bandh)'s language, "Sarkar kuch bi nahi kare". Fekku Manjhi (Srinagar) says that the government does not even look at them: "Ithar sarkar urkar kuch nahi. Na koi hamere tarah najar uthakar dekhte hai (No one even comes to lift the head and look at us). There is nothing called government. We are struggling and surviving here."

From Resolve to a Proactive Will: A Need of the Hour (Concluding Discussion)

Partha Chatterjee (1997a) and Sudipta Kaviraj (1991) suggest that there is a difference in the ways the government agencies are seen by different groups of people within the rural poor. According to Corbridge et al. (2005), people's perception and experience of the state is shaped by their everyday encounters and observations, which are often related to their contact with the agencies of the government, bureaucracy and government officials, as they have a major role to play in ensuring welfare schemes. What is obvious from the Musahars' experience of the state, which finds expression mostly through the government functionaries such as bureaucrats, government officials and elected representatives, is that of continued neglect of the community and apathy towards their concerns. Often, they feel helpless before a system which is often in a nexus between the politicians, government functionaries, the elite class/caste and middle men.

The government of Bihar prepared the 'Roadmap for Disaster Risk Reduction 2015–2013' that defined vulnerability as "conditions arising from social, physical, economic and environmental factors that increase the susceptibility of individuals or communities to the impact of hazards" (p. 6). The resolve (4/Docu 07/2003/2156/Sa.Pu of August 16, 2003) to resettle the *katav*-displaced was also well indented. In spite of the many good intentions, the state seems to have looked at disaster as a one-time event and in generic terms rather than addressing the issues based on the specific contexts and realities. The insecurity of not having a house and homestead land of their own, the fear of the hostile environment, the insecurities arising from the vulnerable areas they are settled in, all of

them haunt the Musahars. They have suffered wide spread marginalisation, prejudices and stigmatisation in their new location. For those affected, it has been an unending saga of misery and suffering for almost four decades. A piece of land where they are resettled is the minimum that they expect from the state government.

The people feel that the government keeps promising land to the *katav*-affected but at the end very little happens concretely. They also feel that the administration and *karmacharis* are making them fools due to their powerlessness and vulnerabilities. While the intent of the government has been appreciable (be it through the legislation of land reforms or even others), the actual implementation often suffered.

The poorer people, often left with no other choice, encounter the state in its raw realities of strengths and limitations and yet depend on and are hopeful about the government, even in situations where the state appears to function here as much as an absence than presence (Corbridge et al., 2005). Above all what stands out very clearly is that with no other way available to them, the Musahars still turn to the state with certain hope. The Musahars' general experience is that the government does not really notice their existence and their struggles, and often they are faced with many false promises. They feel like being treated as a sort of 'unequal citizens' as they still struggle for identity, homestead land and shelter. Their helplessness is expressed when they speak of moving to Nepal as a last resort.

Instead of looking at all the displaced from a general perspective, approaches need to be customised and adapted to fit into specific contexts in which people are displaced. Considering different capacities and vulnerabilities of the communities, households and individuals concerned is a non-negotiable measure.

Notes

- ¹ Bihar Floods: A Field Study, 2013.
- ² Also known as Paschim Champaran.
- ³ District Paschim Champaran: Flood-2017, review meeting by Hon'ble Chief Minister, Shri Nitish Kumar, Date: August 16, 2017 (handbook).
- ⁴ Roadmap for Disaster Risk Reduction 2015–30, Government of Bihar, March 8, 2016.

- ⁵ District Paschim Champaran: Flood-2017, review meeting by Hon'ble Chief Minister, Shri Nitish Kumar, Date: August 16, 2017 (handbook).
- ⁶ Source: Census 2011 reflected in <https://westchamparan.nic.in/about-district/demography>
- ⁷ Hazard, Vulnerability and Capacity Assessment Report, prepared by the District Administration, Government of Bihar, October 2013 (Complete table in Annex).
- ⁸ Of 178 flood-prone panchayats, 33 are on the bank of the river Gandak.
- ⁹ District Paschim Champaran Flood-2017, Review Meeting by Hon'ble Chief Minister of Bihar, Date: August 16, 2017
- ¹⁰ Source: District Census handbook: Paschim Champaran, Village & Town Directory- Directorate of Census Operations, Bihar- Series II, Part XII.
- ¹¹ Considered lowest in the Mahadalit category in terms of socio-economic indicators.
- ¹² Population at Risk of Disaster. A Resettlement Guide, World Bank
- ¹³ In view of reaching out to the most marginalised among the Scheduled Castes in Bihar, the government of Bihar constituted a commission known as *State Mahadalit Commission* in the year 2007 for the welfare of the Mahadalits. Of late the composition of the group has been changed a bit to include more groups
- ¹⁴ Source: Bihar Mahadalit Mission: <http://www.mahadalitmission.org/BMVM-about-us-list.php>
- ¹⁵ A log of wood.
- ¹⁶ Kept eroding, kept moving
- ¹⁷ We are frustrated with floods and the government both
- ¹⁸ ndma.gov.in

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Flood and Its Impact on the Livelihood of Daily Wage Labourers: A Case Study of the 2017 Flood in Dahuabari Village of Araria District, Bihar

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ABSTRACT: This paper presents the results of a study carried out on the impact of the recent 2017 severe flash flooding of the Kosi river on the livelihood of the daily wage worker community of Dahuabari village in Arariya district of Bihar state in India. This defines a clear and explained form of all the factors, including direct and indirect impact of flood on livelihood, and underlying causes, including social, economic and physical vulnerability of that particular area, that are responsible for the livelihood vulnerability of the village. The research also correlates among the livelihood pattern of the daily wage worker and the characteristics of vulnerability through which that got affected. The role of all concerned departments for livelihood generation and support is also linked in the study. The study is based on qualitative and quantitative methods in which a number of methods, including primary data from the affected community and concerned authorities and secondary data from the district office, websites and literature review, were adopted to come to the results.

KEYWORDS: flood, livelihood, vulnerability, coping mechanism

Introduction

Flood is one of the hazardous climate change hazards that has a great impact on properties and lives. This paper address the impact of flood on the livelihood of daily wage workers in Dahuabari village of Kursakanta Block of the Araria district in the Indian state of Bihar. Livelihood refers to people's means of securing basic necessities like food, water shelter and clothing. The livelihood is the primary and the most important aspect of life that helps an individual secure food, fodder, medicines, shelter, clothing and the capacity to acquire all the necessities by working either individually or as a group. Livelihood strategies of any individual may be in diverse forms. They can adopt several activities to meet their needs. But the strength of livelihood cannot

be measured by only its productive outcomes but equally by its resilience to shocks, seasonal changes and trends. The source of livelihood can be damaged, by the shocks of natural disasters, wars and economic downturns. So along with its productivity its resilience should also be taken care of properly. History tells that whenever flood hits any community, it has short- to long-term impacts on livelihoods of the inhabitants of that particular area. In the short-term effects of floods can be included as destruction of farm lands, soil erosion and pollution of drinking water and the impact on crop, which contributes to low productivity and food security; while in the long-term impact food reserve in households whose negative impact on the hunger period from two months to six months and make household food security situation worse.

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Dahuabari is a low-lying area and is located beside Dhar river, which is a tributary of Koshi river and is the biggest cause of vulnerability to flood in the village. This research investigates the relationship between flood risk, poverty and the associated vulnerability of the community of daily wage workers. The research findings show that the low-income family of the village has suffered more than the higher-income family. The low-income household who are dependent on the daily wage work are exposed to more frequent disasters and most vulnerable to financial losses incurred through floods. The village comes under the severely flood-prone area of the block that used to be flooded at the frequency of three to four years. The village has diverse forms of work activity for the daily wage worker. About three-fourth population of the village are engaged in agricultural work, and remaining are engaged in the formal and informal sectors like, masons, vendors, labour in construction site, rickshaw puller and so on, on the basis of daily wage work. The village, along with the whole district, has suffered from flood disasters for many times frequently. The selected village has experienced five severe flood under 10 years, namely 2007, 2008, 2013, 2016 and 2017, in which the 2008 and 2017 floods were severely disastrous and the 2017, 2013 and 2016 floods had moderate impact on the Area. The frequent flood hit in the selected area has made the people more vulnerable economically and socially. Due to lack of proper job and income sources the rate of poverty in the village is high. The study shows that the average income of every household is only 200 rupees per day, which shows their living standard is very low and could hardly fulfill the basic needs of the family. It shows that they have very limited source of coping capacity. In this situation if the flood hit them, they would not be able to cope with the worst situation and have to suffer a lot to recover the loss and damage to their housing, properties and source of livelihood. Due to loss in the traditional source of income (agriculture, masonry, transportation) they had to migrate to other safe places, which also affects their income. The research is based on the 2017 flood in Bihar, in which about 19 districts of the state were affected partially and completely from the flood, in which Araria is also one of them which got affected 100 per cent. For the case study I chose one village name as

Dahuabari that comes under the Kursakanta block. The village is situated beside the Dharba river, which is the tributary of Kosi river, and affected much worse in the 2017 flood. Due to poverty and frequent hit of the flood people are unable to settle in the safe area. The poverty pushing them to settle towards the river bank and the frequent river encroachment are also growing the risk. The main purpose of selecting this village is because the poverty level of this village is high and there is a high rate of illiteracy and no coping mechanisms.

Besides the physical infrastructure damage, flood can also have significant impacts on the human health and provision of health services. Floods reduce the access to health service and can cause changes in the demand in health services (Alxelrod, Killam, Gaston, 1994).

Material and Methodology

The research is based on qualitative and quantitative methods. In the quantitative method the demographic information, comparison of income before flood and after flood, information about loss of house and properties and so on are designed. In the qualitative data problems of people, government policies and schemes analysis regarding flood management, policy regarding livelihood security to the daily wage labour, recovery plan and so on are added.

Dhowabari, of Araria district, has 712 households and 3721 inhabitants. To get the individual's response and information a multi-stage sampling technique was used. Out of total household 20 households were chosen, including the different source of income (people working in agricultural fields, wood seller, hawker, working in food godown, auto driver, vegetable vendor). From each household one person was taken for an in-depth interview with a structured and semi-structured questionnaire. I didn't find it more difficult to select the target population in the village because 70 per cent of the population of the village is dependent on the daily wage labour. So randomly I took interviews of 20 households of the selected village. From every household, one person who was the head of the family was taken for an in-depth interview with a structured questionnaire. Besides this, the four local authorities, including one headman, and three ward

members of the village, were taken in for an interview with an open-ended questionnaire. Some government officers like block development officer and district disaster management authority were also taken in for interviews with a structured questionnaire.

Result

The study shows that a number of factors were created through which people's livelihood, source of livelihood and income were affected, in which social, physical and economic causes are included. Dahuabari is a medium-sized village located in Kursakanta Block of Araria district in Bihar, with total 712 households. The total population of the village is 3721, of which 1913 are males and 1808 are females as per the 2011 census. The total population of children of age 0–6 is 854, which makes up 22.95 per cent of the total population of the village. The average sex ratio of Dhowabari village is 945.

The main source of income of the village is farming and wage labour at different work sites. The main activities of employment in the village are agricultural, self-employment, for example, general store, vegetable vendor, daily wage labourer, wood sheller, carpenter and so on.

Meanwhile, Dahuabari is a flat land, which is prone to serious flood disasters caused by heavy rainfall and river water. The flood risk features in Dahuabari are very sensitive to both disasters, causing factors and social economy. After observing its geographical location, I found that the village is in a low-lying area. The community has a limited capacity to control the hydrological events ensuring from the Dhar river. As a result, the community experiences floods in every rainy season. The flood causes displacement of people from their usual dwelling places, resulting in varying impacts on infrastructure, crops, health, education, environment as well as damage to property. So the study therefore endeavoured to assess the impact of floods on the socio-economic status of the people of Dhowabari.

The village has very few development plans like protective barrage, river embankment, lack of flood-resilient house and roads and so on; as a result, the risk of loss and damage of flood is so high. There are

no proper and stable source of income available in the village; as a result, the development in people's socio-economic level is very slow. This village is still facing the scarcity of industrial development. Education, drinking water, road and electricity are the main concerns of this village. Even in this twenty-first century when a large part of the state is developing in the education and technology sector, the young generations of this village are still barred from technologies. Due to the frequent hit of flood people have to face heavy loss in agriculture and housing infrastructure, which directly affects their livelihood and income. Due to economic backwardness in the village, poor people are not able to anticipate the loss caused by flood. Often the loss becomes destructive of this village because of lack of sufficient resources, poor housing, vulnerable location of their houses, and inability to access food, health facilities and safe drinking water. The inability to access of all these infrastructure is also the cause of unemployment and lack of sustainable livelihood of the village.

Effect of Flood on Livelihood

The flood water affected the source of livelihood in two ways, direct and indirect. The above discussion explains that the flood has a large variety of social impacts that span across and time (Philip Bubeck, 2017). According to the disruption and loss, the impact of flood was divided into two types, direct and indirect. Direct impact of flood means the most immediate and apparent impact of floods caused by physical contact between floodwaters and economic assets, cultural heritage, or humane beings, with injuries and deaths as the result. The indirect impact of flood means the losses that occur outside of the flood event in space and time, such as losses due to business disruption. The indirect impact of flood is the outcome of the direct impact of flood and can last for a long time; for example, experiencing property damage and losing important personal belongings can have negative psychological effect on flood victims. Many researchers have focused only on the direct losses and damage of flood rather than the indirect damage as a result, the full cost of natural hazards remains poorly understood. So there is a need to understand and assess the indirect damage

to improve social stress and national economies. The author further explains about the Direct tangible, direct intangible, indirect tangible, and indirect intangible impacts of flood on the socio-economic level. The author explains how these tangible and intangible assets are connected to people's source of livelihood and protection, and how their livelihood got affected after loss of damage to these assets. Tangible assets are those which have a physical form and can be touched and felt and a business uses these assets such as machinery, buildings, land and plant to produce goods and services. Intangible assets are those that do not have a physical form and cannot be felt and touched but add value to a company or business, like human resource capital, education, goodwill and so on, which help directly or indirectly to produce income.

Direct Impact of Flood

Damage of Housing and Its Impact on Livelihood

A survey of the study area shows that about 40 per cent of the key respondents from the selected area live in mud houses and 40 per cent are in semi-*pucka* houses made of bricks and thatched or tin shed. So almost 70 per cent of the communities in the selected village live in houses made of bamboo and mud with thatched or tin shed. As a result, these communities always have to face the dilemma of their houses getting washed away. Maximum poor household families are found reside in the riverside areas. It is their community whose houses get damaged and they have to suffer the damage to livestock as well.

About 70 per cent of the houses in the affected village are made of bamboo, mud and metals. Almost every respondent of the village narrated that their house were damaged either partially or damaged completely. According to the District Collector of Araria district, almost 2.2 lakh people of the district became homeless due to partial and complete damage to their houses. According to the Block Development Officer of kursakanta block, about thousands of houses alone were lost in the Kursakanta block of the Araria district. The local residents of the village

reported that the waters have also damaged stocks of grain that would have sustained the household over the coming year. The water has not only damaged houses, but valuable materials and cooking utensils were also washed away.

While doing the survey in the selected village in the Araria district I found that a substantial number of productive and non-productive assets were damaged and lost in floods. Of the productive assets that were lost, 15 per cent were livestock, including goats, cows and buffaloes, which was another source of income for the locality and 10 per cent were agriculture tools like plough and seeds, while majority of non-productive assets were beds, chairs, radios, cooking utensils and clothes. Some communities revealed that they have lost income sources in the flood, which forced them to off-load some assets to raise money to meet other basic household requirements.

If there is agricultural production, then a group of villagers earn a livelihood by participating in the production and distribution process. Whether villagers have agricultural land or not, they are directly and indirectly dependent on cultivation, harvest, trading and processing of agricultural crops. Therefore, the impact of the loss of agriculture is multidimensional. The people of Dahuabari village are mostly dependent on agricultural work, and hence their earnings come from agricultural activities and labour work in agriculture. In the village most of the people are farmers and have their own land for cultivation. In Araria most of the villagers have expressed that for them the situation is more difficult than Dalit minorities and Adivasi communities, as most of them have taken land on rent or on share basis from landowners. Mohd. Sazad, who is 38 years old and an auto driver in the village who daily carrying passengers daily from Kursakanta to Araria, told that due to loss in the connectivity at many places he was unable to earn money for 15 days. Shadat, a 45-year-old rickshaw puller, said that his rickshaw was washed away in the high flow of flood water and got broken; as a result, he had to buy new rickshaw by borrowing loan. Mohd. Ajmal, who is a furniture seller, said that his entire shop was destroyed and washed away in the flood water and was carried away too. The flood water was so high that one of the four luggage tractors was

also washed away in the flood water. The engine of the vehicle became useless because of the deposition of sand and flood water in it. So he had to face a loss of about Rs 2 lakh. For renovating and restarting his shop, he had to borrow a large amount of money from his relatives and the bank.

Indirect Impact of Flood on Livelihood

Health plays a key role in shaping human capital. Contamination of water becomes a serious problem for people's health just after the flood. Most interviewees replied that the foul-smelling polluted water caused them skin infections. The flood water brings lots of chemicals and minerals along with it and contaminates the source of drinking water, like hand pumps and wells, which causes serious waterborne diseases like diarrhoea, jaundice and cholera and so on; as a result, this creates an extra economic burden on the communities' income for their treatment. The main problem arises when the head of the family or main earner of the household becomes ill.

About 60 per cent of the respondents reported that they have suffered from health consequences during and just after the flood time. While doing survey in the selected area we found that some of the local health services of the village and city were damaged by flood, and those which are far from the village, the villagers were unable to access them because of damaged roads and bridges. Disruption in accessing health services implies an increase in disease incidence due to a lack of access to appropriate medication. Out of the 20 respondents from the area, about 15 stated that they and their family member were affected by waterborne diseases during and just after the flood. The most significant diseases experienced among the sampled household were diarrhoea, cough, malaria/fever, sores and rashes during the floods. Furthermore, the research survey also revealed that about 12 households from the sample data who use the hand pump for drinking water fell ill with some minor disease like malaria and fever, while 8 households who use wells for their main source of drinking water were affected worse by different kinds of diseases. Those households which

are near the river were affected more. This means that households will continue to be vulnerable to increased disease outbreaks as long as the river continues to be their main source of drinking water. This is a result of increased contamination that occurs during flooding.

Underlying Causes of Vulnerability

This part of the study talks about the underlying causes of vulnerability among the daily wage labourers and the community of Dahuabari village. A number of vulnerabilities were identified in the selected area which are categorised into economic, social and physical dimensions. Several different concepts and definitions of vulnerability have been given by different scientist communities on the basis of geographical characteristics and exposures to risk. My application of the vulnerability concept is based on some of the following definitions by Messner and Meyer (2006). Vulnerability can be defined by the characteristics of a system that describe its potential to be harmed. It can be expressed in terms of functional relationships between expected damage regarding all elements at risk and susceptibility and exposure characteristics of the affected system, referring to the whole range of possible flood hazards (Meyer, 2010). This definition makes it clear that flood vulnerability depends on the number and value of elements at risk and their susceptibility (awareness, preparedness), and it is also related to the exposure of those elements at risk to the hazard, expressed by flood severity and probability (Meyer, 2010). While looking at these definitions I identified a number of vulnerability causes of flood, including economic, physical and social, which affect the livelihood of daily wage workers. The following findings explain those vulnerabilities and exposure of flood.

Economic Vulnerability

The study shows that the respondents of Dahuabari are vulnerable to multiple factors: Poverty, lack of alternative sources of livelihood and lack of government support during an emergency situation are the main factors that make the locality economically vulnerable.

Thirty per cent of respondents replied that the unprotected structure of the river is the main cause of their vulnerability. It's true that the benefit from the river water for their agriculture, but the losses are greater than the benefits. Twenty per cent of respondents respondent replied that they are more vulnerable economically because they don't have an alternative sources of livelihood. Maximum locality is dependent on a single economic source and majority of the people are dependent on agriculture work. As a result, during and after the disaster, these communities don't have a proper source of livelihood to survive. Around Twenty per cent of the respondents said that the main cause of their vulnerability are poverty and residing in a flood-prone area. They said that they are poor and don't have land to go and settle to in any other place. As a result, whenever the flood comes, they are the people who first get affected.

Physical Vulnerability

While contacting the government offices they gave multiple causes of the physical vulnerability of the Araria district. The municipal council of the Araria district gave the following causes for more destruction and damage during flood time.

Around 20 per cent of the population of the district are vulnerable to flood because of unplanned urban growth. People are making their houses in the low land. There is no proper sources of drainage facility; as a result, whenever flood water enters into the district and the contaminated water of open drainage spreads all over the open fields, more water-borne diseases spread. Twenty-five per cent of people of the population is vulnerable to flood because they are living in the flood plain areas illegally and as a result, these people get exposed very easily. People residing in the flood-prone area don't have enough sources like boats, vehicles and easy accessibility to roads. Lack of proper drainage is also another cause of flood risk in the area. Since Forty per cent of people of the population is vulnerable to flood because of a lack of protective measures, so all the above are physical vulnerabilities of residents of the Araria district. Unplanned urbanisation intensifies flood risks and livelihood vulnerability and creates new poverty patterns in urban areas. The findings of the study show that the households of the Araria district are moderately vulnerable to floods due to high financial and physical vulnerabilities. Lack of land-use regulation and insufficient monitoring of land and houses are also major factors of flood risk in the district.

Underlying Causes of Physical Vulnerability					
		Frequency	Per cent	Valid Per cent	Cumulative Per cent
Valid	Unplanned urban growth	4	20.0	20.0	20.0
	Construction and informal settlement in flood plain	5	25.0	25.0	45.0
	Lack of proper drainage facility	3	15.0	15.0	60.0
	Lack of protective measures	8	40.0	40.0	100.0
	Total	20	100.0	100.0	

Social Vulnerability

Underlying Causes of Social Vulnerability					
		Frequency	Per cent	Valid Per cent	Cumulative Per cent
Valid	Poor governance	8	40.0	40.0	40.0
	Discrimination of resource distribution	7	35.0	35.0	75.0
	cast and religion discrimination	4	20.0	20.0	95.0
	Low literacy level	1	5.0	5.0	100.0
	Total	20	100.0	100.0	

Social vulnerability refers to potential harm to people. It involves a combination of factors that determine the degree to which someone's life and livelihood are put at risk by a discrete and identifiable event in nature or in society. In another sense, social livelihood can be understood as the characteristics of a person or group in terms of their capacity to anticipate, cope with, resist and recover from the impact of natural hazards.

The researcher identified a couple of social causes which are responsible for social vulnerability among the community of Dahuabari and whose negative impact they have to face on the economic level. Forty per cent of victimised respondents replied that due to poor governance in the village they are unable to get proper jobs under the MGNREGA. The faulty list of BPL help achieve jobs under MGNREGA and other schemes run by the government. Some people said that they are unable to join the membership in self-help group because of the lack of BPL card. Political biases have also been seen there. After the flood those people got to work under the MGNREGA whose relationship was good with the local representative of the village. About 35 per cent of people of the respondents said that they have to face discrimination when they went to find a job in other city. They were discriminated on the basis of their religion. Five per cent of the respondents said that the illiteracy rate of the village is also one of the biggest factors for their economic vulnerability. Due to a lack

of literacy they are unable to benefit from government schemes and unable to utilise technologies to enhance their socio-economic status. The second biggest cause of the vulnerability of the area is lack of education. According to the census data of 2011 the literacy rate of the village is about 48 per cent. This literacy rate doesn't mean that the villagers are higher educated. Most people of the village are educated between fifth and eighth classes. A very few people of the village have completed their matriculation or 12th class. The sample village shows that about 70 per cent are illiterate while 30 per cent are either literate or 12th pass. This illiteracy rate of the village is the biggest problem for their development. Due to the lack of education they are unable to get proper jobs.

Coping Strategy of Daily Wage Labourers

Flood is a natural phenomenon which has a great intensity of damage and loss and destruction. In that situation the victimised community follows different forms of coping strategies, which have no fixed format. People of the affected place use their available resources and ingenuity to cope with the situation. In the 2017 flood in Bihar, certain coping actions were immediately taken by the affected community as individual households, where some have escaped to relatives' places and majority to refugee camps.

Coping Mechanism at Household Level during Flood					
		Frequency	Per cent	Valid Per cent	Cumulative Per cent
Valid	Taken loan from moneylender	8	40.0	40.0	40.0
	Change in occupation	1	5.0	5.0	45.0
	Selling of property	1	5.0	5.0	50.0
	Migration	6	30.0	30.0	80.0
	5	4	20.0	20.0	100.0
Total		20	100.0	100.0	

Through the survey in the study area I found multiple sources of coping strategies due to floods. The most important coping strategies among the villagers were loans and changes in occupation. Almost 90 per cent of the residents replied that they coped with the drastic situation by taking loans from others, while 40 per cent of the respondents replied that they had to migrate to another place and had to change their occupation. In order to restore destroyed livelihood structure, a large amount of capital investment is required, and it is clear that a daily wage labourer can't have that much deposited amount of money. In the absence of money the villagers had to take loans either from moneylenders or from other family relatives. In the absence of institutional credit companies, households have to use private moneylenders. The poor people start exploring loan possibilities from their friends and relatives. Failing this, they fall back on moneylenders, who usually charge a very interest on loan. After the great hit of flood in Araria district many people migrated to cope with the current situation. Some of the daily wage labourers of the village who were dependent on agricultural activity had to go to another city or state to earn their livelihood. Generally, landless families seasonally migrate in search of a jobs during the post-cultivation season, but the migration becomes permanent after floods. This is mainly because of the unavailability of agricultural labour work in the village.

Conclusion

Daily wage worker is the community that has to face the biggest issues and problems of floods because of limited sources of coping capacity and vulnerable physical and geographical assets. They have to face unemployment during and after a flood event because of less skills and lack of work. Maximum daily wage workers of the village were found to have a single occupational source of income and most of them are dependent on agriculture only. In such a situation they have to face the problem of unemployment when the agricultural land is damaged. So to reduce the impact of floods on the livelihood of daily wage workers and the low income of households, there should be more employment sources along with agricultural work. The farmers of flood-prone areas should be trained to the practice of flood-resilient agriculture. Some secondary sources of livelihood should be provided to them so that the impact of floods on the livelihood can be coped with. There should be accessibility of financial institutions to wage workers so that they can start some micro-finance themselves.

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Community Resilience and Disaster Management in India: A Study of Fishers

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ABSTRACT: Coping strategies of the coastal population provide a pointer to study the resilience of certain livelihoods which can stand against the fury of disasters. The devastating deluge in India witnessed the emergence of fishermen of Kerala as saviours when hundreds of them decided to trade through flood-waters to venture into areas where the navy could not reach. They saved thousands of lives. This is undoubtedly an important case study for disaster research in social science.

Fishing communities, who have been living along the coasts for generations, experience social exclusion in various ways. Along with the commercialisation in fishing that marginalises small fisherfolk, the frequent occurrence of disasters along the sea coast has broken their backbone and pushed them into the vicious circle of poverty. The government has tried to address the conflict between the big fish-traders and traditional fishing community in various ways. However, if their livelihood has sustainability, they can counter the after-effects of disaster. Different research studies indicate that they adopt coping strategies to trade through the crisis. Therefore, coping strategies of the fisher folk households provide a pointer to study the resilience of certain livelihoods which can stand against the fury of disasters.

Disaster and development are inextricably interlinked. The lesser is the risk in a disaster, the better the outcome of development. Therefore, the Sendai Framework of Action (2015–30) announced a paradigm shift and gave the call to the member states to focus more on risk reduction strategies that are to be adopted in a pre-disaster situation. One of the prescribed strategies is to find out community resilience mechanisms that men have been adopting as survival strategies even before the state comes to their rescue. This paper is an attempt to find out the disaster resilient techniques adopted by a particular community whose livelihood is most affected during a disaster. One such community is the fishing community across the globe.

The research study will be a pointer for policy-makers to take into account the mechanisms of community resilience to ‘Build Back Better’ while framing a public policy for disaster management.

KEYWORDS: disaster preparedness, fishing community, fisher-women, community resilience, disaster risk reduction, sendai framework

Introduction

Coping strategies of the coastal population provide a pointer to study the resilience of certain livelihoods which can stand against the fury of disasters. The devastating deluge in Kerala witnessed the emergence of fishermen as saviours when hundreds of them decided to trade through flood-waters to venture into areas where the navy could not reach. They saved

thousands of lives. This is an important case study for disaster research in the world. This expresses their resilience to the disaster. This observation has prompted the present study.

Disaster and development are inextricably interlinked. Lesser is the risk in a disaster, the better the outcome of development. Therefore, the Sendai Framework of Action (2015–30) announced a paradigm shift and gave the call to the member states to focus

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more on risk reduction strategies that are to be adopted in a pre-disaster situation. In the discourse on disaster mitigation, the more commonly used term 'disaster risk reduction' (DRR) is replaced by a more appropriate term 'resilience building, risk reduction, and mitigation' (RRM) (Amita Singh 2018). One of the prescribed strategies in RRM approach is to find out community resilience mechanisms that men have been adopting as survival strategies even before the state comes to their rescue. RRM approach interprets 'resilience' as the capacity of life to withstand nature and human frailties.

This paper argues that institutionalisation of community resilience mechanism will go a long way in capacity-building to reduce disaster risks. This study is an attempt to find out the disaster resilient techniques adopted by a particular community whose livelihood is most affected during a disaster. One such community is the fishing community across the globe.

Understanding Community Resilience

Though humans have experienced disasters quite often on earth, consciousness about disaster management is a twenty-first-century intellectual exercise. Prior to the millennium, disaster response was limited to short-term relief and rehabilitation. The super cyclone of 1999 and the Tsunami of 2004 compelled the national governments to give serious thinking to develop a long-term strategy so that disaster losses can be reduced over time. The pedagogy of this long-term strategy was 'social engineering'. It was a macro model or one can say 'mass culture' of disaster management. Following this model, India had enacted the Disaster Management Act of 2005. The main thrust of disaster management exercise was a huge investment in building infrastructures like disaster shelters and relief camps, developing early warning systems, maintaining food supply and disaster relief to rehabilitate the disaster-affected so as to reduce their vulnerabilities. The macro model did not include assessment of a disaster-prone area and its local ecology and local community practices. Gradually this approach appeared to be devoid of humanistic concerns. The paradigm of 'disaster risk reduction' gave way to a new

approach to developing resilience of community by focusing on community resilience mechanisms.

The impact of natural disasters has been more profound during the last few years. Mega-disasters create vulnerability. Poverty is both a driver and a consequence of disasters. The processes that further disaster risk related to poverty are permeated with inequality. Vulnerability, risk and resilience in a disaster situation need to be understood in a different epistemological framework. 'Earthquakes do not kill, but bad buildings do' (Walsh 2010). Viewing in this framework vulnerability has to be understood as a governance problem. Resilience is the capacity of life to withstand the condition of vulnerability through innovation and to protect oneself. The risk is proportionately related to vulnerability and resilience. Resilience reduces the risk and vulnerability of the community members. Thus, lack of law, weak governance, and non-participative community convert a hazard to a disaster (Amita Singh 2018:27).

The World Disaster Report, 2002 categorically states that international development targets set for the year 2015, such as reducing world poverty and hunger by one half, will not be reached unless the heavy toll of disasters on the poor is reduced through efficiency measures. The same understanding has been reiterated by the 2030 Agenda of the world. Though disaster management has been a major concern in India since the last decade of the twentieth century, it has been realised currently that Total Disaster Risk Reduction Measures is an ongoing national requirement. The Hyogo Framework of 2005–2015 emphasised on 'Building the Resilience of Nations and Communities to Disasters'. Further, the Sendai Framework 2015 gives a call for strengthening disaster risk governance and to 'Build Back Better'. Within this framework of disaster risk reduction, the study aims to investigate the social and spatial reality.

The Sendai Framework of Action has the following essential components which will help us to frame our research questions.

- Disaster risk reduction should be based on an understanding of disaster risk in all its dimensions of vulnerability, capacity, exposure of persons and assets, hazard characteristics and the environment

- Strengthening disaster risk governance to manage disaster risk by having a clear vision, plans, competence, guidance and coordination within and across sectors of risk governance, as well as participation of relevant stakeholders, is needed.
- Enhancing disaster preparedness for effective response and to 'Build Back Better' in recovery, rehabilitation and reconstruction are essential. Empowering women and persons with disabilities is of utmost importance.

This paper argues that area-specific approach to disaster management will motivate us to go for micro-studies in disaster management. Secondly, it emphatically states that imposing something exogenous on local community will create anxiety in their mind. Therefore, it would be of lasting benefit to disaster management if we encourage resilient social and ecological practices adopted by the community since long. These practices are the resultant outcome of human innovation which has been developed by using the 'community spaces'. Thus, the paper makes an attempt to find out the social and ecological practices adopted by the fishing communities in India to curb disaster losses over time. The reasons behind focusing our study on fishers are that this section of the population depends on water bodies to earn their livelihood and are more prone to disaster risks.

The Profile of Indian Fishers

Fish as a source of income and diet is common in the coastal regions of the world. Fish protein constitutes approximately 15 per cent of total animal protein for three billion people across the globe, wherein the dependence of poor and middle-income countries is much higher (Sumaila et al. 2016). The world over, fishing is mostly practised commercially or farmed, with 90 per cent of the fisherfolk being small-scale fishermen. The small fisherfolk use traditional methods of fishing for self-consumption as well as trading and mostly sell wild-caught fish in the markets (Badjeck et al. 2013; 2010). India with a long coastline is no different.

India has 8129 kilometres (5051 mi) of marine coastline, 3827 fishing villages and 1914 traditional fish landing centres. India's fresh water resources consist of 195,210 kilometres (121,300 mi) of rivers and canals, 2.9 million hectares of minor and major reservoirs, 2.4 million hectares of ponds and lakes, and about 0.8 million hectares of flood plain wetlands and water bodies. As of 2010, the marine and freshwater resources offered a combined sustainable catch fishing potential of over 4 million metric tonnes of fish. In addition, India's water and natural resources offer tenfold growth potential in aquaculture (farm fishing) (Vyashnavi & Rao 2016).

Fishing in India is a US\$5.78 billion major industry exporting 1,134,948 metric tonnes of seafood. Its contribution amounted to over 1 per cent of India's annual gross domestic product in 2008. It provides livelihood to 14 million people in its coastal states. According to the Food and Agriculture Organization (FAO) of the United Nations, fish production has increased more than tenfold since 1947 and doubled between 1990 and 2010. Among all the major factors impeding the sustainability of fisheries, a factor of climate change is the recent addition. Climate change trends along major river basins of India have revealed a warming trend (0.2–0.5 °C), declining rainfall (257–580 mm) and shifting seasonality of rainfall occurrence. Rising sea levels (1.06–1.75 mm/year), receding Himalayan glaciers and frequent occurrence of extreme weather events are also a matter as per IPCC AR5. The impact of climate change on Indian fisheries is profound.

Since the fishing community resides in coastal districts and states, they are most affected when disasters like cyclone or flood affect the coastal areas. Many fishers are unable to work due to the loss of boats and gear or due to fear of the sea in a post-disaster situation. On the other hand, in a post-disaster situation, the market for sea food plummet due to public fear of disease and contamination from water bodies. This issue persists despite resounding dismissal by health authorities throughout the region, further complicating the lives of those fishers who want to resume their livelihood. Low rainfall also affects fish culture.

The Fishing Community in Odisha

Odisha is the seventh largest fish-producing state in India, the first being Gujarat. Fish production is an important culture among the people of Odisha to a large extent. The state is the highest fish consumer and the demand for fish is ever increasing with an assured market. Two main components of the better yield are seed and feed. However, the fish production during the last five years has substantially increased in neighbouring states like Andhra Pradesh, West Bengal and Chhattisgarh, whereas the production in Odisha has increased very marginally. The recent economic development in the state has affected the fishing community of the state which is a matter of concern for about 3 per cent of the total population of the state.

Odisha is a state on the eastern seaboard of India, located between 17°49' and 22°36' North latitudes and between 81°36' and 87°18' East longitudes. It has an area of 155,842 sq km which accounts for 4.7 per cent of the geographical area of India. It has a 480 km coastline forming 8 per cent of the coastline of India. The continental shelf up to 200 m depth covers an area of 25,000 sq km, which is 4.5 per cent of the total area of the country's continental shelf. In the northern part of Odisha, the continental shelf extends up to 120 km and in the southern part up to 40 km. Its population was 4.19 crore as per the 2011 census. Administratively, the state is divided into 30 districts, 58 sub-divisions, 314 blocks and 103 urban local bodies. The average density of population comes to 236 per sq km with significantly higher density in the coastal areas compared to the interior parts. The other side of the story is that Odisha is frequently confronted by natural disasters like floods and cyclones due to its coastal morphology. Due to its subtropical littoral location, the state is prone to tropical cyclones, storm surges, and tsunamis. Its densely populated coastal plains are the alluvial deposits of its river systems. The rivers in these areas with a heavy load of silt have very little carrying capacity, resulting in frequent floods, only to be compounded by breached embankments.

Odisha has a bounty of nature with sea coast, lake, river and water reservoir of fresh, brackish and marine water which has been a sustainable source of livelihood for water-based communities including fisherfolk, fish

workers and people engaged in allied activities for generations.

Fishing has been a long tradition providing employment, income and food security. It's estimated that a population of about 12 lakh, including 9 lakh in inland and 3.33 lakh in the marine sector, depends on fishing for livelihood (Banerjee, S, 2017). The inland fishermen population is highest in Chilika followed by Ganjam, Khurda, Cuttack, Kendrapada, Jajpur and Puri. The marine fishermen population is highest in Baleswar, followed by Bhadrak, Jagatsinghpur, Kendrapada, Puri and Ganjam. The fishing population is located in 3878 villages all over the state out of which 641 are marine and 3237 are inland villages. The literacy rate of fisherfolk is 48.15 per cent and most of the fishing villages lack basic infrastructures like communicating road, electricity, drinking water, health, sanitary facility, school and housing.

The fishery sector contributes about 3 per cent to the GDP and has potentialities of growth to generate employment and food security. The fishery development policy of the state and the prospective plan of the fisheries sector in Odisha for the next 10 years have emphasised to improve the production of fish through private sector investment, but equal importance has not been attached to the communities in the sector considering the changing socio-economic and environmental context in the coming days. There has been no mention of the rights of traditional fishing communities. The strict implementation of Odisha Maritime Fishing Regulation Act has restricted the access of fishing communities.

The industrial development initiatives are going to impact the people which will be largely displacing coastal community including fisherfolk from their land and water-based livelihood. The process will destroy habitations and pave the way for the loss of livelihood. Fishing by use of traditional boat engaged the whole family including women and children in different roles. The people engaged in marine fishing on 480 km coast of Odisha have been already facing a number of issues in recent times due to natural disaster, climate change and capital investment in fishing by the corporate world such as fishing by vessels and trawlers. The production of marine fish has been decreasing due to pollution, natural disaster and change in ecosystems

with vanishing mangrove forest. A study on Vatika village of Bhitarkanika sanctuary of Kendrapar reveals that the issue of turtle breeding and low pressure has almost been preventing them from entering into the sea for about more than six months which is affecting the livelihood of the communities depending on the coast for survival (Banerjee Subhra 2017). The conservation actions have prevented the fishing community to do fishing in national parks and sanctuaries on the coast. The Forest Rights Act, 2006, allows scheduled tribes and other traditional forest dwellers for fishing right and use of water bodies in forest areas which are also applicable to fisherfolks in the mangrove forest area. The Wildlife Protection Act, 2006, protects the rights and occupational interest of the traditional fishing community.

The tourism development in port areas of Gopalpur, Puri, Satapada and Chilika lake has restricted the traditional fishing right of the local fishing community. Chilika lake is home to 2.5 lakh fisherfolk. The illegal prawn farming by outsiders has created a negative impact on the local fishing community.

The people engaged in small-scale and traditional fishing are facing the problem of pollution in mining and industrial belt where the river and other traditional water sources are found increasingly polluted. This has been evident with traditional fishing community living on the bank of rivers like Brahmani, Mahanadi, and Baitarani having lost their livelihood. The other problems faced by them are indebtedness and distress sale of fish by the local traders in the absence of a supporting price system by the state. The water bodies such as ponds, canals, lakes, wetlands and reservoirs are being restricted to them for fishing. These people are also being debarred from participation in managing these water bodies. The power of planning and management of minor water bodies in the scheduled areas is vested with the panchayats. Similarly, the panchayats in non-scheduled area do not allow traditional fisherfolk to have rights over water bodies for livelihood purpose where ever they have a presence.

Odisha has 2.56 lakh hectares of the reservoir where the state reservoir fishery policy encourages leasing out for fishing to primary fishermen cooperatives

of locally displaced families and use of advanced technologies for the purpose. The government has set up fish farmers' development agencies in each district to develop fish pond and trained fish farmers for inland fishing development which should give priority to traditional fish workers, but many of the policies have not reached the people in the fishing sector.

Fishing communities in Odisha, as in other parts of India, are being displaced as coastal areas are increasingly targeted for competing activities, including industrial development, tourism and urbanisation. Fishing communities, who have been living along the coasts for generations, rarely have any 'legal titles' to their land (Naskar P. 2018). Economically and politically weak, they often have little option but to leave their traditional lands in the face of pressure from the industry and from the government. It is the time that the customary rights of these traditional populations to the land they live on, and the waters they fish in, are accorded due recognition. Development should not be at the cost of natural resources and the livelihoods of marginalised groups. The Odisha government does provide marine cards to the fishermen residing the villages. According to the marine card, the state government provides 25 kg of rice to each affected fisher family at the rate of Rs 1/kg every month as compensation under the World Bank-funded Integrated Coastal Zone Management Programme (ICZMP). *Fishermen's households practice occupational diversity to overcome the loss of their primary occupation of fishing and dependence on forest product in the Vetka village in Bhitarkanika wildlife sanctuary. Sixty per cent of the respondents in the study state that with the decline of mangroves, there is also a decline in the fisheries. They said that mangroves enhance the productivity of marine and estuarine fish, prawns and crabs which contribute to the growth of the fishery ecosystem.*

The new policy needs to look at the environment and the local population in the surrounding environment as a larger social system in which both the sub-systems are mutually interdependent. Therefore, this research makes a humble attempt to explore the opportunities, access and possibilities for the local community.

Review of Literature

Adaptation to climate change is a great challenge for all nations especially the developing ones. The developing countries with long coastlines are more vulnerable to disasters as their economies are dependent on climate-sensitive sectors such as agriculture, fishing and tourism. With lower per capita income and limited access to technology developing countries have less adaptive capacity. Thus, it has been assumed that pre-disaster administrative management in a disaster-prone region is meant to build in the requisite consciousness and confidence in the people and administration as well to manage mega-disasters.

Further, structure, density and socio-economic indicators of the population determine their level of vulnerability. Therefore, while delivering justice, the nature of vulnerability has to be incorporated into public policy so that the fault lines of social justice get adequately addressed. In this context, it is pertinent to mention here that the core capabilities of the vulnerable population need to be enhanced to meet disaster threats in a scientific way.

Ensuring the safety of people and the well-being of survivors is the top priority of governments when disaster strikes. The areas covered for assistance include:

- Assistance for replacement/repair of craft and gear
- Repair of infrastructure such as fishing harbour/fish-landing centres.
- Repair/relocation of ice plants and other infrastructure
- Assistance to small entrepreneurs engaged in the sector and more.
- Gratuitous assistance, housing and so on.

The key challenges for medium- to long-term rehabilitation includes rehabilitation of fishermen and Community Disaster Management programme covering awareness, communication and other aspects. But, hardly attention has been given by the researchers or the government on pre-disaster preparedness except for the presence of early warning system or evacuation. Hardly any study exists on documentation of mechanisms of community resilience in a pre-disaster period. It is pertinent to mention here that men have a survival instinct. Our search is how do

specific communities prepare themselves much before the disaster strikes for protecting their livelihood and families. Therefore this study focuses on this particular aspect for a particularly vulnerable community whose livelihood depends on water bodies.

Research questions of the Study

- What is the socio-economic status of the fishing community?
- What is the socio-economic status of fisher-women?
- What is the impact of disasters on fisher's households?
- What disaster resilient practices they have been adopting since long to stand against a disaster until the administration comes to their assistance?

Methods of Research

The study has been conducted in the Krishnaprasad Block of Puri district of Odisha where a sizeable number of fishermen reside as natives of the villages. The study has interacted with 100 households of the fishing community in different villages. The study has adopted a qualitative research design which has captured the techniques adopted by the fishermen throughout the year to enhance their resilience against disasters.

Research Tools Used in the Study

Focus group discussion, interaction with panchayat leaders and important personalities in the villages and case study method to document narratives of some fishermen which contains important findings for our study.

The paper has four sections. The first section gives the theoretical framework of the study. The socio-economic condition of the fishing community in India and the issues of fishermen are given in the second section. The third section states the findings of the study and the fourth section deals with certain actionable strategies to be adopted for the fishing community who are frequently affected by disasters.

Impact of the Study on Public Policy

The research study will be a pointer for policymakers to take into account the mechanisms of community resilience to 'Build Back Better' while framing a public policy for disaster management.

Discussion

The research study has been conducted in Krishnaprasad Block of Puri district of Odisha. Therefore, a discussion on the Puri district is essential to understand the social and ecological nature of the study area. By the year 1995 the Puri district was divided into three districts:

- Nayagarh district comprises Nayagarh sub-division.
- Khordha district comprises Khuradha and Bhubaneswar sub-division.
- Puri district comprises Puri Sadar sub-division only.

The present Puri district of Odisha comprises 1714 revenue villages. It has one sub-division (Puri Sadar), 11 tehsils and 11 blocks. Puri is the only municipality of the district. Konark, Pipili and Nimapara are the three N.A.C. in this district. Puri Sadar sub-division consists of four tehsils, that is, Krushna Prasad, Sadar, Pipili and Nimapara. It has a geographical area of 3051 sq km or 264,988 Ha. It has a varied geographical and geological divisions depending upon the available rock types, soil, vegetation, water bodies and climate. The whole of the district may be divided into two dissimilar natural divisions: the littoral tract and the level alluvial tract which is the agricultural area of the district.

According to the 2011 census, the Puri district has a population of 1,697,983. This gives it a ranking of 291st in India (out of a total of 640). The district has a population density of 488 inhabitants per square kilometre (1260/sq mi). Its population growth rate over the decade 2001–11 was 13 per cent. Puri has a sex ratio of 963 females for every 1000 males, and a literacy rate of 85.37 per cent.

The study area, that is, Krishnaprasad Block has 83 villages whose population range between minimum 48 persons to 3222 in Maludkhas village. About 42.5 per cent of the population in Maludkhas are scheduled castes who have a literacy rate of 82.39 per cent. The Block is a rural area having 20 panchayats and no urban area. Twenty-four per cent of its population are scheduled castes. Only 186 scheduled tribes live in this Block. However, the literacy rate is 81.51 per cent as per 2011 census. In 2011 there were total 12,088 families residing in Krishna Prasad Block. The **average sex ratio**

of Krushna Prasad Block is 942. In all panchayats, the ruling political party Biju Janata Dal has a stronghold. As of 2011 India census, Krishnaprasad Block had a population of 57,505 out of which males constitute 51 per cent of the population and females 49 per cent.

It has six marine fishing villages. Twelve per cent of the households in the block belong to fisherfolks. In other words, 11 percent of fishermen in Puri district reside in this block. Four per cent of fishermen in this block have formal schooling. Thirty-one per cent of fishermen are engaged in actual fishing. Seventy-nine per cent of fishermen have gillnet for fishing.

It's a general practice among the fishers to respond to the early warning announcements made by the government before the onset of a cyclone. However, the fishers make themselves prepared when they visualise the onset of a cyclone. They call this natural phenomenon 'Mahuli' which is the weather condition before the onset of a heavy storm and wind blows from the North. Our research team found the following community practices followed by fishermen when they see 'mahuli' is coming:

- Majority of fishermen use country boats though some of them are using mechanised boats whose engine costs around 3 lakhs. When they see Mahuli condition, they take out the engine from the boat and keep it in a safe place in their house.
- Secondly, they choose a place to develop an artificial bay/harbour on the shore. They use gunny bags, grass patches to block it so that seawater does not enter in a large amount during a heavy storm. This creates a strong wall for the bay or a condition of the artificial harbour. After this, they keep the boats here and tie them strongly to some strong support.
- The alternative practice adopted by them is that they prepare strong carriers with wood and grass which can roll on the sand to carry boats from the seashore to a far off place. Precisely speaking, wood carriers work as vehicles to carry boats.
- After this, the fishers turn the boat upside down on the sand to face the heavy storm so that wind does not flow away from them.
- In such a situation, they opt for distress sale of their fish. Due to the frequent occurrence of natural

disasters, the fishermen experience distress sale quite often.

- Before they shift to the cyclone shelter made by the government, they keep their utensils and valuables in a safe place in someone's pucca house.
- These fishermen are always in a debt trap. Their debts are small debts that range between Rs 30,000 and 50,000. But, they are not in a condition for years together to pay back the debt. Therefore, indebtedness is a regular feature in fishermen's lives. This is the major reason behind their distress migration for livelihood.
- Majority of the fishermen are small and marginal fishermen having two to three nets. They own on an average 1–1.5 acres of land. The fishermen who have small boats are at a loss, as they go fishing near the seashore and therefore are forced to sit at home as their nets sometimes kill the turtles who come for nesting. However, the big trawlers face no losses as they go deep inside the sea, albeit illegally, to catch fish.
- Further, the modernisation of fishing ushered in the introduction of new equipment and fishing gear, such as gillnets and mosquito nets. However, access to these inputs was limited to the better-off sections of the community, while the rest followed the traditional ways of fishing. This led many fishermen to leave their traditional deep-sea fishing and join the privately owned big trawlers.

Conclusion

While recognising the rights of traditional fishing communities, steps should be taken in the light of recommendation given by a committee on fisheries of the Food and Agricultural Organization of the United Nations (FAO). The guidelines of work in the fishing convention of ILO 2007 should be adopted to improve the living and working condition of the fish workers. Institutionalising community resilience practices would help us to prepare ourselves to counter frequent disasters.

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Community Participation in Railway Disasters

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ABSTRACT: Indian railways are one of the busiest rail networks in the whole world. In a single day it runs around 20,000 trains across various terrains covering 67,368 kilometres that transport million of passengers. Fatal accidental problems can occur in our everyday life as we come across the causes of these disasters. There are many forms of disaster and each has a terrific effect on man and material. Every time a crisis has occurred gaps have been observed in the mechanism.

Case studies in the unusual occurrence on Mumbai Suburban section revealed that the injured persons were sent to hospitals by local public using the services of local taxis even before 108 ambulance services could reach. Thus helping to save multiple lives by reaching the affected persons to hospitals where they could be taken care of.

Indian Railways, due to its extensive coverage and physiographic conditions, is one of the most disaster-prone areas of India. Vulnerability to disasters/emergencies of Chemical, Biological, Radiological and Nuclear (CBRN) origin also exists coupled with vulnerability to unsocial activities which are on the rise in recent times.

This paper elaborates planning framework for the actions envisaged for risk reduction. Further, it emphasises training the untapped third force, that is, the manpower always available on railway stations, namely, porters (coolies), vendors, stall owners and so on. These people are available round the clock and are aware of the local situations. This strategy of providing basic disaster management training to the third force in building resilience and ensuring success in an area where it has been elusive so far.

KEYWORDS: community, disaster, Indian railways, third force, porters, vendors, stall owners, suburban

Introduction

Indian railways are one of the busiest rail networks in the whole world. In a single day it runs around 20,000 trains across various terrains covering 67,368 kilometres that transport millions of passengers. Increasing number of disasters with a large number of victims and significant social and economic losses are observed in the past few years. Prevention is always better than the cure for any kind of problem, and this very concept applies to disasters also. Recent events such as the serial bomb blast in Mumbai suburban section and the terrorist attack at Chhatrapati Shahu

Maharaj Terminus can catch our eyes as how much loss we have to suffer in both as life and as property.

Indian Railways, due to its extensive coverage and physiographic conditions is one of the most disaster-prone areas of India. Vulnerability to disasters/emergencies of Chemical, Biological, Radiological and Nuclear (CBRN) origin also exists. Heightened vulnerabilities to disaster risks can be related to increasing population, urbanisation, industrialisation, development within high-risk zones, environment degradation and climate change. Indian Railways due to its extensive coverage is vulnerable to unsocial activities which are on the rise in recent times.

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Railway Disasters through History

- **The Amritsar train accident, October 19, 2018**
A passing train ploughed through revellers who had gathered at the rail tracks at Joda Phatak to watch the burning of Ravan's effigy
Death: 61
Injury: 143
- **Falling of pathway at Andheri railway station, July 3, 2018**
Death: 1
Grievous Injury: 4
- **Stampede on FOB of Elphinstone road station, September 19, 2017**
Death: 23
Grievous Injury: 5
Simple Injury: 32
- **Kuneru train derailment 2017** – Kuneru train derailed near the Kuneru village in Andhra Pradesh killing 41 people and injuring 68 others.
- **Kanpur train accident 2016** – Kanpur Train Accident killed nearly 127 people when Indore Patna Express train jumped the tracks near Kanpur.
- **The Gyaneshwari Express train derailment, West Bengal, May 28, 2010** – Attack by Maoist kills at least 170 people when the Mumbai-bound Howrah Kurla Lokmanya Tilak Gyaneshwari Super Deluxe Express is derailed by an explosion.
- **Mumbai terrorist attacks, November 26, 2008**
Death: 171
Injury: 239
- **Incidents of bomb blast in seven EMU locals on Mumbai Suburban, July 11, 2006**
Death: 187
Grievous Injury: 540
Simple Injury: 327

History of Disaster Management on Railways

Indian Railways came into existence with the running of the first train from Kurla to Thane in 1853. Ever since

then handling train accidents has been a priority area for the railways. Sharing of the Indian Railways and Army Cranes as also their Medical Vans in times of a train accident was an accepted system for handling disasters (rail accidents).

With the gradual growth of Indian Railways, it gradually built up its own infrastructure of Cranes, Accident Relief Trains (ARTs), Accident Relief Medical Equipment Van (ARMVs). Till the beginning of the year 2005, a disaster on the railway in effect meant a serious train accident; other items of disaster, namely, floods, earthquakes and more, were handled in an uncoordinated manner.

The situation has now changed with the promulgation of the Disaster Management (DM) Act in 2005. A disaster no longer means only a train accident, but its scope has become much wider to include other incidents, terrorism-related activity and natural calamities. The Indian Railways Disaster Management Plan has been prepared on the principles now incorporated in the Disaster Management Act, National Disaster Management Plan and also Guidelines issued by NDMA. The basic philosophy now to be followed is of sharing resources of all government departments along with Railways' own resources available to handle serious train accidents, other mishaps, terrorism-related crisis, natural calamities and so on.

Concept of Disaster on Railways

The concept of a disaster was, till the year 2005, not adequately and comprehensively defined on Indian Railways. It was accepted that a disaster situation implies, on the railways, to cover only cases of serious rail/train accidents. It was, perhaps, due to this anomaly, as late as the year 2008, even CAG's report on DM on Indian Railways has broadly adopted this fact in the concept of disaster and has gone to examine the relief/rescue/mitigation and preparedness of Indian Railways based on the earlier concepts and has reviewed the facilities for handling disasters available with the Railways only on the report/recommendations of the High Level Committee (HLM) on DM.

Indian Railways presents Disaster Management Plan and proposes different strategies for planning, preparedness and capacity building/upgrading the prevalent systems and practices in Indian Railways to meet the global trends. It elaborates planning framework for the actions envisaged for risk reduction, the basic philosophy to be followed for sharing resources of all government departments along with Railways' own resources to handle serious train accidents, other mishaps, terrorism-related crisis, natural calamities and so on.

Strengths of the Railways to Handle a Disaster

In handling disasters, Indian Railways is in a unique position as it has a number of strengths not available with many other departments of Government of India. These include:

- **Railways' own communication network:** During the serial bomb blast it was seen that all communications networks were overloaded and calls could not be made. However, railways got its own dedicated communication network which was the only means of communication.
- **Operating control on each division linked with each station:** Each station is linked with the divisional control through control telephone and inter-divisional controls are linked. This facilitates speedy communications and thus fast movement of rescue teams.
- **Territorial Army Units:** Indian railway personnel are attached to various TA units. These units are trained in disaster management and can be used in times of peril.
- **Uniformed force of RPF/RPSF:** Railway Protection Force and Railway Protection Special Force are trained in handling disasters and are available round the clock.
- **Railways' own medical infrastructure:** Health units, primary hospitals, divisional hospitals and tertiary care hospitals form the backbone of railways' own medical infrastructure. This is coupled with ARME Scale II at important stations and POMKA kits/first aid boxes at stations to deal with any incident.
- **Civil defence organisation:** The mandate of the civil defence has been redefined to assign an effective role in the field of disaster management. An active civil defence organisation ready to deal with any type of disaster, this organisation collaborates in mock trials along with NDRF/SDRF.
- **An army of gang men spread out all over the Indian Railways:** Gang men form an integral part of the team maintaining the rails in fine fettle. These men form the backbone of restoration after a disaster. Western Railway has a cadre of 22,830 gang men.
- **Scouts and guides:** Dedicated scouts and guides or teams of young girls and boys are available on all six divisions of Western Railway and they help in crowd management and can be utilised.
- **Dedicated rescue/restoration and medical equipment on rails:** Accident Relief Trains/Accident Relief Medical Equipments are in readiness and strategically located so as to reach the site in shortest possible time. Further, railway also has its network of hospitals at zonal, divisional and sub-divisional levels.

Zone-Wise Location of SPARTs/SRARMVs and ARMVs

S. No.	Zonal Railway	Self-propelled Accident Relief Trains	Accident Relief Trains	Accident Relief Medical Vehicles
1.	Central Railway	5	20	9
2.	East Central Railway	5	16	11
3.	East Coast Railway	3	10	4

S. No.	Zonal Railway	Self-propelled Accident Relief Trains	Accident Relief Trains	Accident Relief Medical Vehicles
4.	Eastern Railway	4	12	8
5.	North Central Railway	4	7	6
6.	North East Frontier Railway	4	10	11
7.	North Eastern Railway	3	9	11
8.	North Western Railway	3	8	10
9.	Northern Railway	5	14	14
10.	South Central Railway	5	15	10
11.	South East Central Railway	2	12	8
12.	South Eastern Railway	3	10	8
13.	South Western Railway	3	8	8
14.	Southern Railway	6	12	9
15.	West Central Railway	2	8	8
16.	Western Railway	5	17	15
17.	Konkan Railway (KRCL)	2	1	2
Total		64	189	152

List of Hospitals over Indian Railways

S.No.	Railway	Central Hospital	Divisional Hospitals	Sub-divisional Hospitals
1.	Central Railway	1	5	5
2.	East Central Railway	1	5	3
3.	East Coast Railway	1	3	--
4.	Eastern Railway	1	3	4
5.	North Central Railway	1	2	2
6.	North East Frontier Railway	1	5	5
7.	North Eastern Railway	1	4	1
8.	North Western Railway	1	3	4
9.	Northern Railway	1	5	3
10.	South Central Railway	1	3	3
11.	South East Central Railway	1	1	3
12.	South Eastern Railway	1	4	2
13.	South Western Railway	1	2	--
14.	Southern Railway	1	5	5

S.No.	Railway	Central Hospital	Divisional Hospitals	Sub-divisional Hospitals
15.	West Central Railway	1	2	4
16.	Western Railway	1	5	3
17.	Konkan Railway Corporation Ltd.	--	--	1
18.	CLW	--	--	1
19.	DLW	--	--	1
20.	DMW	--	--	1
21.	ICF	--	--	1
22.	RCF	--	--	1
23.	RWF	--	--	1
24.	RDSO	--	--	1
	Total	16	57	55

Case Studies

Western Railway is one of the 17 zones of Indian Railways and is among the busiest railway networks in India. The major railway routes of Indian Railways which come under Western Railways are the following:

- Mumbai Central–Ratlam,
- Mumbai Central–Ahmedabad
- Palanpur–Ahmedabad

Western Railway is divided into six operating divisions: Mumbai, Vadodara, Ahmedabad, Rajkot, Ratlam and Bhavnagar.

Mumbai Suburban Section of Western Railway has been playing the most crucial role in moving millions in the metropolitan regions. The suburban section of Western Railway in Mumbai extends from Churchgate, the city's business centre, to Dahanu Road covering a distance of 123 km. and 36 stations. The first electric train on this section was introduced in 1928 between Colaba and Andheri; since then the network has been extensively widened with 1305 services running and carrying about 35 lakh commuters every day almost round the clock. The passenger density on Western Railway is 60,000 passengers per km per day which is

highest among all the leading Metro Railways of the world.

After the promulgation of Disaster Management Act 2005, three incidences have occurred on the Mumbai Suburban section on Western Railway. Below is the brief of the three cases:

Case Study I

Incidents of bomb blast in seven EMU locals on Mumbai Suburban

Date: July 11, 2006 between 6:23 and 6:28 p.m.

Death: 187

Grievous Injury: 540

Simple Injury: 327

Relief Arrangements

- By 6:35 p.m. intimation of all seven incidents had been received by control office.
- ARME BCT departed at 6:48 p.m. reached Matunga Road at 7:00 p.m.; by that time injured persons and dead bodies had been shifted.
- ARME proceeded further north to Mahim and other locations. But injured persons and dead bodies had already been shifted to hospitals.

- Injured persons were shifted to hospitals within 20–40 minutes and completed in one and half hours.

Local Railway staff and local volunteers shifted injured persons to road access quite fast. Delay in reaching hospitals was due to heavy traffic on roads.

Case Study II

Stampede on FOB of Elphinstone road station

Date: September 29, 2017 at about 10:30 a.m.

Death: 23

Grievous Injury: 5

Simple Injury: 32

Relief Arrangements

- SS-EPR informed BCT control, City Police, RPF and so on about the stampede and to arrange 108 ambulances.
- Railway doctors moved towards the site of the incident and later to KEM hospital to assist the injured persons.
- Help was rendered by local public available at the site of the incident followed by City Police, Railway staff and local administration.
- Injured persons were sent to the KEM Hospital by 108 ambulance services and local taxi. Last injured person evacuated at 11.20 a.m.

Case Study III

Falling of pathway at Andheri Railway station

Date: July 3, 2018, at about 07:35 a.m.

Death: 1

Grievous Injury: 4

Relief Arrangements

- SS-Andheri informed BCT control, who further stopped traffic on up and down lines
- Injured persons brought to emergency medical room between 07:55 and 08:20 a.m. and attended by emergency doctor provided by Western Railway.
- Railway doctor could reach site at 08:35 a.m.
- Injured persons were sent to the Cooper Hospital by ambulance services between 09:20 and 09:30 a.m.

Case studies in the unusual occurrence on Mumbai Suburban section revealed that the injured persons were sent to hospitals by local public using the services of local taxis even before 108 ambulance services could reach, thus helping to save multiple lives by reaching the affected persons to hospitals where they could be taken care of.

Resources during a Disaster

Resources available in case of a disaster have may be grouped into different units, depending on the time frame within which these can be made available after a disaster and the intensity of a disaster. These are as follows:

A. Railway Resources

- Railway resources available on the train, and at nearby surroundings.
- Railway resources available at Accident Relief Medical Equipment/Accident Relief Train depots and elsewhere within the division.
- Railway resources available at Accident Relief Medical Equipment/Accident Relief Train depots and elsewhere on adjoining zones and divisions.

The above resources constitute the first force.

B. Non-Railway Resources

The basic philosophy followed after the implementation of Disaster Management Act 2005 is of sharing resources of all government departments along with Railways own resources available to handle disasters. In case of serious disasters help is sought from non-railway resources, namely, local authorities (police, fire brigades), NGOs, SDRF, NDRF and so on. This constitutes the **second force**.

- C. There is an untapped manpower always available on railway stations, namely, porters (coolies), vendors, stall owners and so on. These people are available round the clock and are aware of the local situations. The training and utilisation of this force will lead to a new architecture for supporting efficient decision-making during disasters and contribute to provide a model for an Effective Early Response to a disaster first aid mechanism for managing the disaster immediately. There is a

plan to train this untapped manpower. This trained manpower available at stations will constitute the **third force**.

Community-Based Disaster Management: Railways

A critical element of sustainable disaster management is communities' participation in these activities. Unless the disaster management efforts are sustainable at individual and community levels, it is difficult to reduce the losses and scale of the tragedy. The emphasis of disaster management efforts should focus on communities and the people who live in them.

Apart from natural calamities many of the disasters caused on Indian Railways are generally due to overcrowding, public trespassing on railway tracks and anti-national activities.

The impacts of the disasters especially the serial bomb blast incidents on Mumbai Suburban section and the terrorist activity at Mumbai CSTM are deeply related with the socio-economic conditions, tradition, culture and climate of the communities. It has been observed that at time of disasters local public and staff available at stations were the first responders.

The community on the railway station or in the train consists of the following:

- Passengers
- Railway staff
- Other personnel working on the station
- Other personnel working in the vicinity of the station

The Third Force

On 18th December-2018 fire broke out at the Kamgar ESIC Hospital in Marol of Mumbai. A twenty-year-old Swiggy executive Sidhu Humanabade who was out for delivery saw smoke billowing out of the hospital, and rushed to help the rescue workers; he climbed up using the fire brigade's ladder and used stones to break the glass windows, to rescue people. His presence of mind managed to save 10 lives.

Railway has a fleet of Self-Propelled Accident Relief Trains/Accident relief medical vehicles strategically located at various locations. However, despite our best plans in case of grave incidences/disasters, namely, the serial bomb blast in Mumbai Suburban railways 2006 and the terrorist activities in Mumbai 2008, the relief equipment is stressed upon and cannot reach multiple sites at the same time especially in the golden hour due to constraints, such as calling time for the concerned staff and travelling time from location to site of the incident.

Each railway station is equipped with stretcher, wheelchairs, first aid boxes/Portable Medical Kit for Accidents (POMKA), fire extinguishers and so on which can be used during any incident. Further, a list of important telephone numbers of hospitals, fire brigades, ambulance services and so on are available with the station master. However, in time of incidences the road traffic increases and it takes time for the above resources to reach the site of the incidence.

Every time a crisis has occurred gaps have been observed in the mechanism. Prevention is always better than the cure for any kind of problem, and this very concept applies to the disasters also. Other than the above efforts, out of the box thinking is required to train and utilise the manpower and resources available locally to

- minimise losses and
- render help in golden hours to reduce loss of life.

In addition to railway staff, manpower, namely, porters (coolies), vendors, stall owners and so on are available round the clock at railway stations. Further, taxi/auto drivers and vendors in the vicinity of stations operate around train times when the chance of occurrence of an incident is maximum. These people are aware of the local conditions and are familiar and conversant with the available resources. These constitute the third force.

The third force manpower can be segregated into two parts:

- Manpower available at stations
- Manpower available in running trains

From Tables 1 and 2 above it can be seen that a major force of about 7000 persons including 269 shoe polish boys are available round the clock. If this

untapped force is given a basic training in disaster management, it could go a long way in identifying and minimising the effects of a disaster.

Most of these incidents have happened in Mumbai Suburban section as seen in the above case studies. According to a survey carried out by Wilbur

Smith Associates on behalf of Mumbai Railway Vikas Corporation Limited the number of passengers dealt with and number of trains stopping at a few stations on Mumbai Suburban section of Western Railway between 8 a.m. and 10 p.m. hrs on a working day are depicted in the following:

Table 1: Manpower Available at Stations

S. No.	Division	No. of Stalls	No. of Vendors at Stalls	No. of Porters Available
1	Mumbai	399	1517	669
2	Vadodara	122	684	102
3	Ratlam	94	484	161
4	Ahmedabad	106	262	431
5	Rajkot	54	100	78
6	Bhavnagar	53	101	55
Total		828	3148	1496

Table 2: Manpower Available in Running Trains

S. No.	Division	No. of Originating Trains	No. of OBHS* Staff	No. of Bed Roll Staff	No. of Pantry Car Staff
1	Mumbai	45	222	277	--
2	Vadodara	2	4	14	21
3	Ratlam	22	82	85	--
4	Ahmedabad	29	141	150	
5	Rajkot	10	45	34	--
6	Bhavnagar	11	58	38	88
Total		119	552	598	109

*OBHS: on-board hospitality services

Table 3: Footfall in Mumbai Suburban–Western Railway

S. No.	Station	No. of Passengers Between 8 a.m. and 10 p.m.	No. of Trains Stopping at Station Between 8 a.m. and 10 p.m.
1.	Churchgate	505,110	687
2.	Mumbai Central	238,231	683
3.	Dadar (Western)	286,960	730
4.	Mahim	122,939	541

(Continued)

Table 3: (Continued)

S. No.	Station	No. of Passengers Between 8 a.m. and 10 p.m.	No. of Trains Stopping at Station Between 8 a.m. and 10 p.m.
5.	Bandra	491,106	873
6.	Andheri	604,244	849
7.	Goregaon	285,204	432
8.	Borivali	392,417	644
9.	Mira Road	170,262	301
10.	Bhayander	235,621	304
11.	Vasai Road	202,868	263
12.	Nala Sopara	322,365	236
13.	Virar	318,459	237
Total		4,293,693	

Table 4: Gist of Third Force on Mumbai Suburban

S. No.	Station Name	No. of Stalls Available	No. of Vendors Available at Stalls	No of Coolies Available	No. of Shoe Polisher Available
1	Churchgate	5	14	8	25
2	Marine Lines	11	41	0	7
3	Charni Road	8	18	1	8
4	Grant Road	9	32	2	16
5	Mumbai Central (Main)	12	30	152	0
6	Mumbai Central (Local)	4	25	0	9
7	Mahalaxmi	4	17	0	5
8	Lower Parel	4	14	0	6
9	Prabhadevi	5	20	0	4
10	Dadar	22	96	65	13
11	Matunga Road	2	8	0	4
12	Mahim	0	0	0	4
13	Bandra	15	57	0	16
14	BDTS	15	38	84	3
15	Khar Road	3	9	0	5
16	Santacruz	5	26	0	9
17	Vile Parle	4	17	0	6

(Continued)

Table 4: (Continued)

S. No.	Station Name	No. of Stalls Available	No. of Vendors Available at Stalls	No of Coolies Available	No. of Shoe Polisher Available
18	Andheri	20	103	18	20
19	Jogeswari	3	16	0	3
20	Jogeshwari (AT)	2	2	0	0
21	Goregaon	10	37	0	10
22	Malad	9	29	1	10
23	Kandivali	9	45	2	9
24	Borivali	22	111	90	20
25	Dahisar	5	21	0	5
26	Mira Road	1	6	0	6
27	Bhayandar	3	12	2	12
28	Naigaon	1	4	0	4
29	Vasai Road	8	41	16	8
30	Nalasopara	3	18	0	10
31	Virar	12	58	0	6
32	Palgarh	21	42	0	0
33	Boisar	5	23	0	0
34	Vangaon	1	5	0	0
35	Dahanu Road	5	16	0	0
Total		268	1051	441	263

This Suburban Section consists of a number of train passing stations, such as Prabhadevi, Lower Parel and Mahim, where only basic staff, that is, station master, platform porter, ticket collector and Railway protection force staff, that is, about four to five railway staff are manning the station. This is miniscule compared with the passengers dealt with, as brought out in Tables 3 and 4 above. In times of disaster it is very difficult to manage the situation till reinforcements are received. Whereas from the table below depicting the third force on Mumbai Suburban it can be seen that about 2000 persons other than railway staff are available on Mumbai Suburban.

If this force is available, then why not train them?

Training is necessary as it gives confidence to these individuals to come forward and help in the adverse situation. The third force should be imparted disaster management training so as they can be not only available as first responders but also in a position to defuse the first spark, thus avoiding the disaster or keeping its effects to the minimum, as they are aware of the procedure to be followed in case of disaster and also familiar with locations of relief materials and resources. This third force will be a major resource in Mumbai Suburban as there are a large number of stalls

available on platforms employing a number of vendors which can be seen from the table below.

The incident of stampede at EPR occurred due to the persons standing on the FOB in order to avoid getting wet in the rains. The tragedy may have been avoided had this third force been trained to keep an eye on the unusual build up of crowd and informed the station master regarding the same and had taken corrective action to disperse the crowd.

Training the Third Force

Training this third force is a great way to be prepared for disaster; some simple steps can be taken to prepare the team for a disaster.

- **Team Coordinator** – The Station Superintendent as the incharge of the station can act as the team coordinator and arrange for training for the third force. Basic training can be given and identity cards issued to the trained personnel. Further a clause may be set in the contract under which the onus of training of the staff lies with the contractor/stall owner.
- **Make a Plan** – Make sure the team has a plan in case of an emergency. Before an emergency happens, sit down together and decide how you will get in contact with each other, where you will go and what each member will do in an emergency.
- **Build/use of a Disaster Kit** – During emergencies, being self-reliant is the key to success. The third force should be trained in basics such as locations and use of fire extinguishers, first aid and evacuation exits.
- **Keep the Team Informed** – The force can be informed in a number of ways. Certain signals like ringing of the station bell continuously should act as a signal for the team to assemble; further announcement on the platforms regarding the incident can also inform team members of the various facilities like valves for water supply and important telephone numbers.
- **Know Your Supervisors** – Railway workers and Rail users have a long history of working together to recover from disaster. Getting to know your supervisors will help you work with them in the event of a disaster. Meetings along with the railway

team will make the third force aware of the plans and also or prepare themselves for a disaster.

The training programme should be designed to fit into community members' ordinary schedules. The training may be divided up into various modules. During these modules, trainees will have classes on the organisational structure used by government agencies in disasters, basic first aid techniques, basic search and rescue techniques, and ways to ensure that the individual trainee is prepared for a disaster.

Classes are to be taught by local supervisors such as Station Superintendent, Traffic Inspector, Commercial Inspectors and other safety officials who have experience in the units they instruct. The courses are managed by a lead instructor who has undergone a Train-the-Trainer programme. This training should be provided free of charge.

Conclusion

Disasters are not likely to decrease in the foreseeable future; thus, a sustained effort is needed to minimise risk by reducing vulnerability through prevention and mitigation and by increasing capacity through preparedness measures. In previous experiences, such as serial bomb blast on Mumbai Suburban section, terrorist activity in Mumbai, stampede at Elphinstone Road and falling of pathway of Andheri FOB the services rendered by the local public have been critical.

Previous strategies employed by Railway authorities and relief groups to reduce further morbidity and mortality following railway incidences may be helpful in similar future events; however, this must be comprehensively evaluated for each disaster plan. Due to the geographical and geological situation of Indian railways, it could be argued that further disaster events are inevitable. Nevertheless, many lessons should be learned from previous railway disaster events and how planning could be applied to future incidents.

During a disaster, it may become necessary to evacuate non-ambulant and ambulant patients; thus the response to disaster including evacuation procedures should be well established to the third force. Therefore, planning for disasters depends on the type and magnitude and its consequent impact on Railways preparedness and resources to handle such

incidents. Training to the third force will help in the immediate response which can help to minimise the loss of life and limb in the aftermath of a major disaster, and meet extraordinary demands for resources that might have been drained by the immediate emergency response.

This strategy of providing basic disaster management training to the third force in building resilience and ensuring success in an area where it has been elusive so far. This study gives an impetus to the use of the third force on Railways. Nevertheless, this research can contribute to the existing knowledge for better management of disasters, and mitigate the impact of disasters not only on the Railways but also at other government and non-government organisations where there exists a third force.

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Elphinstone road station.

Western Railway Zonal Disaster Management Plan- 2018

Investigating Socio-ecological Systems for Gaining Resilience in Rural Settlements

Shruthi Dakey^a and Sameer Deshkar^a

ABSTRACT: In the present era of Anthropocene, the status of prevailing ecosystem services all around the world is declining, highlighting the emerging need to improve and protect the ecosystem services to achieve Sustainable Development Goals (SDG 15 and SDG 6). Under the changing climate scenarios and intensified disaster impacts along the coastal areas all around the world, the communities depending on these ecosystem services are either forced into poverty traps or forced to prefer a non-ecosystem dependent occupation, thereby contributing to the modifications in interactions within socio-ecological systems. This paper explores the role of ecosystem services in strengthening disaster risk resilience in rural settlements in the Gautami-Godavari Estuary region located in the Low Elevation Coastal Zone (LECZ) of Andhra Pradesh, India. For this purpose, the research identifies various ecosystem services in the seven rural settlements, through focal group discussions, and explores how and which ecosystem service degradation creates changes in the system. The study adopts fuzzy logic cognitive mapping for exploring the prevailing state of system. In this study, it was found that the recovery time of the damaged ecosystem services due to disasters is much longer than expected due to multiple drivers, from both social and ecological systems. The scenarios were modelled using the Mental Modeler simulator. Hence, the regime of the socio-ecological system is largely dependent on the sensitivity of the ecosystem services in the area and interdependencies with the other components of the socio-ecological systems.

KEYWORDS: disaster risk, socio-ecological systems, ecosystem services, resilience, coastal areas, fuzzy-logic cognitive mapping

Introduction

Coastal systems all over the world are constantly changing as a result of biophysical and socio-economic activities by humans. In addition, disasters create unaccountable losses to ecosystem services in these areas. The coastal rural communities in India, which are majorly dependent on natural resources (Jurjonas & Seekamp, 2018), were exposed to multiple natural hazards, with increasing frequencies in the recent past (Kesavan and Swaminathan, 2006), forcing communities into poverty (Lade et al. 2017). Under the

changing climate scenarios and intensified disaster impacts along the coastal areas all around the world, the communities depending on these ecosystem services are either forced into poverty traps or to prefer a non-ecosystem-dependent occupation, thereby contributing to the modifications in interactions within socio-ecological systems (SES). Ecosystem services shape both the exposure of people to hazards and the ability to cope up with hazards (Ecosystems and Disasters Working Draft I). The path towards Sustainable Development Goals 15 and 6 highlights the protection of ecosystem services. The Millennium

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Ecosystem Assessment (2005) report emphasised the decline of approximately 60 per cent (15 of 24) of the ecosystem services, at the same time reporting an increase in consumption of over 80 per cent of the services. It is an established fact that ecosystem services play a critical role for the purpose of reduction in disaster risk. A decline in regulatory ecosystem services all over the world has been emphasised by the increased anthropogenic activities concentrated around food, fibre and fuel production. By their nature, ecosystem service losses after a disaster hits a system are unaccountable and are limited to agriculture, horticulture and other ecological resources, which are normally pre-recorded. Protecting ecosystem services from various anthropogenic activities is by itself a great challenge humanity is facing in everyday decision-making. A progress report on the state of the system is suggested to be made for many protected areas all around the world. However, records of decline in ecosystem services after a disaster occurs are very few.

Need and Purpose of the Study

Identifying indirect after-effects of a disaster in a system is very much necessary for achieving systemic resilience. By their nature, indirect losses are harder to measure than losses stemming directly from physical damage. Additionally, there are almost no programmes or processes in place to draw upon in measuring indirect losses (National Research Council, 1999). In a complex socio-ecological system, understanding the complexity existing in the system is by itself an important task for decision-making. In addition, accountability for ecosystem services and data paucity existing for the ecosystem services play a critical challenge for accounting ecosystem service losses after a disaster occurs. Ecosystem management for disaster risk reduction has been prioritised at both the 2009 and 2011 ISDR Global Platform for Disaster Risk Reduction, and cited most recently in the latest IPCC release of the Summary for Policy Makers of the new Special Report on Extremes (SREX). Also, ecosystem-based disaster risk reduction is being supported in the international

policy arena through several multilateral agreements such as the SFDRR (Sudmeier-Rieux 2013).

This paper tries to explore the role of ecosystem services in strengthening disaster risk resilience in rural settlements in the Gautami-Godavari Estuary region located in the Low Elevation Coastal Zone (LECZ) of Andhra Pradesh, India. To do so, it essentially addresses two basic research questions: (1) What if ecosystem services take comparatively more time to recover in a system than any other components? Can indirect effects on a system be identified and used as inputs for decision-making for disaster risk reduction? (2) Can the relative status of various components of socio-ecological systems be verified during a decline in one or more ecosystem services?

The methodology subsequently addresses understanding the concept of recovery time (Sec. 3.1) and the importance of interactions between human and natural components (Sec. 3.2.) in achieving resilience. A methodology has been designed for investigating socio-ecological systems. Fuzzy cognitive mapping (FCM) is used in this research for overall system scenario development.

Figure 1 shows the procedure followed for research.

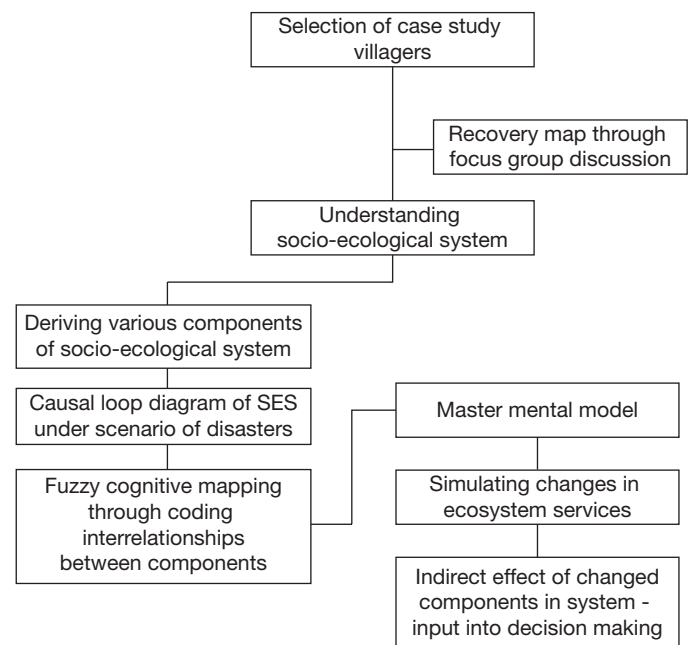


Figure 1: Workflow of the study

Study Area

This paper explores the role of ecosystem services in strengthening resilience in rural settlements in the Gautami-Godavari Estuary region located in the Low Elevation Coastal Zone (LECZ) of Andhra Pradesh, India. Andhra Pradesh is one of the most affected states in the east coast of India during the past decade (NDMA), with the lengthiest coastline of 972 sq. km.

For the purpose of application, the study has chosen seven villages, namely, Maasanitippa, Balusutippa, Pedavalasa, Lakshmipathpuram, Gogullanka, Bairavalanka and Nillarevu in the mandal of Katrenikona, Andhra Pradesh (see Fig. 2). The Godavari Estuary region is the second-largest estuarine region in India (Satapathy et al. 2007), located between 82°00'' and 82°35'' E longitudes and 16°30'' and 17°05'' N latitudes, with Gautami-Godavari as the main branch of the river. The annual rainfall in this region is of about 1000–3000 mm.



Figure 2: Location of seven villages in the study area

The ecosystem services in the study area are declining sharply over the past few decades: notably, provisioning services such as sea fishery availability in the area, reflected through the reduced landing centres (see Appendix 1) and the reduced ground water quality in the area. The selected study areas have a diverse range of ecosystem services, such as provisioning services (sea fishery, river fishes, mangrove crab and molluscs), supporting services (soil fertility), regulating services (mangrove ecosystem) and cultural services.

Data Collection

An initial focus group discussion was conducted for preparing a recovery map for various components of the socio-ecological systems. The participants were asked as to how much time it takes for a component to recover (come back to original state) after a disaster. A recovery map was prepared as shown in Fig. 3.

Using a participatory model approach, we collected data from workshops in the seven villages in the study area. The components of the SES identified during the study and data collection are presented in Table 1. The data was collected in the form of cognitive maps from seven villages through semi-structured interviews, which were digitally recorded, filmed and photographed when the participants allowed. Cognitive maps were used in analysing decision-making and complex social systems in various studies (Roberts 1973; Axelrod 1976; Montazemi and Conrath 1986; Carley and Palmquist 1992; Cossette and Audet 1992). These models represent the social and ecological components associated with the causal dynamics of disasters and their effects on the system. Cognitive mental models were prepared by various stakeholder groups, with the help of interviews using the FCM method. The study focused on capturing the already existing community knowledge about the system and how various stakeholders perceive them (Kontogianni et al., 2012).

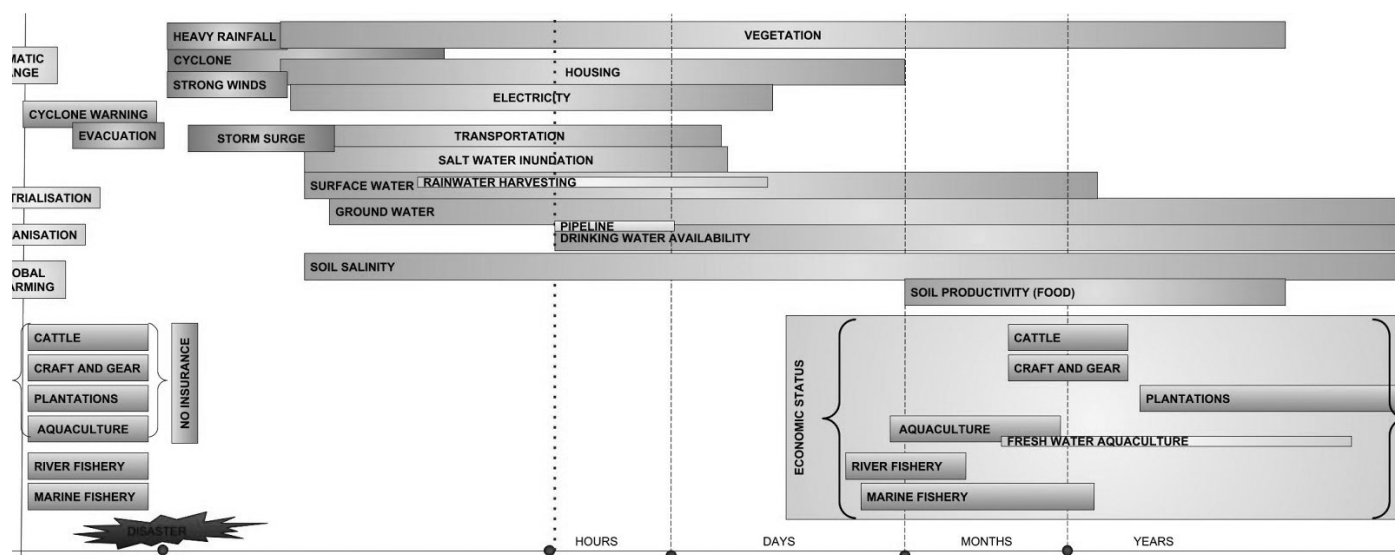


Figure 3: Temporal analysis of recovery of components: timeline of recovery of various components of system after the 1996 cyclone. Timeline derived through community participation in a focus group discussion

Table 1: Overall Parameters for the Entire System

Cultural	Socio-economic	Ecological	Physical Infra	Anthropogenic Activities	Hydro-Meteorological Hazards	Governance
Adaptation mechanisms [14]	Occupational [50]	Groundwater quality [41]	Drinking water supply [29]	Dredging	Floods [5]	Training and development [7]
Customs and rituals [15]	Agriculture [51]	Soil fertility [42]	Wash and hygiene	Sound pollution	Salt water inundation [4]	Ecosystem conservation [8]
Innovation [16]	Economic status [52]	Vegetation [43]	Transportation	River pollution from industries	Tsunami [3]	Participatory governance [9]
Community traditional knowledge systems (tks) [17]	Occupational change [53]	Marine fishery availability [44]	Road connectivity	Urbanisation	Storm surge [2]	Early warning systems [10]
Gender [18]	Migration [54]	River water quality [45]	Housing condition	Industrial development	Sea surface temperature [6]	Ecosystem knowledge and training [11]
Indigenous knowledge systems [19]	Literacy levels [55]	River fishery availability [46]	Flood protection structures	Non-sustainable practices	Cyclone [1]	Employment generation programmes [12]

(Continued)

Table 1: Continued

Cultural	Socio-economic	Ecological	Physical Infra	Anthropogenic Activities	Hydro-Meteorological Hazards	Governance
Continuity of tks [20]	Unemployment [56]	Food production variety [47]	Fish landing centres	Wastewater industries		Financial institutions [13]
Social cohesion [66]	Livelihood availability [57]	Forest productivity [48]	Cyclone shelters	Extraction of resources		Adaptive governance
	Access to credit [58]	Biodiversity [49]	Rain water harvesting infrastructure			Local governance
	Access to insurance [59]		Hospitals and medical centres			
	Property rights [60]		Schools			
	Livelihood security [61]		Distance from livelihood-supporting services			
	Availability of alternate income [62]					
	Distance from livelihoods [65]					

Data Analysis

Recovery Time Matters

It is a well-known fact that recovery time is different for different components of a socio-ecological system. The research considers the high lag in the recovery of ecosystem services as a major drawback for gaining resilience in the system. As shown in Fig. 3, after the disaster (cyclone) occurs, it is followed by heavy rain and strong winds for a few hours in a day. The heavy rainfall and strong winds destroy the vegetation and affect electricity at first, followed by transportation. This is normally accompanied by a storm surge, which is the major one to affect transportation, as salt water inundates immediately on to the land. After a few hours,

surface water and ground water quality starts declining. Human life, marine fishery, river fishery, plantations, crafts and gear, and cattle are at primary risk according to the community. From Fig. 3, we can observe that the recovery of electricity and transportation takes a few hours to days after a disaster occurs, while drinking water availability and the vegetation recovery process last for years according to the community. It is important to note that the recovery map is purely case specific and may be relevant to certain remote coastal rural communities.

From the very basic definition of resilience, it is about the recovery of the system back to its original state. Various definitions and perspectives for resilience emerged in the past studies (4R, resilience of socio-ecological systems, resilience of engineering

systems, concept of panarchy etc.). When there exist several different components in a system with different spatial and temporal scales, and their recovery time is different, considering their interrelations, it is very obvious that there can be multiple feedback arising in the system. During the recovery of each component, the interrelations play a critical role. When a disaster occurs and affects one component in the system, the resilience is determined based on its properties of resilience as described by Biggs et al. (2015).

However, considering the interrelations in the socio-ecological system, the study tries to understand the effect of change in one component on the other components in a system on a relative scale.

Scenario Creation

A matrix is created using interrelation data, which were further inputs into the Mental Modeler interface (Gray et al., 2013), for analysing the fuzzy links in the matrix. After gathering FCMs from various stakeholder groups, a social cognitive map was prepared by following the procedure of matrix addition (Ozesmi and Ozesmi, 2004). A final adjacency matrix was developed.

Fuzzy Cognitive Mapping Analysis

The disaggregate data (interrelations between key components identified and their weights) collected in the study is coded into binary for input into an FCM, between $[-1, +1]$ (see Table 2), to be suitable to use in a Mental Modeler online interface. An increase (or decrease) in one component leads to an increase (or decrease) in another component; then the values were given in the range between $[0.1, 1]$ according to the level of interrelation. If no relation exists, then the value $[0]$. If an increase (or decrease) in one component leads to a

decrease (or increase) in another component, then the values were given in range between $[-0.1, -1]$. After the possible causal interrelations among the components of FCM were identified, the linkage weight was given as presented in Table 2. The final scenario output can be observed in Fig. 4, which is the final master model. The values of coded interrelations between components were as presented in Table 3. The data in.csv format is then exported to the Mental Modeler platform. Mental Modeler has three interfaces, including concept mapping for building the model according to the FCM, adjacency matrix interface with structural properties, and the scenario interface, which can be used for running scenarios, comparing the variations within the same system under different situations and could be revised accordingly (Gray et al. 2013).

Table 2: Eleven Grades Considered for Describing the Influences Among the Components of Socio-ecological Systems

Strength of Connection by Participants	Sign and Strength of Relationship
+1	Negatively very high
+0.8	Negatively high
+0.6	Negatively moderate
+0.4	Negatively low
+0.2	Negatively very low
0	No effect
-0.2	Positively very low
-0.4	Positively low
-0.6	Positively moderate
-0.8	Positively high
-1	Positively very high

Table 3: Causal Linkages between Various Components According to the Participants

Linkage Number	Causal Factor 1	Causal Factor 2	Sign of Linkage	Coded Overall Value
1	Navigation	Dredging	P	0.6
2	Dredging	Depth of river	P	1
3	Depth of river	Floods	N	-0.8

(Continued)

Table 3: (Continued)

Linkage Number	Causal Factor 1	Causal Factor 2	Sign of Linkage	Coded Overall Value
4	Floods	River water inundation	P	1
5	River water inundation	Ground water quality	P	0.8
6	Ground water quality	Soil fertility	P	0.8
7	Ground water quality	Health	P	1
8	Ground water quality	Drinking water supply	P	0.6
9	Sea level rise	Salt water inundation	P	1
10	Soil fertility	Vegetation	P	1
11	Soil fertility	Agriculture	P	1
12	Salt water inundation	Soil fertility	N	-1
13	Salt water inundation	Ground water quality	N	1
14	Flood protection	Salt water inundation	N	-0.2
15	Tsunami	Saltwater inundation	P	0.1
16	Storm surge	Saltwater inundation	P	1
17	Cyclone	Storm surge	P	1
18	Sea surface temperature	Cyclone	P	1
19	Global warming	Sea surface temperature	P	1
20	Climate adaptive lifestyle	Global warming	N	-0.2
21	Sea surface temperature and water quality	Sea fishery availability	N	1
22	Training and development	Livelihood availability	P	0.2
23	Livelihood availability	Economic status	P	0.2
24	Agriculture	Livelihood availability	P	0.8
25	Vegetation	Food production variety	P	0.8
26	Sound pollution and oil exploitation	Sea fishery availability	N	1
27	Forest productivity	Sea fishery availability	P	0.8
28	Sea fishery availability	Livelihood availability	P	1
29	Sea fishery availability	Food production variety	P	0.8
30	Wastewater industries	Sea surface temperature and water quality	P	0.8
31	Agriculture	Food production variety	P	0.4
32	Innovation	Aquaculture	P	0.6
33	Innovation	Climate adaptive lifestyle	P	0.2
34	Occupational change	Innovation	N	1

(Continued)

Table 3: (Continued)

Linkage Number	Causal Factor 1	Causal Factor 2	Sign of Linkage	Coded Overall Value
35	Occupational change	Migration	P	0.6
36	Occupational change	Labour or low quality of life	P	0.8
37	Occupational change	Landuse	P	0.6
38	Economic status	Occupational change	N	-0.8
39	Economic status	Literacy level	P	0.4
40	Literacy levels	Innovation	P	0.4
41	Innovation	Economic status	P	0.6
42	Continuity of traditional knowledge systems	Innovation	P	0.6
43	Ecosystem knowledge and training	Innovation	P	0.6
44	Participatory governance	Ecosystem knowledge and training	P	0.8
45				
46	Participatory governance	Continuity of traditional knowledge systems	P	0.8
47	Customs and rituals	Continuity of traditional knowledge systems	P	1
48	Customs and rituals	Ecosystem conservation	P	0.8
49	Molluscs	Ecosystem conservation	P	0.8
50	Forest productivity	Molluscs	P	1
51	Ecosystem conservation	Forest productivity	P	1
52	Biodiversity	Ecosystem conservation	P	0.8
53	Economic status	Housing condition	P	1
54	Housing condition	Physical vulnerability	N	-1
55	Transportation inaccessibility	Remoteness	P	1
56	Transportation inaccessibility	Physical vulnerability	P	0.8
57	Remoteness	Drinking water quality	N	-1
58	Forest productivity	Fisheries river	P	0.2
59	Fisheries river	Food production variety	P	0.6
60	Forest productivity	Crustances	P	0.6
61	Crustances	Food production variety	P	0.4
62	Aquaculture	Food production variety	N	0.4

(Continued)

Table 3: (Continued)

Linkage Number	Causal Factor 1	Causal Factor 2	Sign of Linkage	Coded Overall Value
63	Sea surface temperature and water quality	Fishing sea	N	1
64	Fishing sea	Food production variety	P	0.2
65	Wastewater industries	River water quality	N	1
66	River water quality	Fisheries river	P	1
67	Wash and hygiene	Health	P	0.6
68	Physical vulnerability	Livelihood loss	P	0.6
69	Tsunami	Livelihood loss	P	0.2
70	Cyclone	Livelihood loss	P	0.2
71	Tsunami	Cattle loss	P	0.2
72	Cyclone	Cattle loss	P	0.6
73	Cattle loss	Economic status	N	0.6
74	Cyclone shelters	Cattle loss	N	0.8
75	Cyclone shelters	Human life loss	N	1
76	Cyclone resistant homes	Housing condition	P	1

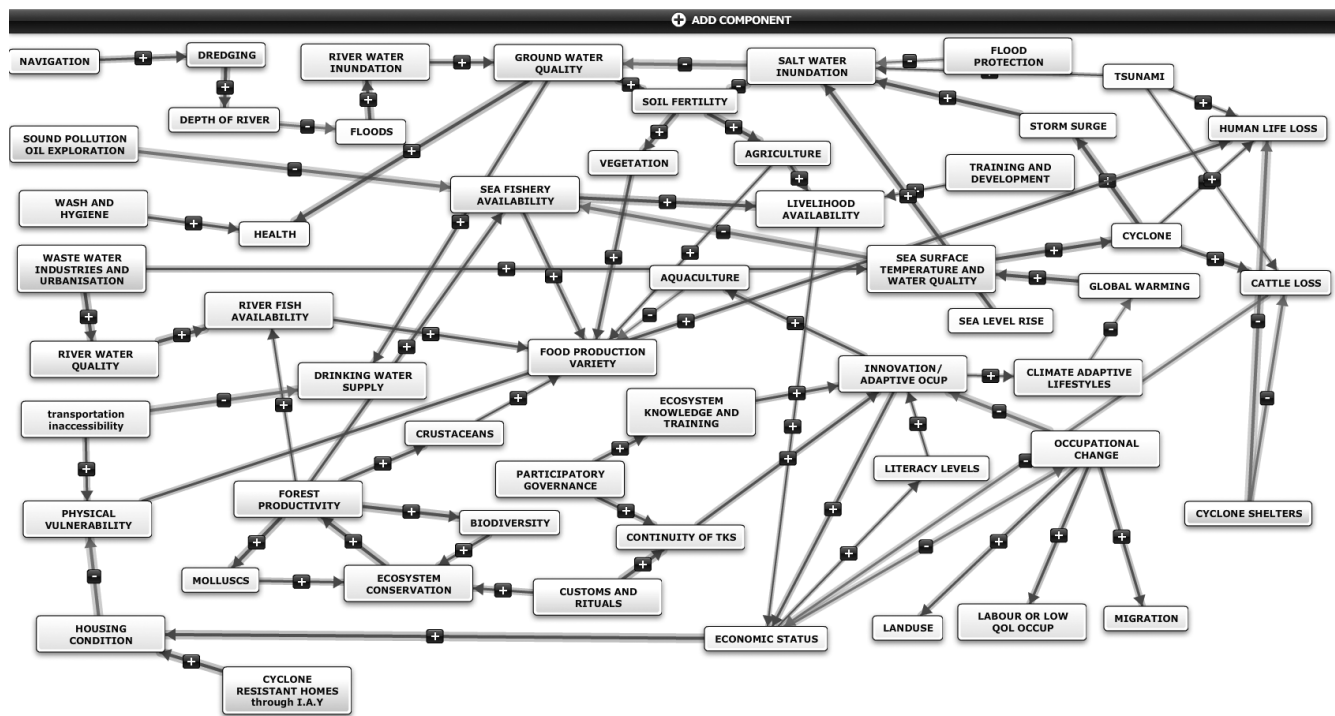


Figure 4: Master model created in the Mental Modeler platform using fuzzy cognitive mapping technique

Analysing the Structural Metrics of the FCM

A network analysis was used to assess the strength of the interrelations among various components in the FCM (Biggs et al. 1976). Deriving the structure of FCM facilitates the comparison of different FCM models through the concepts of complexity and density. The variables, relative importance can also be determined. Various types of components considered in a system were driving, receiving and intermediate (Nyaki et al. 2014). Using graph theory, in the Mental Modeler platform, training and development, wash and hygiene, navigation, tsunami, sound pollution

and oil exploration, sea level rise, customs and rituals, transportation inaccessibility, wastewater from industries, participatory governance and urbanisation were identified as the major drivers of the study. The degree of centrality, a graph theory measure (Harary et al., 1965), reflects the importance of the component (nodes) (Kosko, 1986) in a socio-ecological system. Gray et al. (2014) describe the centrality score of individual variables as “the degree of the relative importance of a system component to system operation” (Konti, & Damigos, 2018). Table 4 shows the important components in the entire system, which may be critical during a disturbance.

Table 4: Important Components in the System and Their Centrality Scores

Component	Indegree	Outdegree	Centrality	Type
Forest productivity	1	3.61	4.61	Ordinary
Sea fishery availability	2.8	1.8	4.6	Ordinary
Saltwater inundation	2.41	2	4.41	Ordinary
Ground water quality	1.83	2.41	4.24	Ordinary
Innovation/adaptive occup.	2.55	1.46	4.01	Ordinary
Soil fertility	1.83	2	3.83	Ordinary
Sea surface temperature and water quality	1.8	2	3.8	Ordinary
Occupational change	0.8	2.98	3.78	Ordinary
Economic status	1.42	2.18	3.6	Ordinary
Food production variety	3.41	0	3.41	Receiver
Ecosystem conservation	2.38	1	3.38	Ordinary
Housing condition	2	1	3	Ordinary
Cyclone	1	1.81	2.81	Ordinary
Continuity of tks	1.8	0.61	2.41	Ordinary
Physical vulnerability	1.8	0.58	2.38	Ordinary
Livelihood availability	2.06	0.21	2.27	Ordinary
Agriculture	1	1.24	2.24	Ordinary
Cattle loss	1.63	0.61	2.24	Ordinary
Human life loss	2	0	2	Receiver
River water quality	1	1	2	Ordinary
Storm surge	1	1	2	Ordinary

(Continued)

Table 4: (Continued)

Component	Indegree	Outdegree	Centrality	Type
River fish availability	1.23	0.61	1.84	Ordinary
River water inundation	1	0.83	1.83	Ordinary
Cyclone shelters	0	1.8	1.8	Driver
Vegetation	1	0.8	1.8	Ordinary
Molluscs	1	0.8	1.8	Ordinary
Customs and rituals	0	1.8	1.8	Driver
Transportation inaccessibility	0	1.8	1.8	Driver
Wastewater industries and urbanisation	0	1.8	1.8	Driver
Biodiversity	1	0.78	1.78	Ordinary
Depth of river	1	0.6	1.6	Ordinary
Floods	0.6	1	1.6	Ordinary
Dredging	0.6	1	1.6	Ordinary
Participatory governance	0	1.58	1.58	Driver
Health	1.58	0	1.58	Receiver
Drinking water supply	1.58	0	1.58	Receiver
Ecosystem knowledge and training	0.78	0.56	1.34	Ordinary
Global warming	0.2	1	1.2	Ordinary
Aquaculture	0.63	0.38	1.01	Ordinary
Cyclone-resistant homes	0	1	1	Driver
Sea level rise	0	1	1	Driver
Sound pollution oil exploration	0	1	1	Driver

Structural Analysis and Dynamics of the Model

For a comparison of scenarios, sigmoid functions such as hyperbolic functions are generally used for problems with complexity (Tsadiras, 2008). In this study, we considered a hyperbolic function (see Eq. 1), which is a continuous function producing infinite states that are freely distributed within the $[-1, 1]$ M hypercube. It can handle equilibrium and cyclic states (Felix G. et al., 2017). Though such functions might not yield chaotic outputs, they can be used for modelling qualitative and quantitative scenarios useful for the complex problems (Groumpos and Stylios 2000):

<Equation 1>

$$f(x) = \tanh x = (e^x - e^{-x}) / (e^x + e^{-x}) \quad \text{equation (1)}$$

Where f is a threshold function (also known as a transfer function) ranging from $[0, 1]$.

In this study we tried to compare the scenario of interrelations in the system, before the introduction of change in the decline of ecosystem services after a disaster hits the system. Figures 5 and 6 show the conceptual change after a decline in ecosystem services in the system, which was analysed using the hyperbolic function. The research being to understand the contribution of one parameter to the conceptual change in other parameters, the study tries to understand the dynamics through preferred state metrics available in the Mental Modeler platform. The interface of the Mental Modeler allows deciding the preferred states, and allows the decision maker to simulate the preferred state of each component in the system.

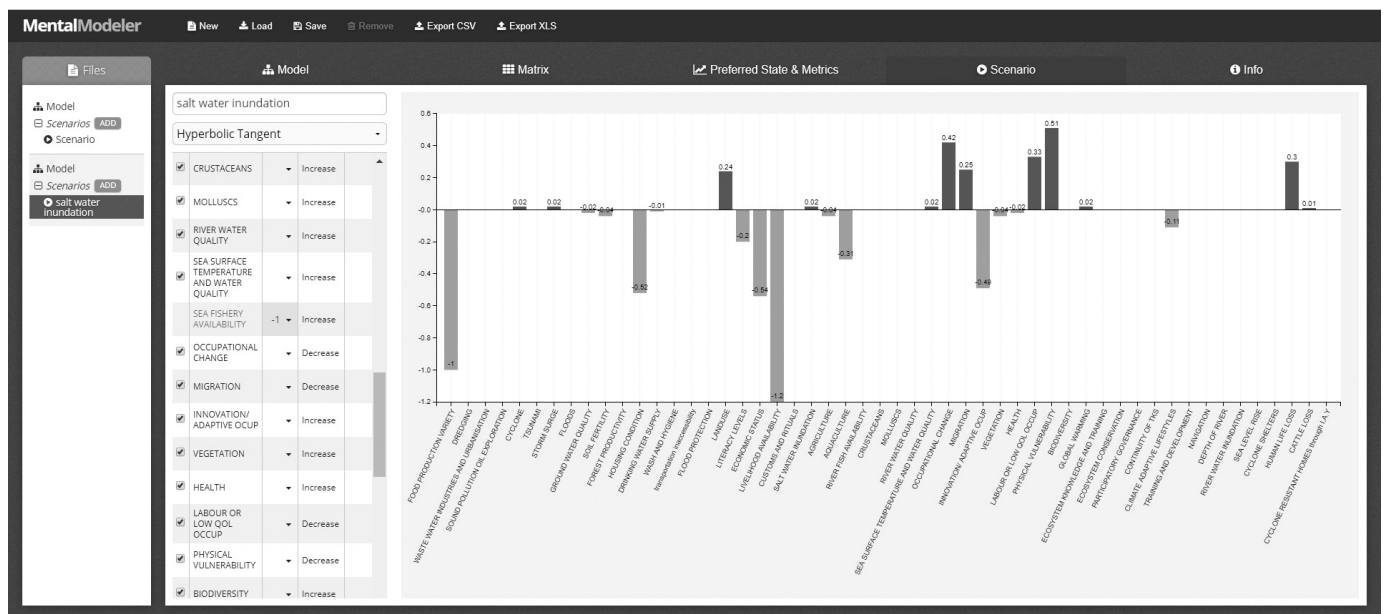


Figure 5: A complete decline in sea fishery availability

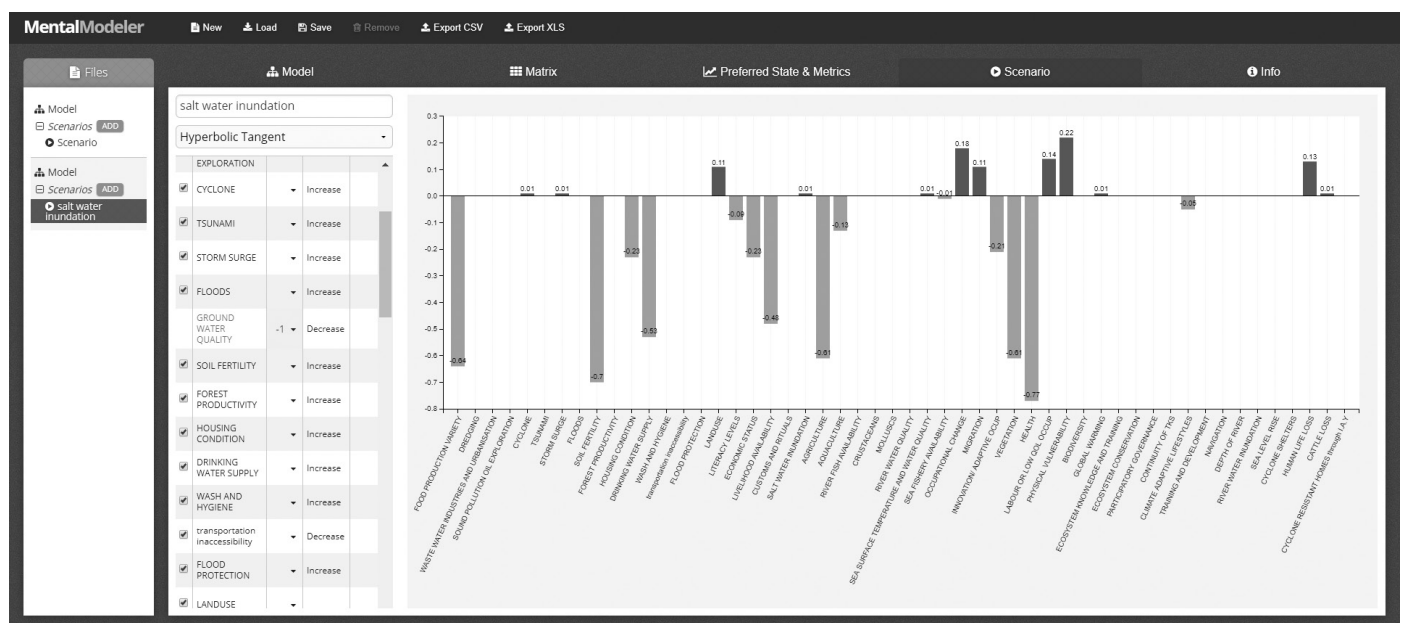


Figure 6: Ground water quality when reduced to -1

Results: Changing Dynamics of Ecosystem Services in the Socio-ecological System After a Component Change in the System

From the case study it is derived that it takes comparatively more time for ecosystem services to

revive when scientific interventions are lacking. The study shows a check on which components change and by how much, when they are completely damaged.

The analysis came up with indirect effects on various components of socio-ecological system resilience.

The degree of relative change to each component under the scenario will appear in the scenario bar chart

space as seen in Figs. 5 and 6. It can be interpreted that with a complete decline in the ecosystem service: sea fishery availability, we can observe a significant conceptual change in the system as follows.

A complete decline in sea fishery availability can lead to a reduction in fishery availability (by -1), ground water quality (-0.02), housing condition (-0.52), drinking water supply (-0.01), literacy levels (-0.2), economic status (-0.54), livelihood availability (-1.2), agriculture (-0.04), aquaculture (-0.31), innovation/adaptive occupation (-0.49), increase in cyclone effect ($+0.02$), storm surge effect (0.02), soil fertility (0.04), land use (0.24), salt water inundation (0.02), sea surface temperature (0.02), occupational change (0.42), migration (0.25), labour or low QOL occupation (0.33), physical vulnerability (0.51) and human life loss (0.31).

The scenarios created in a hyperbolic tangent tan h range between $[-1, +1]$. The decisions also have minor effects on ground water quality (-0.02), water supply (-0.01), agriculture (-0.04), cyclone effect ($+0.02$), storm surge effect ($+0.02$), soil fertility ($+0.04$), salt water inundation ($+0.02$), and sea surface temperature ($+0.02$). It is important to note that the values indicate the relative change in the components, based on edge relationships under the chosen scenario and are not to be considered final input into decision-making without validation. The model was further validated by debating and conducting discussions with stakeholder groups in a community consultation survey before implementing. Further expert opinions can be taken and final scientific data justification (maybe for cross-checking) should be added for supporting the results before inputs into decision-making. Similarly, all other ecosystem service decline scenarios could be reviewed and indirect effects of disasters on the system can be achieved, thereby providing information for decision-making in the system.

When ground water quality in the scenario is declined to the least possible, the affected factors include: a decrease in components such as food production variety (-0.54), soil fertility (-0.7), housing condition (-0.23), drinking water supply (-0.53), land use ($+0.11$), literacy levels (-0.09), economic status (-0.23), livelihood availability (-0.48), agriculture (-0.61), aquaculture (-0.13), occupational change

($+0.18$), migration ($+0.11$), innovation/adaptive occupations (-0.21), vegetation (-0.61), health (-0.77), labour/low QOL occupations ($+0.14$), physical vulnerability ($+0.22$) and human life loss ($+0.13$).

Similar simulations can be created by changing each component according to the requirement of the decision maker. Thus, n number of simulations are possible to a limit, as explained in Lavin and Giabbanelli (2017).

To run the scenario, the components are set to pre-decided values as in Table 4, the simulation procedure. The decision makers can decide what scenario can be run based on various disturbances a system can be faced with. The change in the components is identified concerning relative conceptual change. From the Figs. 5 and 6, it can be seen that the relative change in the system is displayed in the form of a bar graph to indicate how components might react under a given scenario (Gray, S., 2015). Lavin and Giabbanelli (2017) describe the simulation procedure and the interpretation of results, and highlight that to identify the contribution of each link, it is important to simulate the system as a whole.

Conclusion

Very few studies have explored the effect of other components of a system during the recovery of ecosystem components on a system. Accepting the very fact that ecosystem services recover slowly compared to other human-related components of the socio-ecological system, the study tried to identify the changes in the interrelationships between other components in the system, when the services degrade. By understanding how the components of the socio-ecological system get influenced after a disaster, indirect effects can be critically identified and decisions can be made accordingly, thereby buffering resilience in the system. Also, multiple scenarios can be simulated at a time for understanding the overall effect on the system. Scientific inputs can be input into the system by coding them accordingly. It can be concluded that fuzzy cognitive mapping can be a useful tool for identifying indirect effects on various components of a system due to disaster effects.

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Applying a Socio-ecological Perspective for Fostering Resilience in Rural Settlements of the Melghat Region

Vibhas Sukhwani^a and Sameer Deshkar^b

ABSTRACT: At the brink of climate change, the perpetual human-nature links observed in remotely placed rural settlements, particularly those nested within ecological regions, are alleged to be deprecating. While the indigenous communities in and around protected forest areas depend on the surrounding environment for their livelihoods, the emerging climate discrepancies are posing serious concerns to their sustenance. This paper deliberates on the impacts of climate change on the rural communities of the Melghat region in Central India. The paper establishes a methodical understanding of the Socio-Ecological Systems (SESs) in Melghat by meticulously detailing out their social and ecological characteristics. The study framework explores various parameters through which social and ecological systems are linked so as to understand the interdependencies between the two systems. SESs in the selected settlements are then analysed based on the evaluation of community responses for defined indicators using choice-based preference method. The study results highlight that 'Livelihoods' aspect is the most critical element for the local communities and the progressive depreciation of the nature-based livelihood practices is primarily influencing the local SESs. The author attempts to characterise the obtained results with the existing scenario in Melghat and determine the key areas of intervention. The recommendations focus on strengthening the traditional livelihood systems that can effectively contribute in building alternative livelihoods that are resilient to the exacerbating impacts of climate change.

KEYWORDS: choice experimentation, rural livelihoods, protected forest areas, rural communities, socio-ecological systems

Introduction

The natural climate variability has customarily been the foremost challenge to rural livelihoods, primarily based on climate-sensitive sectors. In recent decades, human-induced climate change has advanced the complexities of this challenge to another level. As per the Fourth Assessment Report (AR4) of the United Nations Intergovernmental Panel on Climate Change (IPCC), the natural climatic variability compounded

with human-induced climate change is supposed to adversely affect millions of livelihoods around the world (IPCC 2007). It is important to note that while being unpredictable, the emerging changes present serious problems to the development and management perspectives for rural communities (Walker et al. 2004) as they influence their endurance and adaptive capabilities. Apparently, the rural communities in the developing countries are expected to be affected more due to their extensive dependence on climate sensitive

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livelihood options and limited adaptive capacity to adapt to the emergent changes (Dasgupta et al. 2014). Numerous researchers have repetitively pointed out that the imprudent development drift in the wake of globalisation is causing adverse environmental impact for indigenous communities in terms of landscape changes, environmental pollution, biodiversity loss, changing demographics and so on. The development factors such as increased connectivity, zoning restrictions, low-cost alternatives and other basic accessories are proving fatal for the traditional rural systems as they seem to be eclipsed by modern-day technology.

In the context of remote rural communities, the congruence between the society and environment majorly determines the survival and growth of the residing population. The role of social and ecological systems as complex adaptive systems is universally acknowledged and is today being examined from the perspective of strengthening the rural communities against the emerging risks. India's diverse geo-climatic conditions as well as its high degree of socio-economic vulnerability places it in the vanguard of climate change impacts, widely concerning the predominant rural societies. Notably, the rural population (per cent of total population) in India is observed to be exponentially declining and was last measured at 66.46 per cent in 2017 (Trading Economics 2017). The rural population residing around natural systems like forest areas are under increasing pressure due to their restricted access, economic instability, continuing population growth, competing claims on land and climatic challenges. This study looks across social structures in the two selected rural settlements in the Melghat region, namely Lawada and Kotha, and their sinuous relationship with the surrounding environment at the micro level. It reviews and highlights the major livelihood strategies of the indigenous communities and the scale of environmental dependence. The study explores various parameters associated with Socio-Ecological Systems (SESs) and investigates the community preferences for the selected parameters before coming up with relevant strategies to foster resilience in SESs of the Melghat region.

Evolving Human–Nature Interactions in Protected Forest Areas

Humans and nature have patently co-evolved over centuries or millennia, creating unique bio-cultural systems (UNU-IAS et al. 2014). The social systems abiding in and around nature profoundly interact with the ecological substrate and their survival is dependent on the interrelations with natural resources. In fragile ecosystems like protected forest areas, the environment and its natural resources are conditioned by the actions of indigenous societies and hence the human and natural systems should be seen as overlapping components together forming a holistic complex adaptive system (Schouten et al. 2009). Presumably, the pattern, intensity and scale of human-nature interactions considerably fluctuate corresponding to the geographical features of any land area, geo-traditional practices, local flora and fauna, abiotic components such as soil type, resource availability and so on. Likewise, the threats and vulnerabilities also differ in degrees, levels and impact depending upon the scale of human-nature interactions. UNU-IAS et al. (2013) specify that the management of these interlocking social and ecological systems requires the capacity to cope with complexities and adapt to emerging complex scenarios and continuing adaptation.

Before long, the interactions between human and natural systems have emerged as an unusual concern today because of the hurtling development scenario, whose impacts are demonstrated to be globally connected, both socio-economically and environmentally (Liu et al. 2016). The human influence has allegedly become so pervasive that it dramatically alters the evolutionary trajectories of many other species (Liu et al. 2007). The continued recklessness may profoundly modify the ecological dynamics by depleting the available stocks, resulting in the loss of important habitats and the services they offer to society (Aylward et al. 2005). Correspondingly, the environmental conservation and change needs to be balanced through an adaptive process of optimisation across various system goals. For environmental

sustainability, it is desirable to integrate social and ecological systems at various geographical scales, ensuring compliance with general system requirements such as ecological and cultural integrity, economic stability, social equity and economic efficiency (Hediger et al. 1998). The rural communities living in and around protected forest areas are inextricably linked with the adjoining ecological systems and there is a need for understanding the social and ecological systems as one system operating over many linked scales of time and space (Adger 2000). Today the need for resilience perspective to manage SESs is augmented by the proven fact that these complex adaptive systems do not change in a predictable, linear, incremental fashion (Pisano 2012) and it becomes very important to keep a track of these dynamic changes.

Case Study Area: Melghat Region

At the northern extreme of the Amravati district of Maharashtra (Fig. 1) lies the Melghat region in the south-western Satpura Mountain ranges. The region comprises mainly two tahsils of Amravati District, namely Dharni and Chikhaldhara (Homeo 2007).

Melghat literally means a place where several hills (ghats) meet and represents highly undulating and deep valleys, offering great diversity and rugged and undulating topography with variation in vegetation almost every mile. Melghat Tiger Reserve (MTR) is one of the first nine tiger reserves included in the Project Tiger launched in 1973, with a total area of MTR 2027.41 square kilometres. The major part of the Melghat region is covered with Tiger Reserve (buffer zone) and the reserve forest (Khandare 2004) as shown in Fig. 2.

Melghat is predominantly a rural region and has a rich tribal culture. The region is known to be one of the most remote areas in the Amravati district of the state of Maharashtra. The region has been in limelight for the past 20 years on account of malnutrition deaths of children where an estimated 5000 tribal children died of malnutrition during the years 1992–1997 (Datta 2013). This study covers two medium-size settlements of Dharni block of the Melghat region, namely Lawada and Kotha, having a population of 1787 and 1064 respectively (Census 2011). Figure 3 depicts the regional settings around the two selected rural settlements. Notably both the settlements are located outside the boundary of Melghat Tiger Reserve.

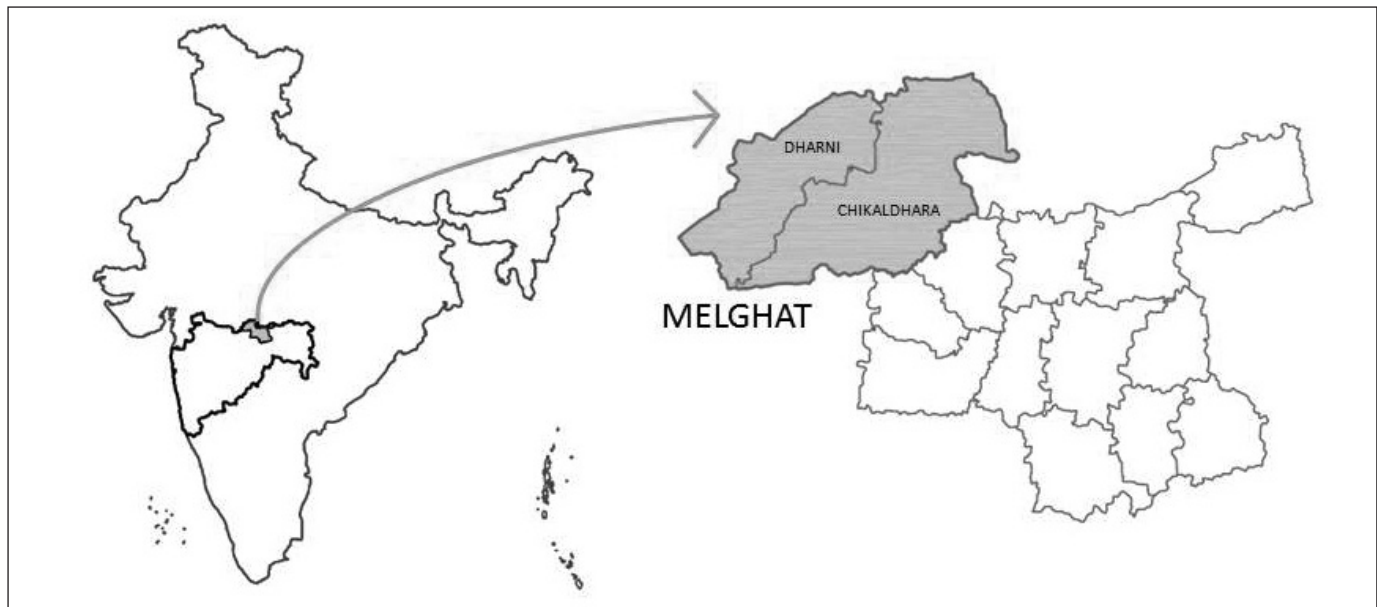


Figure 1: Location map of the Melghat region in India (Author)

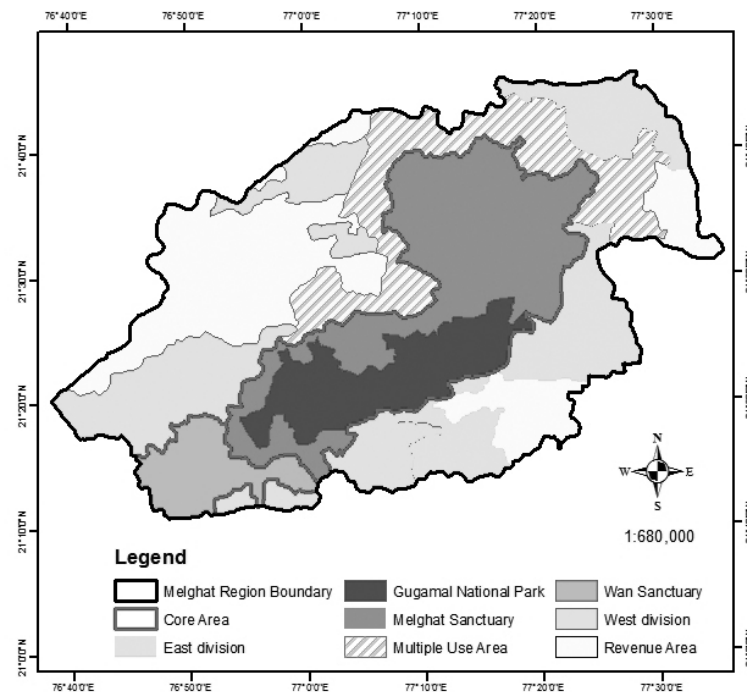


Figure 2: Regional setting of the Melghat region (Author)

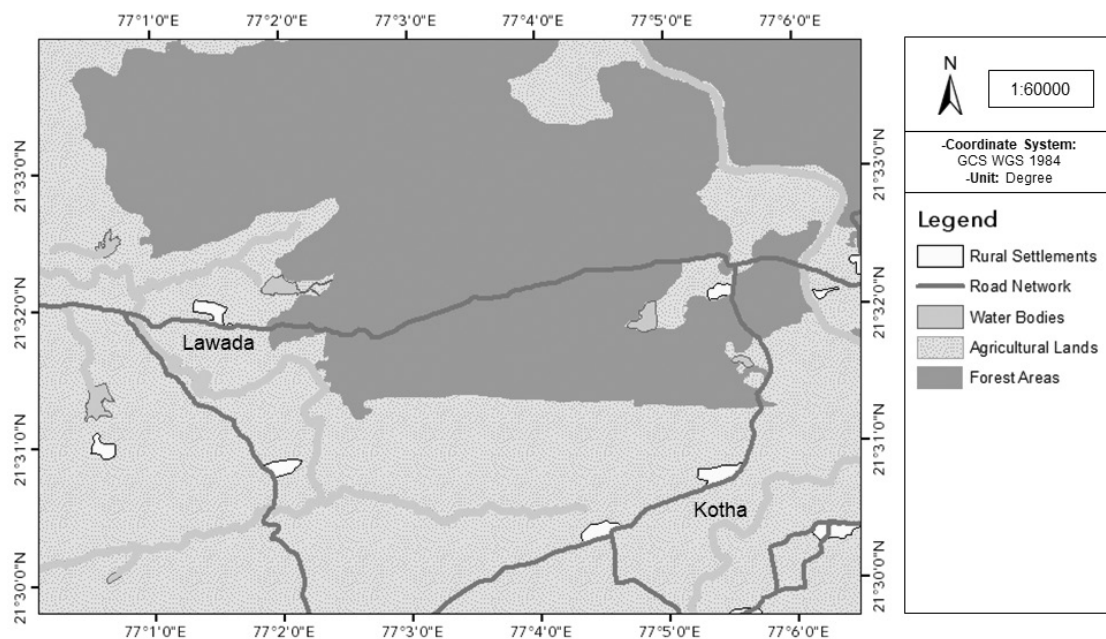


Figure 3: Regional settings around the two selected settlements of Lawada and Kotha (Author)

Melghat is located in the central highland biotic province of the Deccan biogeographic zone and supports typical dry teak forest of central India (Choukhande and Gudadhe 2013). The climate of the Melghat region is characterised by a hot summer and

general dryness throughout the year except during the south-west monsoon season (Nazimuddin 2011). The rainfall occurs from the middle of June to mid-October, with the annual rainfall varying from 1000 to 2250 mm (Musavi 1999). The area exhibits two distinct

geographical regions – namely the plains of the Purna Basin and the hilly tract of the Gawilgarh Range. The soils in Melghat forest are radish brown and the slopes under fairly high rainfall permit leaching of soils making them poor in time and alkalis (Kazi 2013).

Emergent Dilemma in Managing Conventional SESs

Before the Melghat tahsil came under British administration in 1853, the forests were being exploited by the local inhabitants, for shifting cultivation and trade in forest produce. The local tribes have been involved in logging and related forestry activities for a long time as labourers (Musavi 1999). After the sudden advent of Melghat Tiger Project in the year 1972, the settlements in and around the Melghat protected areas have extensively been subjected to additional pressures varying from wildlife conflicts to government regulations which persistently impacted their livelihoods. Today, Melghat is known as one of the most underdeveloped regions in the Maharashtra state owing to the presence of Tiger Project. Research (Homeo 2007; Choukhande and Gudadhe 2013) has pointed out that the government schemes and policies have not been very effective in uplifting the development pace of these tribal communities. The region's typically lower socio-economic status and social marginalisation are primarily attributed to the restricted access to forest areas. Further, the climate

change is threatening the already stressed rural systems by influencing the agriculture, natural ecosystems, housing patterns, resource availability and so on. As a result, the local population is forced to migrate for work during the rest of the year (Jawale 2015). Based on the community consultation workshops, the study finds that in Melghat, the local communities have been broadly categorised into eight groups namely Korku, Gond, Gawli, Bhomka, Thakur, Basod, Lohar and Charmakar (Fig. 4). These stakeholders knowingly protect and safeguard the environment by means of their nature-friendly traditions, rituals and customs (MTR 2012). As depicted in Fig. 4, the predominant socio-economic ties amongst the social groups reflect the heavy reliance of locals on the social networks. The support systems of food and labour sharing like exchange, reciprocity and barter system have invariably persisted in Melghat; however, in the wake of climate change, these support systems are on the verge of collapsing as many of the stakeholders seasonally migrate or temporarily work afar due to lack of opportunities in the region. Further, the social structure has changed drastically as the vulnerable communities are changing their occupations in search of a stable income source, eventually migrating to urban areas for better opportunities. The study underlines that specific social groups like 'Charmakar' and 'Thakur' (Fig. 4) seem to have vanished from the community cycle as their traditional occupations are no more practised.

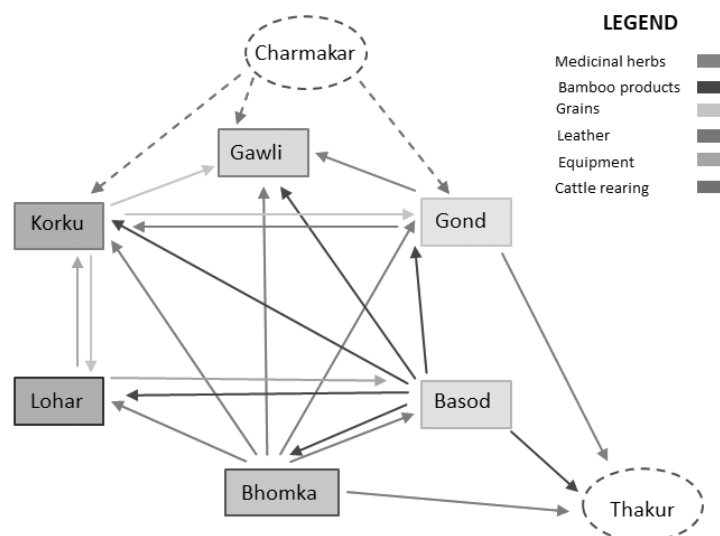


Figure 4: Important stakeholders in Melghat communities and their interdependence

Material and Methods

There are several conceptual models established to understand resilience; however, the author comprehends that the majority of these frameworks lack a comprehensive understanding of the system dynamics and tend to overlook the systems of traditional ecological knowledge which are practical, attuned to local ecology and embody a complex of socio-cultural interactions pertinent to ecosystem functioning and resilience (Oudenhoven et al. 2010; Bergamini et al. 2013). Numerous studies suggest that indicators of community disaster resilience can be classified into five domains: namely, social, economic, institutional, physical and natural domains (Ostadtaghizadeh et al. 2015; Dasgupta and Shaw 2015; Suarez et al. 2016). Markedly, these indices do not apply a social-ecological framework provided they consider the universal development aspects of infrastructure, institutional setup, financial aspect and more. The study attempts to identify the dimensions of resilience specifically based on the characteristics of SESs and hence the indicators are designed to capture the diverse aspects that are entailed and essential for sustaining a resilient society in different geo-climate zones. The resilience index prepared for this study has been broadly classified into five aspects as described in Table 1. The indicators under each head are prepared in consultation with the local communities of the Melghat region and selected based on their significance, relevance to the objectives of study and their applicability.

Table 1: Indicator Set Defined for the Study (Author)

ES	Ecosystem Services
ES1	Food variety
ES2	forest produce and timber
ES3	Landslide and flood protection
ES4	Customs and rituals
EG	Environmental Governance
EG1	Ecosystem knowledge and training
EG2	Participatory governance

(Continued)

EG3 Active engagement in ecological conservation

EG4 Monetary provisions for ecological conservation and DRR

SC Socio-Cultural

SC1 Ethics and norms for resource conservation

SC2 Continuity of traditional knowledge systems

SC3 Climate adaptive lifestyle

SC4 Recognition for innovations in adaptation and mitigation

LV Livelihoods

LV1 Availability of alternative income source

LV2 Distance from livelihood supporting services

LV3 Access to financial institutions

LV4 Training and development

NH Natural Hazards

NH1 Early warning systems

NH2 Integration of hazard map in planning

NH3 Adaptive measures and coping mechanisms against natural calamities

NH4 Response mechanism and community capacity

The variegated environmental threats are perceived differently within the broader patterns of society and therefore analysing them in consideration with the community perception is incumbent for policy making. Correspondingly, the study considers local communities as primary stakeholders and attempts to evaluate their preferences for various parameters in strengthening SESs. While there are numerous statistical approaches to determine how people value different features of a service or scenario, this study adopts choice modelling for assessing the resilience indicators of SESs. In the choice-based survey, the respondents face two generic alternatives for each choice set, described by four corresponding indicators. The defined set of indicators under each aspect are shown to respondents and by analysing how they make preferences for choice sets

within a particular aspect, the implicit valuation of the individual indicators is determined. The overall choice sets for indicators within five defined aspects sum up to 35 (7 each for five aspects) and an additional choice set comprising of all five broad aspects is also included. The number of iterations for this concluding set sums up to 15 which takes the total number of choice sets to 50. The settlement-wise survey data in binary coded format is tabulated in an Excel sheet and used to run a Generalised Linear Model using software R. A logit model is run to get the logistic regression coefficients, which provides the basis for interpreting the significance of each variable. The odds ratio which is the ratio of probability of occurrence of an event to the probability of its non-occurrence of these coefficients is obtained as the exponentiated values of the coefficients and used to decipher the relationships between the identified resilience components of SESs in rural settlements of the Melghat region.

Survey Results and Analysis

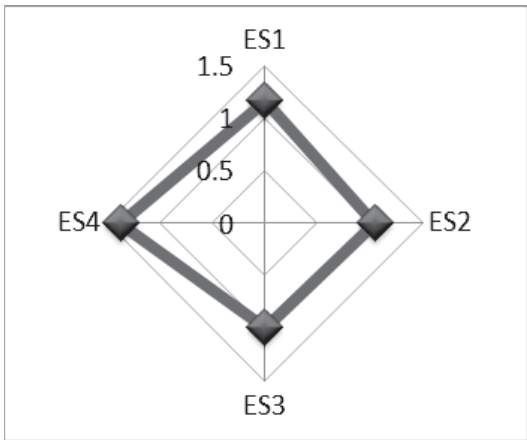
From Fig. 5a, it can be interpreted that within the four indicators of ecosystem services, the change in predictor of 'Customs and Rituals' (ES4) by 1 unit of interval and keeping all other predictors constant will change the odds (probability) of enhancement or reduction of ecosystem services by a factor of 1.37. The change in odds of such parameters could be either positive or negative, but it will remain in the ratio to ES4, provided the other variables remain constant. It is important to note that an odds ratio less than 1 indicates a probability of response to be less than 50 per cent. Thus, based on the odds ratios, it can be inferred that in the case study of Melghat, attached 'Customs & Rituals' (ES4) is comparatively more significant and preferred choice of the residents for the aspect ES. This does not downplay the significance of other parameters but implies that these services should be emphasised more in planning approaches for the SESs in Melghat communities. The choice preferences for all the five dimensions are analysed following the above-explained procedure and the key observations are as below:

- Based on Fig. 5f, it is manifested that the 'Livelihoods' (LV) aspect has the foremost role

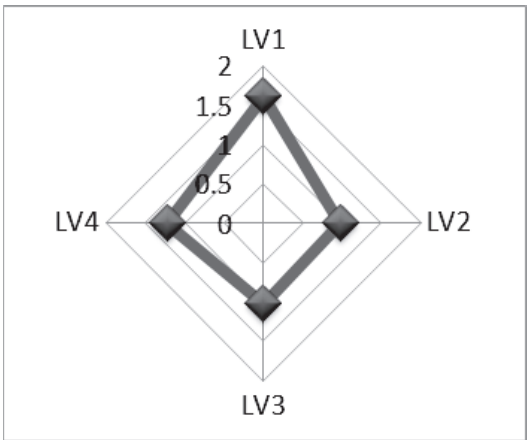
to play in enhancing the resilience of SESs in rural settlements of the Melghat region and the residents primarily aspire for 'Alternate Income Sources' (LV1) (Fig. 5d).

- Deprived of perpetual access to forest resources and located at such fragile locations, the communities believe that the 'Environmental Governance' (EG) is the second most decisive factor for easing their socio-ecological stressors (Fig. 5f).
- Though widely known that the rural settlements are based on their traditional beliefs and customs, it has been found in the study that the Meghat communities have given the least preference to the 'Socio-Cultural' (SC) aspect (Fig. 5f) in the context of emerging disaster risks.
- In the context of adaptability to 'Natural Hazards' (NH), the residents of Melghat believe that their 'Coping Mechanisms' (NH3) would majorly determine the resilience of communities (Fig. 5e).

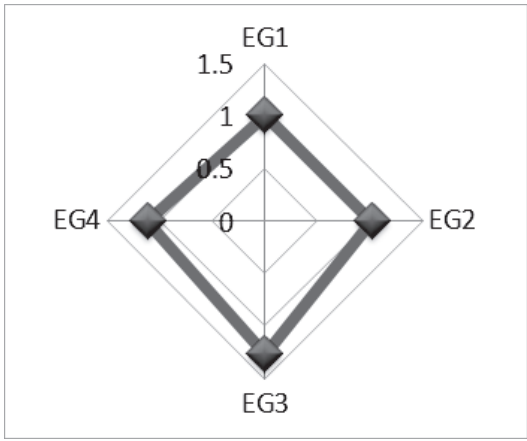
The schematic diagram as shown in Fig. 6 figuratively summarises the community preferences for all the indicators and helps to visualise the potential sectors in Melghat, providing an optimal focus for development in different sectors. In the schematic diagram, the varying thickness of arrows around the Socio-Ecological Resilience (SER) implies the preference levels for various aspects. The higher odds ratio indicates higher relevance in resilience context and the varying size and colour of circles denote the choice-based preferences for variables in all the identified aspects of SESs. Notably, the communities in Melghat have given higher preference to 'Alternate Livelihoods' (LV1), 'Active Participation in Ecological Conservation' (EG3), 'Coping Mechanisms' (NH3), 'Customs and Rituals' (ES4) and 'Ethics and Norms' (SC1). The development practices in Melghat should correspondingly be aligned with the identified community priorities with an aim to make the development planning for these small rural communities holistic. The core development focus for strengthening SESs in protected areas of Melghat should be on livelihoods aspect with special focus on alternate income sources, as it is the most consequential sector identified by the local communities.



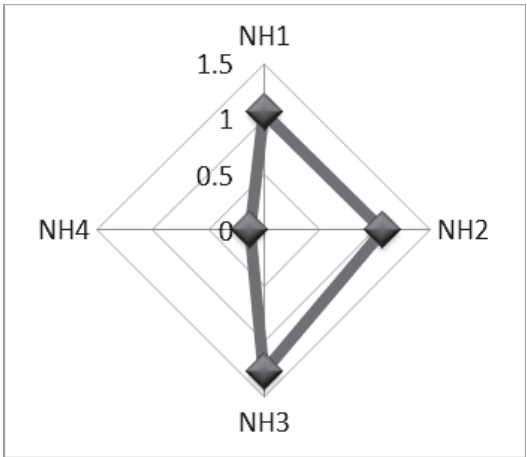
a. Ecosystem Services



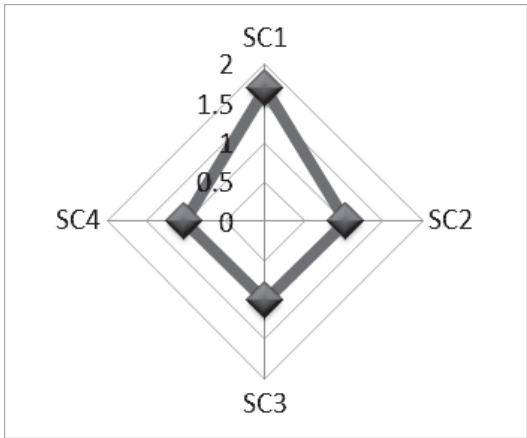
d. Livelihoods



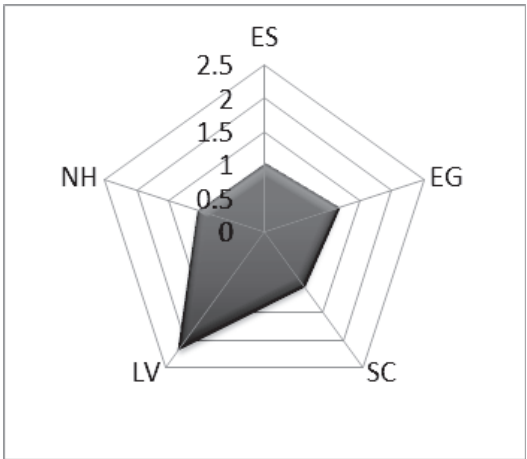
b. Environmental Governance



e. Natural Hazards



c. Socio-Cultural



f. Comparing five aspects

Figure 5: Choice preferences of selected rural communities in Melghat (the abbreviations in the figures correspond with Table 1)

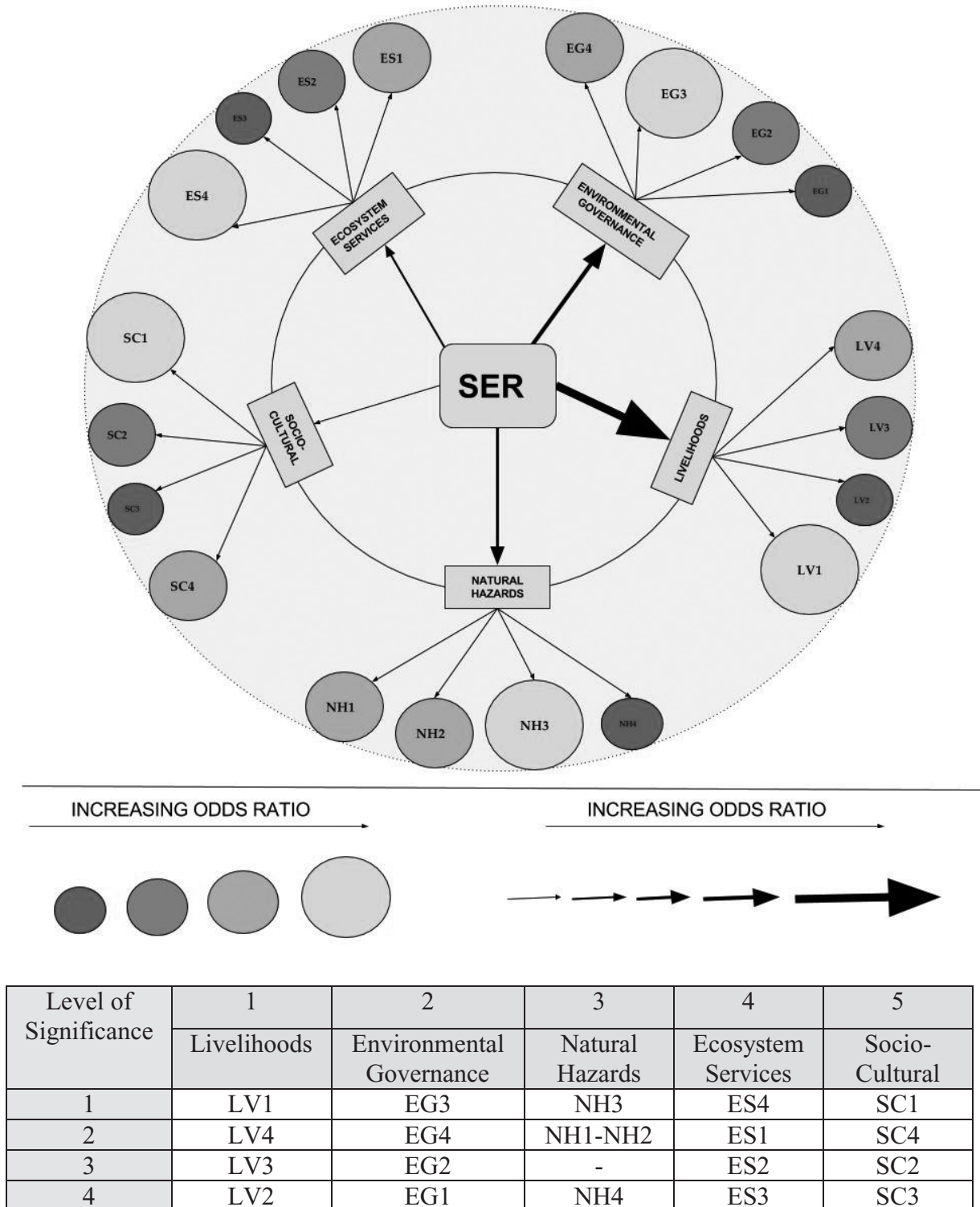


Figure 6: Schematic diagram for identified community preferences in Melghat

Discussion

Evident from the study results, the most pertinent issue in the Melghat region is 'Livelihoods'. The study pinpoints that the numerous restrictions imposed on tribal communities limiting the cultivation of land and collection of minor forest produce have added to the complexities in fragile regions, further making their survivability difficult and consequently forcing the communities to vacate their long acquired traditional lands. As the climate for agriculture is becoming more and more variable and unpredictable, it has become necessary for indigenous communities to supplement their subsistence livelihoods with income gathering activities beyond agriculture in order to minimise their susceptibility to hazards. The study theorises that the conservation of biodiversity on a long-term basis is possible only when local communities that are an integral part of the ecosystem are involved in management practices. The decision makers must recognise that indigenous communities play a vital role in forest protection and the valuable traditional knowledge possessed by indigenous communities needs to be acknowledged by giving their due share or equal rights. There is a need for collective community forest protection initiatives through Gram Sabha unlike dominated Joint Forest Management (JFM). The state-sponsored cooperatives of landless tribals should be set up for the processing and marketing of various non-timber forest produce. The study recommends that alternative livelihoods for communities located in and around protected areas should be derived essentially based on the local traditional practices. Emphasis should be given on revival of traditional livelihoods through cattle rearing, bamboo crafts and constructions in tribal regions like Melghat. The diversification of traditional livelihoods strategies combined with capacity building in non-traditional sectors would effectually allow traditional communities to draw on various sources of food and income and in doing so, spreading the risks of vulnerability to climate change. Based on the contextual understanding, the study suggests three general recommendations to reframe the management of SESs in rural settlements across the Melghat region.

Promoting Indigenous Economy

As highlighted from the literature review, seasonal migration has purportedly been an outburst of depreciation of rural livelihoods and to successfully revert the migration patterns, the study compels for rejuvenation of rural livelihoods. The idea of fortifying the existing rural economic base by promoting indigenous economy would give a strong hold to the indigenous communities. The traditional occupations in Melghat like pastoralism, shifting cultivation, fishing and gathering are naturally adapted to the environmental values. The requisite recognition to the traditional knowledge possessed by the indigenous communities could help sustaining the ecosystem-friendly customs and beliefs, eventually paving way for the upliftment of indigenous communities at the grassroots level.

Documenting Traditional Knowledge

With advancing times, the traditional knowledge associated with the environment is found to be dwindling. The residual abridged knowledge is visibly insufficient to counter the emerging problems like loss of species, degrading soil quality and worsening social structures. The indigenous peoples have for years negotiated with climate-based externalities by suppressing their impacts based on a variety of effective adaptive and mitigation strategies. The precise documentation of impacts of climate change on different geographical, socio-cultural, economic and political situations would act as optimum pathway for global communities exposed to follow and effectually deal with.

Enhancing Social Safety Nets

The rural communities are exposed to numerous stressors, as already deliberated, that include cultural and spiritual impacts, demographic changes, displacement from their traditional lands, loss of livelihoods, impacts on food security, health issues, water shortage and so on. However, despite several issues, the rural systems manage to adapt to the

evolving changes and foremost reason behind it are the variegated social safety nets. The strong social bonds and community relations amongst the community members act as shields to the entire community. The smaller groups or individuals exposed to the shocks are covered by the community networks and the entire community resists the impacts together. These safety nets act as armours to the community members, endowing them with the audacity to experiment and innovate in the face of emerging externalities.

Conclusion

As deliberated, the robustness of SESs in rural systems, especially those around the natural systems, majorly determines the survival and safety of the residents. The Melghat region represents a socio-ecological system that works in coherence with the indigenous communities in such a way that the core ecosystem conservation values have always been maintained. The nature-friendly practices in Melghat have been developed through generations of understanding and know-how of the local flora and fauna, including various attributes of it such as climate adaptive lifestyle, bamboo based construction, firewood usage, medicinal importance and nutrient sources. Based on the study results and literature studies, it is construed that the conventional livelihoods like fishing and gathering have become more difficult due to unpredictable weather and seasonal changes. As the implications of climate change are widespread today, the study furthers that there is a need for alternative livelihoods beyond agriculture so as to infuse redundancy in rural systems. The revitalisation of traditional soil and water-conservation methods and cropping systems is incumbent to diversify the livelihoods of Indigenous communities. The study points that the concerns of environmental conservation cannot be isolated from the development of society and must be viewed as an essential prerequisite for sustainable development. Subsequently, this study pushes for revitalisation of traditional occupations that are based on nature-friendly techniques. Further, the method of choice experimentation serves as a valuable medium for decision-making and community-oriented development. The future scope of this study entails

understanding the dynamics of the SESs in different geo-climatic zones of India and building these parameters to test their relevance and applicability for resilience planning at national level.

Acknowledgements

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Vulnerable Settlements and Responses Corollary to Natural Disasters

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ABSTRACT: Natural disasters and their aftermaths have always been a topic of discussion. This paper analyses an instance and effects of natural disasters all while keenly analysing the plight of communities which rely upon informal structures for their livelihood. The infrastructure built by such communes is always at once under strike when a natural disaster comes forth.

Primal examples can be seen all over India, the *fishermen communities living in coastal areas of Kerala* faced huge losses during the Ockhi Disaster. The structure built by the fishermen communities usually is made up of a thick wooden base covered by Tarpaulin; in case of an actual cyclone such as Ockhi the fishermen themselves had to act as first responders then only could they rely upon the government to handle things.

In case if original tribal colonies native to Kerala such as the *Venniyode Vaishyan Adivasi Colony* where their homes consist of a wooden base and the roof is made of clothes or coconut leafs. Even when Kerala floods occurred, they adversely affected the tributary of the Kabini river where the colony was located. The water level on the low-lying area on the banks of the Cherupuzha resulted in landslides and flash floods where in which the communities were relocated.

The incident of *Samoa islands* in the year 2009, when a tsunami struck the Samoa islands, the islanders had to take matters into their own hands. The Aumaga became the first responder while the family clan known as Aigas took charge of shelter, food and other aid to vulnerable individuals. Their internal cooperation is, in fact, unique in its variant.

The paper analyses the core notion of such communities in the face of natural disasters, how they handled the situation, the outcome of their decisions and what prospects the government enacted or started to aid such communities in times of need. In all inclusion, the paper analyses the individual instances of these events and the example of Samoa island shall be treated as a comparative study to the 2018 Kerala Floods.

KEYWORDS: fishermen communities, Venniyode Vaishyan Adivasi colony, 2018 Kerala floods, Samoa islands, tsunami, natural disaster, internal cooperation

The notion of natural disaster and its corresponding after-effects is not something that would need a description; disaster is always disaster regardless of what form it may take. Yet people move on and continue with their life as they were, all while they would have lost their livelihood, shelter and far more. This paper, in short, will be analysing the responses

corollary to such natural disasters. To fulfil the premise of our paper total of three instances will be analysed.

1. The Ockhi Cyclone – a reference to the affected southern coast of India
2. The Kerala Floods – a reference to *Venniyode Vaishyan Adivasi Colony*

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3. The Tsunami of Samoa (2009) – a reference to the response of indigenous communities unique to Samoan islands

The Ockhi Cyclone

The Ockhi Cyclone brought forth devastation in India. On November 29, the cyclone struck the southern coast of India; Kerala was worst off among others, at the time when the cyclone hit the death toll, estimated to be around 40 and even then, officials concluded that it would summarily rise. The joined effort by the Indian Navy and Airforce and Coast Guard was able to rescue 252 fishermen during the time the disaster struck. Even though rescue operations were rigorous, at the time over 90 people had been missing. Even more so the allegation by those affected and the opposition parties said that the state government led by Chief Minister Pinarayi Vijayan did not issue a cyclone warning and furthermore did not take effective measures to speed up the relief measures (bbc.com, 2017).

Relief Package and Drawbacks

In response to the allegation Chief Minister Pinarayi Vijayan responded that it was a matter of communication error. He said the state had received the cyclone warning beforehand at 12 p.m. November 30. However, the Opposition Leader Ramesh Chennithala said the adverse impact, damage and loss of life caused by the Ockhi cyclone could have been reduced had the state government departments paid attention to the warning officially issued by the Union Home Ministry to the state government at 5 p.m. on November 29. Thus, it can be said in one form or the other that if the government had effectively responded, the aftermath and damage caused could have been significantly reduced. It came to a point where the fishermen themselves went off to seas in search of their friends and family members saying the rescue operations were not up to the mark.

The union government gave about 133 crores to the Kerala government. While in retrospect that sum was far too low to entirely aid the reconstruction and

relief schemes intended for the people, by which Kerala government itself was able to raise an amount of Rs 120 crore which was near to what the central government has granted to them. “The scheme included awarding Rs 20 lakh to the kin of 74 killed so far by the cyclone, handing out compensation for loss of equipment for affected fishermen, such as boats and nets, apart from promises to address re-employment, education and rehabilitation of the affected families” (Kerala, n.d.).

Even so, an issue came up about the misuse of the relief funds. According to a government order dated January 6, 2018, state police chief Loknath Behera hired the chopper from Chipsan Aviation Private Limited. Though the aviation company had quoted an amount of Rs 13,09,800 initially, it got reduced to Rs 8 lakh after negotiations, the letter added. Following the DGP’s request to pay the expenses to the aviation company, the government had issued a sanction order to the district collector (Trivandrum) to release said amount from the “State Disaster Relief Fund” SDRF account. The order was withdrawn due to the backlash from the opposition and people like the chief minister claimed he had no knowledge of the order and the General administration department would bear expenses of the trip (news, 2018).

Now on the well-being of the fishermen community which had been harshly affected. To an extent, the welfare package provided by the state government has been helpful although those who have been lost due to the incident can never be returned.

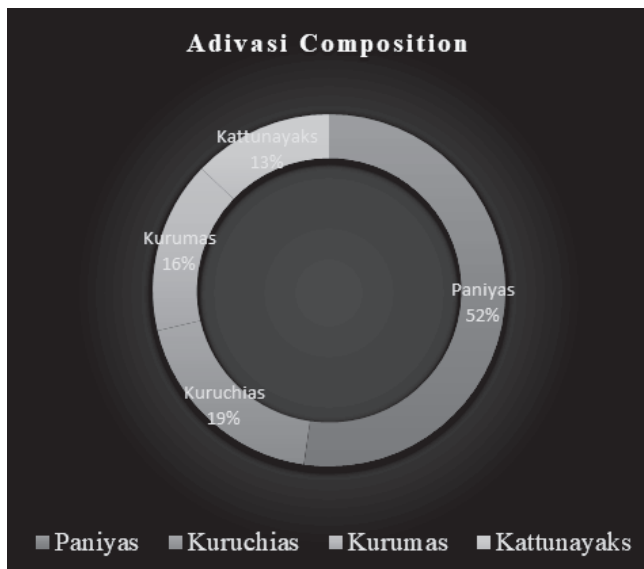
The consensus of the Ockhi disaster can be considered as under:

As per the intel gathered from the fishermen associations in Kerala and Tamil Nadu, over One hundred and Twenty fishermen are dead and about Nine hundred were still missing after Ockhi struck. The extent of this could have been avoided if there was swift and ample action from the government and Disaster management effort. The government’s own estimation dictates over Three thousand six hundred and seventy-seven fishermen from Kanyakumari and Kerala were lost in the sea. On November 30 morning, action plans should have been kicked in and the Indian Coast

Guard, with its seaborne vessels and helicopters, should have initiated emergency search and rescue operations. If the Coast Guard ships had taken along a few fishermen from the villages as navigation assistants it would have sped up immensely aided the rescue operations (because they knew where to look for missing people) and should have intensely combed the area. Had this been done, hundreds of fishing boats and fishermen would have been found and rescued within the shortest possible time. (Devasahayam, December)

The Venniyode Vaishyan Adivasi Colony

According to the Indian Census of 2011 in Kerala, Wayanad district holds the largest number of Adivasi colonies in the district with a percentile of 18.5 per cent of the district's total population. Paniyas are the largest tribe constituting 45.6 per cent, followed by Kuruchias 16.6 per cent, Kurumas 13.8 per cent and (Andrew Rumbach, 2014) Kattunayaks 11.2 per cent; each tribe lives in a separate settlement of its own.



That said these Adivasi colonies face an existential crisis because of natural disasters and here we will be speaking about the *Venniyode Vaishyan Adivasi Colony*.

The colony is situated near the banks of Cherupuzha; every monsoon the river breaches its banks and inundates the colony, and every time this happens residents of the Venniyode colony temporarily relocate to a flood relief camp; even way before the devastating Kerala floods this Adivasi colony on a regular basis had to relocate to the aforementioned relief camp for about 10 years; the school has functioned as a relief camp and yet officials are unable to devise a permanent solution for this situation.

In the year 2014, the government had promised that the colony residents would be moved to higher ground. Yet in the year 2018 the situation has not changed the resident's state, "the revenue department is deliberately lagging the file", the government had issued an order to take over the land in 2016, and yet no follow-up seems to have occurred.

If that were not enough, the Kerala flood of 2018 brought forth even more devastation to the colony. The extensive rainfall caused hazardous flash floods, landslides and land subside; the culmination of these factors made the colony a red zone to live in.



Image 1: The resident of the colony showing the flood line on the wall (Ameerudheen, 2018)

The plight of the residents of the colony should be heard. Only three are concrete houses and rest are makeshift structures covered in tarpaulin more like a crude hut than an actual house where people can live in.



Image 2: Six people sleep on the damp floor of Channakkan's tarpaulin shed in Venniyode Colony (Ameerudheen, 2018)

Drawback

The district administration dictates the cost incurred due to the flood would be estimated at Rs 14 billion. Even more so their basic needs are not fulfilled, and the government officials seem to be turning a blind eye, the colony residents had not even received Rs 10,000 that was promised to them; in total their current state is deplorable. The floods had washed away their temporary settlements made from base structure and tarpaulin, with it their household utensils leaving them bare, not to mention the colony does not have proper healthcare. Their water is contaminated and yet they drink and use it since there are no other options available.

The government has yet to speed up the process needed to move the residents to a permanent place; if not for the volunteers who aid them during their annual relocation the colony residents would not be able to survive. The residents reiterated their demand for the colony to be moved, saying that it will end their annual evacuation (Ameerudheen, 2018).

The Tsunami of Samoa Islands (2009)

The tsunami that hit the Samoa islands resulted from three undersea earthquakes that ended up taking the lives of 34 and injuring several hundred people, causing millions worth of damages.

While the above discussed two instances dictated the plight of the people who were victims of natural disasters, one a cyclone and another flood, in both instances and the one being explained here, "the communities faced an existential crisis," but the point which differentiates the tsunami in Samoa islands is as follows.

Instead of asking for the help of Federal Emergency Management Agency (FEMA), the indigenous people, the Matai, began organising relief measures; for each there was a separate division.

- The Aumaga – the village organisation of untitled men in Samoa (Definition by Merriam Webster)
- Aualuma – the village association of women who attended the wounded
- Pulenu'u – the traditional institution of village mayors
- The extended families are known as Agias that offered shelter, food and aid

Among the Aumaga and the rest of the indigenous people, the overall relief measures were taken care of rather than causing mass hysteria the natives were well and able to handle the situation, minimise the damage and prompt relief measures. 'The Aumaga were crucial, they were the de facto "first responders", he said. "Functioning in each village they are able to promptly handle the local relief measures and aid the injured and maintain activities without bringing forth a state of hysteria".

"We found that communities like this have strong traditions that may not fit into the Federal Emergency Management Agency (FEMA) model, but they are still highly effective," said study author Andrew Rumbach, PhD, assistant professor of planning and design at CU Denver's College of Architecture and Planning. "We think these same kinds of traditions could play important roles in disaster preparation, response and recovery in American Indian communities, Alaskan villages, and among other indigenous people" (Denver, 2014). The model proposed by FEMA is something people can aspire to their grassroots development system and systematic aid has drastically improved the fundamental basis of rescue operations all the while opting for the help of the local natives speeds up the rescue operation. Internal cooperation is yet another

key factor in analysing and promoting the fundamental basics of rescue operations (Andrew Rumbach, 2014).

Conclusion

The University of Denver and the University of Hawaii at Manoa which conducted the analysis of the same situation worldwide state that even though some indigenous customs may not fit into the rescue operation framework, if we were to incorporate the indigenous community productively and create a grassroots frame, it is a matter that should be included in the indefinite article while formulating such rescue operations.

While comparing the Tsunami of Samoa in 2009 and the horrendous flood that struck Kerala in 2018, an undeniable similarity can be found.

When Kerala was hit by the downpour in August which culminated in a drastic flood, all 14 districts were placed under red alert. The Indian government declared it a Level 3 Calamity; for the first time all five overflow gates of the Idukki Dam were opened at the same time. Heavy rainfall in Wayanad and Idukki had caused severe landslides and left the hilly areas purely deserted. The part where a sense of similarity comes forth is when the Keralites took matters into their own hands.

The social media group which functioned for trolls turned into points of information. The general youth took matters into their own hands. WhatsApp groups turned into centralised hubs where people would send message and these would be transferred to district coordinators. A division would handle and verify the information sent. Students and people from all occupations took part in relief efforts; when the Navy could not reach the underwater districts of Pathanamthitta, fishermen took the matter into their own hands; aided by local police they came from the shores to help in rescue efforts.

Considering their efforts the fishermen were given an unofficial title the Royal Navy of Kerala, which truly put they are far more deserving for such a title; while no one from the land masses came to help them when the Ockhi disaster struck, they helped wholeheartedly in rescue missions when called upon. The only difference,

however, is the discrimination and backwardness portrayed by few even amidst these rescue operations.

An instance reported by CNN is baffling; Marion George, a 47-year-old fisherman, reached a home in the city of Kollam on Friday with a family of 17 trapped inside.

When he told them that he was there to help them, he was asked, “Isn’t this a Christian boat?”



Fishermen Marion George says Hindu Brahmin flood victims would only let him rescue them if he did not touch them.

When he replied that, he was a Christian, the men in the family refused to get in his boat and waved him away.

The men were from India’s highest Hindu caste, Brahmin, and would not go near George, despite their desperation.

Five hours later, George was back in the same neighbourhood and saw the same family calling for his help. He docked his boat close to their home but was again told by the men that they would only board if he did not touch them.

“Normally, their attitude is like this only. We just thought that in this situation, they would have changed,” George said (Swati Gupta, 2018).

In all the rescue efforts coordinated by the people, each individual tried their best to handle the situation and aid those in need. To give an example, the students of Pondicherry University were able to raise an approximate amount of Rs 1,000,000 from the students alone; even more so the Pondicherry University issued a circular appealing the teaching and non-teaching staff members to give their one-day salary towards this cause.

Remarks

The final remarks or suggestions I would like to make would be as follows:

- Enact disaster management and classes to students to promote welfare activities among the youth.
- Enact disaster preparedness programmes in case of indigenous communities to make them self-sufficient.
- Introduce complete transparency in the collection and distribution of funds accumulated.
 - Introduce laws where misuse of funds results in severe action (legally).
 - Introduce a public record system where every rupee collected and distributed is recorded and should be foreseen by the revenue department and live tally be made accessible as a public record.
- Bridge the gap between disaster management centres and weather, seismic activity monitoring institutions. Ensure disaster preparedness.
- Enact disaster prevention and monitor cells in each district.
- Make disaster management a compulsory part of our education curriculum where undergraduates should have at the least one paper on disaster management and this paper should be inclusive to matters, such as first aid and preparedness.
- Finally a sense of steadfast response is required when natural disasters strike, rather it is better to be prepared.

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Chance Dependency Syndrome in Disaster-Prone Masses

Ambrish Prakash Pandey^a

ABSTRACT: Presence of seismic zone at north eastern, existence of many course-changing rivers and draught-prone plane in the middle make India prone to natural disasters. Nearly 60 per cent of Indian land is lying under earthquake-sensitive zone. Though disasters are expected and cannot be altogether eliminated from human life, through sustainable efforts its effect can be contained and its damage potential can be curtailed to a significant extent. Meticulous planning by policy makers with strict implementation of rules/regulations by government is a pre-requisite at one end while at the other end adaptive, well-aware and sensitive individuals are required to prevent the recurrence of earthquake and other disasters. The paper discussed about the attitude of well-educated and well-settled individuals of Eastern Uttar Pradesh towards earthquake reduction initiative. The study found less awareness among people regarding preventive measures to reduce the impact of earthquake. Subjects in the study reported that government initiative in creating awareness for mitigating impact of the earthquake is insignificant.

In the above circumstances, subjects develop tendency to depend upon luck or chance for their survival from earthquake. They suffer from chance dependency syndrome in which instead of taking concrete action to prevent/reduce the impact of natural disaster, the individual totally depends on luck/God for saving him, his beloveds and their properties.

KEYWORDS: natural disaster, chance dependency syndrome, disaster mitigation initiative, individual awareness

Introduction

A typical definition is “Disaster is a sudden, calamitous event that seriously disrupts the functioning of a community or society and causes human, material, and economic or environmental losses that exceed the community’s or society’s ability to cope using its own resources. Though often caused by nature, disasters can have human origins”.

For an event to be considered a disaster depends upon where it occurs, who is going to face the situation and the time at which it happens. The combination of hazards, vulnerability and inability of the habitant to reduce the potential negative consequences of risk results in disaster.

The International Federation of Red Cross and Red Crescent has given a notional relation for Disaster as:

$$\text{Disaster} = (\text{Vulnerability} + \text{Hazard}) / \text{Capacity}$$

Therefore, the disaster management efforts would also include the aspects of vulnerability, hazards and resource capacity.

Planning for recognition and mitigation of hazards are being done by policy makers with men/materials/machinery to enable responders to handle disastrous situation with minimum damage to life and properties. It is expected from the responders to inculcate inputs like training and information feed to them from time to time by the planners to make them capable to deal with disaster events. The percentage of absorption of

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these preventive measures by an individual depends upon the quality and quantity of input provided, and also the capacity (level of education/Job nature of service/colleague thinking pattern over disaster issues, etc.), attitude and values of the individual.

Indian disaster reduction programme is lacking in involving qualities like sustainability, so its appeal value faded with the passage of time.

Megumi Sugimoto (Kyoto University, Kyoto, Japan) et al. in their study "Tsunami height poles and disaster awareness: Memory, education and awareness of disaster on the reconstruction for resilient city in Banda Aceh, Indonesia" found that the unique device of 85 tsunami height poles was brought from outside to Banda Aceh City so that people may remember the impact of the tsunami over a longer period of time when awareness is likely to reduce. As local people gradually understood the significance of the poles, the number of local cooperators increased and the project's impact improved significantly.

The present study tries to assess the impact of individual education (individual capacity) like engineering, medicine and graduation degree on awareness level against prevention from disaster.

Waheeb Nasr Naser and Huda Ba Saleem in their study "Emergency and disaster management training; knowledge and attitude of Yemeni health professionals- a cross-sectional study" found that the overall knowledge status of Yemeni health professionals was insufficient with regard to emergency and disaster preparedness. The educational level was a key factor in the knowledge gap amongst respondents. Regardless of the period of experience, postgraduate staff were more knowledgeable than graduates with regard to emergency and disaster preparedness.

The frame of thinking of an individual is largely governed by culture and norms of society. So, for making conducive environment for building up disaster resilience community, level of thinking of an individual must be aligned with the requirement for disaster reduction initiatives.

Prevention of disaster begins with implementable and adoptable information about measures to be taken to mitigate its effects. Awareness about the precautions adopted to lessen the impact of disaster is the first step towards preparatory action. Literate individuals of society (graduate/engineers/doctors/

government officials/hospital staff etc.) are the best one for imparting training and sowing collective values of prevention against hazardous situations, as they can further act as vehicles for building a culture of prevention among other strata of society.

This paper assesses the effectiveness of government intervention programmes in inculcating a feeling of prevention towards disastrous situations like earthquake among the first target group of responders i.e. one who can easily grasp the concept proliferated by government in preventing and mitigating disaster. The present paper discussed earthquakes as disaster event.

Izadkhah et al. in their study "Training Teachers on Disaster Risk Reduction in Developing Countries: Challenges and Opportunities" conclude that the challenges in educating teachers about disaster risk reduction are lack of sufficient priority, lack of enough motivation and incentives, lack of appropriate and adequate background knowledge, expertise and experience in disaster-related issues and insufficient time to train them.

The above challenges are also replicated to greater extent even in the disaster reduction programmes of the Government of India.

Preparation of individual (living in city area) for avoiding vulnerability has been assessed in the paper.

Magiswary et al. did a survey of the disaster preparedness in Malaysia giving a questionnaire to the heterogeneous group of peoples and studied their perceptions of disaster issues and preparedness towards them, and emphasised that desirable knowledge and understanding is lacking to a great extent.

The present study tries to highlight individual plan to evacuate family to safe zone as earthquake has multi-dimensional damaging capability.

Zhao et al. and Scawthorn et al. demonstrate that there are many aspects of earthquakes and earthquake-caused damages, and one of the aspects that has had relatively little investigation has been the spread of fire immediately following an earthquake. An earthquake has the potential for initiating a chain of events involving multiple damages.

Earthquake has been taken as a disastrous event in the paper as India's case is quite serious as the Indian sub-continental plate grinds against the Asian

continental plate. India cities, particularly towards the north and closer to the Himalayas, face a bigger threat.

According to the Ministry of Earth Sciences, Uttaranchal, major portion of northern part of Bihar lies in the Zone V, remaining part of Bihar and northern part of Uttar Pradesh lie in Zone VI and rest of UP lies in Zone III. Therefore, Tarai belt mainly lies in Zones III and VI.

Very severe earthquakes in the Himalayan region are expected, which could affect millions in the country (e.g. Bilham et al.).

Natural disasters like earthquake take place at irregular frequencies, involves unpredictability and can occur all of a sudden and with enormous magnitude with many dimensions of damage capability. Therefore, it appears to individual as if it is beyond his coping capacity, though with his effort the individual can certainly curtail/eliminate some dimensions of disaster. However, the individual gets inflicted with chance dependency syndrome due to bystander effect/diffusion of responsibility (i.e. many persons would be affected in case of disaster but they don't bother), feeling of helplessness against natural disaster, relies more on short-term memory (forgets past disastrous situation) and becomes ignorant about small steps/precautions which can be helpful in saving life/properties.

Chance dependence syndrome reflects the mindset of an individual in which instead of taking some action to prevent/reduce the impact of natural disaster, he will totally depend on luck/God for saving him, his beloveds and their properties. Chance dependency syndrome makes individual to take indifferent attitude in government initiative of mitigating disaster.

Material and Methods

The paper builds a discussion around disaster reduction impediments. The general psychiatric trait of humans suggests that they are more sensitive towards immediate danger and give quick response to it compared to long impending danger. They also recognise visible threat over invisible one irrespective of damage capability of invisible danger. Human general attitude towards immediate danger senses and reacts to it much more easily as compared to long impending danger, recognised visible threat over invisible one. People have

short memory or more precisely have general tendency of forgetting unpleasant events easily as compared to pleasant events. They also don't want to discuss those bad events/disastrous events as if they consider discussing it will bring bad luck or disaster to them.

For the current study, Questionnaire survey methodology has been adopted by using close-end questions related to awareness about action/precaution needed to be adopted for saving life and properties from earthquake. Questionnaires are designed to reflect present and future planning of primary front responders (those who are going to face disaster first) for reducing impact of an earthquake. Face-to-face survey has also been done to some subjects to counter the effect of positive self-presentation.

Questions in questionnaire are classified to reflect four main categories, i.e.

- government initiative
- Individual initiative
- Chance/luck dependency in front of pending disaster like earthquake
- General awareness of subject with respect to earthquake

Questions reflected individual initiative containing questions to provoke response what individual has been doing in protecting or safeguarding his family or himself from impending threat of earthquake. It is very likely that these questions would be answered in a fabricated way to present individual as a responsible person. Face-to-face survey is organised for some individuals for countering the effect of positive self-presentation by some subjects in the above case.

Government initiative means steps to be taken by government to make people aware about measures needed to be adopted to reduce the impact of earthquake. Government has to frame rules and regulations and ensure its strict implementation regarding construction or retrofitment of building/houses to ensure earthquake-resistant construction.

Chance dependency reflects the mindset of an individual in which instead of taking concrete actions to prevent/reduce the impact of natural disaster, individual gets convinced that happening or nonhappening of natural disasters are mainly luck dependent and it is chance or probability only that some survive while others perish in a disaster.

Subjects chosen for this study are as given below:

- All are well educated (graduates/engineers/doctors/officers) adults having families. ✓ Majority of them have their own or paternal house.
- They are residing in Gorakhpur (a district of eastern UP) ✓ Majority of them are in job.
- They all have good knowledge about earthquake and are also well aware that earthquake is severely damaging as it involves collapse of structure/houses/buildings due to shaking of Earth.
- All have vicarious experience of earthquake and other disasters through information provided by

media or internet about the disasters happening all over the world.

- All have direct experience of earthquake. They all experienced the earthquake which took place during 2015 in Tarai region though none of the subjects involved in this study got hurt in that earthquake.

Results

Responses to the Questionnaire of 350 subjects (170 engineers, 30 doctors, 50 teachers, 100 graduates) are being shown in Tables 1–6.

Table 1

	Yes (Subject agrees with attribute)		No (Subject does not agree with attribute)	
	In numbers	In per cent	In numbers	In per cent
Individual awareness with respect to earthquake	238	68	112	32
Individual initiative from prevention against earthquake	140	40	210	60
Government initiative for awareness among mass concerning earthquake	35	10	315	90
Government enforcement of implementation of earthquake resistance building code	28	8	322	92
Chance dependency attitude among individuals	252	72	98	28

Summary of responses of subjects on various categories of questions

Table 2

	Individual Awareness with respect to Earthquake			
	Yes (Subject agrees with attribute)		No (Subject does not agree with attribute)	
	In numbers	In per cent	In numbers	In per cent
Graduates	60	60	40	40
Doctors	18	60	12	40
Engineers	124	73	46	27
Teachers	36	72	14	28

Table 3

	Individual Initiative from Prevention against Earthquake			
	Yes (Subject agrees with attribute)		No (Subject does not agree with attribute)	
	In numbers	In per cent	In numbers	In per cent
Graduates	46	46	54	54
Doctors	11	37	19	63
Engineers	64	38	106	62
Teachers	19	38	31	62

Table 4

	Government Initiative for Creating Awareness among Mass against Earthquake			
	Yes (Subject agrees with attribute)		No (Subject does not agree with attribute)	
	In numbers	In per cent	In numbers	In per cent
Graduates	5	5	95	95
Doctors	4	13	26	87
Engineers	24	14	146	86
Teachers	2	4	48	96

Table 5

	Government Enforcement of Implementation of Earthquake Resistance Building Code			
	Yes (Subject agrees with attribute)		No (Subject does not agree with attribute)	
	In numbers	In per cent	In numbers	In per cent
Graduates	6	6	94	94
Doctors	4	13	26	87
Engineers	10	5.9	160	94
Teachers	8	16	42	84

Table 6

	Chance Dependency Attitude among Individual			
	Yes (Subject agrees with attribute)		No (Subject does not agree with attribute)	
	In numbers	In per cent	In numbers	In per cent
Graduates	78	78	22	22
Doctors	19	63	11	37
Engineers	117	69	53	31
Teachers	38	76	12	24

Discussion

The paper highlights the importance of attitude of individual for making disaster resilience society. It stressed over the fact that government initiative is not sufficient to inculcate confidence in the individual so that individual can muster courage to fight against natural disaster to reduce its damage potential.

Questionnaires were distributed to 350 responders (170 engineers, 30 doctors, 50 teachers, 100 graduates). In the questions related to individual initiative, 140 responders answered that they had built houses as per earthquake resistance design and had done mock drill related to earthquake with family members. Some of them even claimed that they had done mock drill related to earthquake with community members.

Out of 140, 20 responders were cross checked for their response. Their house designs were checked, and it was found that 12 houses were in a very congested area where it is not possible to evacuate or to take safe shelter in case of earthquake. It was also observed that the houses of those 20 responders were not as per earthquake resistance design.

Of 350 responders 210 have accepted that they never thought about earthquake resistance building design while thinking about constructing their houses or before purchasing the flat in a multi-storey building. They have never tried to get information about earthquake resistance structure. They were also not aware about mock drill for saving of life or property in case of earthquake. Therefore, they have not conducted any mock drill with family members or with community. These responders have even avoided talking about mock drill with community as it would make their mockery.

On the questions related to government initiative for reduction of impact of earthquake, 315 responders are of the opinion that government has not been doing anything significant for making people aware about preventive measures needed to be adopted for reduction of earthquake disaster. And 92 per cent (322) subjects inform that government is lacking in enforcing building codes strictly which result in the construction of vulnerable structures or houses in densely populated area.

Interview with 15 responders reveals that when earthquake strikes, then for next few days government takes initiative for making people aware about steps to be taken in reducing the impact of earthquake. Dos and don'ts displayed on media for some days following the earthquake, and once memory of event is faded, everyone forgets about it.

In response to chance dependency, in the face of earthquake 72 per cent responders have reported that saving life and property in case of earthquake is mainly chance dependent. Therefore, a percentage of people presume that it is through luck factor that one can survive from the fury of earthquake. About 305 subjects have observed that in Nepalese earthquake in 2015, it was very difficult for an individual to survive through their own effort or awareness.

Further, on the basis of the literature reviewed, the paper emphasises the need for enhancing the awareness level of primary front responders in mitigating disastrous events like earthquake.

Government has to understand that its role as policy makers is limited in mitigating disaster, and to proliferate the idea/concept put forth by policy makers in the field, responders (who are going to face disaster at first) have to internalise the appropriate way of behaving for reducing impact of disaster. It is the duty of policy maker to put proper mechanism in place so as to prepare a robust wing of primary front responders who believe that they can make significant change in the consequences of disaster by adopting measures suggested by the government.

In this paper, no clear-cut demarcation has been noted in response pattern of subject belonging to different occupation/stream such as doctors, engineers, teachers and graduates. Contrary to expectation, all of them have been found nearly at equal footing as far as awareness for adaptation of preventive measures against earthquake is concerned.

Conclusion

Paper concludes that government fails to make people continuous vigilant about the silent threat from earthquake. Whenever earthquake strikes, precaution instructions have been issued by the government.

But these efforts are not sustainable. Even very well-educated and well-to-do subjects have not been sensitised by government efforts in adopting measures to contain impact of earthquake then leave aside marginal others who are very difficult to mobilise. Even government is not able to ensure implementation of rule and regulations for the construction of earthquake-resilient houses, therefore enhancing vulnerability of population against earthquake.

Very well-educated and informed subjects of Tarai belt (mainly Uttar Pradesh) were failed to foresee the consequences of earthquake, though they have direct and vicarious experience of earthquake. They are competent financially and well informed personally to take earthquake-resistant building or demand for flat with earthquake resistance design. They can also take precautionary measures themselves for saving life and property against earthquake. But they are totally ignorant about it therefore instead of looking scientifically and cognitively about earthquake related issues they depend upon heuristics and left it to chance/ luck factor to save life and property from earthquake.

Recommendation

Disasters are expected to happen with irregular frequency with very less accuracy in prediction. It can't be eliminated altogether from individual life. Our education system including higher education needs to be upgraded to make individual learn to live safely with disastrous events. With policy makers' sustained intervention, individual should be encouraged and forced to take small but important steps towards enhancing safety level of everyone against disaster.

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Role of Volunteers in Building Disaster Resilience: Learnings from the Kerala Floods of August 2018

Renu Raj^a

ABSTRACT: Kerala went through an unprecedented calamity in August 2018 due to floods which affected around 54 lakh people, caused 573 landslides, damaged 57,000 hectares of agricultural crops and claimed 483 lives. Eleven out of fourteen districts were on red alert, and 14 lakh people were accommodated in approximately 3000 relief camps.

In all disasters of such huge scale, a combination of government efforts and assistance from volunteers and organisations provides succour to the troubled people. In addition to this, Kerala saw a heroic resilience of people, who defeated all odds to survive and rebuild their shattered lives. The massive role of volunteers is an exemplary feature of the state's fight to collectively survive the disaster. This dimension can serve as a lesson for future, when such calamities befall other places.

The study followed a pluralistic approach based on the direct observations of functioning of volunteers in Thrissur district of Kerala where the flood claimed maximum lives, as well as semi-structured interviews and feedback from five district administrations which were hit hard by the floods. How volunteers can be deployed and the challenges in coordinating and commanding such an unorganised mass of people have been explored. Gender-wise participation as well as the role played by the women's self-help group "Kudumbashree" was also analysed as a leading example.

This study establishes that along with the lead from government and armed forces, the real heroes also include ordinary citizens who rose to extraordinary levels during and after the disaster.

KEYWORDS: Kerala, flood 2018, volunteers, resilience, Kudumbashree, communities, digital volunteerism, innovation

Introduction

Ordinary citizens are usually the first to come on the scene in any disaster or emergency. They are also the ones who stay long after official services have ceased. In disasters, the local community and its volunteer citizens play a vital role in helping the victims to respond and recover. They also provide invaluable assistance to government and other official agencies.

The influence of social media and development of newer technologies have also enabled citizens to

participate in disaster management more easily and effectively than earlier. This was evident in August 2018 when heavy rain and unprecedented floods pushed most parts of Kerala into distress.

In most countries, emergency and disaster management relies largely on government machinery and a trained workforce of professionals. Individuals and groups who work outside of this system have tended to be viewed as alien elements and their efforts are often undervalued. But the floods of 2018 have given us an insight that, given the increasing disaster

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risk worldwide due to various factors like population growth and climate change, it is likely that volunteers will provide the additional surge capacity required to respond to emergencies.

Citizen participation is a key principle of disaster risk reduction and resilience building. In a devastating disaster, trained rescue workers are located elsewhere and have to travel to the disaster site and hence usually are unable to meet immediate needs. Hence many residents who live nearby offer initial assistance. Each disaster is unique in terms of the social and economic backgrounds of the victims and human health hazards. Therefore, the knowledge and skills of the volunteers may become essential for effective commencement of the rescue mission; however, their management requires careful consideration. Most volunteers lack training, potentially exposing them to a greater risk of physical and mental health harm, compared with trained professional rescue workers. Many volunteer rescue workers are themselves survivors of the disaster at which they are volunteering.

The response of volunteers to emergencies and disasters is perhaps the greatest expression of man's commitment towards his fellow beings and it underpins his readiness to attend to the needs of others. The first and foremost of people's reactions to a disaster is to assist the direct victims. In most cases, this takes place spontaneously, without any organised setting. But volunteerism extends far beyond immediate response. The actions of volunteers span the spectrum of disaster management, from prevention through to preparedness and mitigation, as well as rescue and recovery. With climate change, rapid urbanisation and increasing instances of man-nature conflict, the nature of calamities that strike mankind is changing rapidly.

Objectives

The objectives of the study include the following:

- To find out how important is the role of volunteers in disaster management
- To find out the difficulties and risks of involving volunteers during disasters along with official and professional agencies
- To find out how volunteers and thereby the community as a whole can be utilised in a more

productive way for building disaster resilience in future

Defining the Role of Volunteers

Volunteerism refers to activities that are non-obligatory, done for the benefit of other people or society at large. It means any activity which is given freely to benefit another person or group of persons.

According to Shaskolsky, volunteerism takes different forms in disaster situations. Broadly, it includes individual volunteers and organisation (group) volunteers. Individual volunteers can be anticipated individual volunteers, who fulfil the general expectations of society as an individual, for example a doctor who comes voluntarily to the aid of victims. Spontaneous individual volunteers provide assistance as individuals, who are not clearly expected but spontaneously come forward, this being most common at the search and rescue stage. Organisation volunteers can also be anticipated or spontaneous. Anticipated organisation volunteers are associated with an organisation, for example the Red Cross, and their involvement and participation is expected in an emergency. Spontaneous organisation volunteers come forward and work as part of a group or organisation once a disaster has occurred.

Common individuals and groups of people generally become more cohesive than in usual times and work together to overcome disaster-related problems. They are usually not attached to the official machinery and may not be part of any organisation. They are informally working volunteers and work outside formal disaster management arrangements to help others who are affected by emergencies and disasters. This may take place before the event, during the event or after the event. Informal volunteers may participate as individuals or a group, regularly or irregularly. The participation can be spontaneous or planned.

Kerala Floods

Kerala went through calamities of an unprecedented flood in August 2018. It directly or indirectly affected around 54 lakh people, caused 573 landslides, damaged

57,000 hectares of agricultural crops and claimed 483 lives. In the state, eleven out of fourteen districts were on red alert and 14 lakh people were accommodated in about 3000 relief camps. Kerala saw a heroic resilience of people, in which the role of volunteers is a striking feature which helped the state survive the disaster.

Immediately after a disaster, there are pressing needs for search and rescue, giving first aid, food, water and other essentials. The requirement is not accurately measurable at this point and these services need to reach the victims at the earliest. Hence there is a pressing need for manpower and the service of volunteers becomes indispensable. After the rescue phase, participation of community and volunteers is crucial in the relief, rehabilitation, preparedness phases and ultimately to bring about disaster resilience for the future.

Features Which Made Volunteer Participation Successful

There were many features which made participation by volunteers and common citizens, organised or unorganised, a successful venture. One was the unifying role of administration. The second was decentralisation: resources as well as power. The third was the lead by entities like youth and student organisations, self-help groups, women's groups, unions and activity clubs. And fourth was the unexplainable way in which people united beyond differences. If this had not happened and only centralised ways of rescue and relief were followed, with a population density of double the national average, unimaginable loss of life would have happened.

Unifying Role of Administration

When the rains continued to pound the state of Kerala, the government announced that senior IAS officers would be sent to each affected district to help and give directions in coordinating rescue and relief activities. This was for the first time in the recent past that such directions were given to senior officers. The District Collectors were the overall in charge for their district who coordinated and functioned with inputs from the Superintendents of Police. The police also took

responsibility for leading rescue operations in the field. Fire service personnel coordinated with them. The laymen who wanted to volunteer as rescue operators or as relief workers mostly approached the district headquarters, where the administrative head had already given the responsibility of managing them to the Sub-Divisional Magistrates (SDMs) or the Deputy Collectors under them. Based on the willingness and qualifications each volunteer possessed, these officers allotted them work. Some were sent to the field whereas many were kept engaged in various activities at the headquarters. One minister of the state government was deputed to each district to provide the necessary support, along with other elected representatives like Members of Parliament and Members of the Legislative Assembly. These leaders visited and directed the volunteers at every point and made sure they were never left alone unsupervised. The armed forces that were deployed also coordinated their work through the district authorities.

Decentralisation

The staff of all local self governments including Gram Panchayats, Municipalities and City Corporations were asked to work in rescue and relief operations. All local bodies were given immediate permission to use their own funds as they deemed fit. The elected representatives in these local bodies, irrespective of political lines, were involved in the disaster management and they were the most important forces that drove common citizens in large numbers into the disaster management operations. Engineering wings of panchayats were also taken into service and they started maintenance and repair work immediately on orders. The local bodies were given the freedom to act, setting up and managing relief camps, and it was made sure every such camp was set up and run with the knowledge and under the ultimate responsibility of the revenue officer in the field, that is, the village officer. The local bodies were instructed to bring the possible local workforce in to service under the coordination of the revenue officers and not work in contradiction to the disaster management authorities' directions, so that there would not be any confusion. Any issues in coordination were immediately addressed by higher

authorities of the district. The volunteers also shared their concerns, ideas and solutions with these officials as well as peoples' representatives, who in turn conveyed every matter to the administrative officers.

This kind of decentralised intervention also led to mobilisation of 600 boats belonging to the fisherfolk community to rescue over 100,000 marooned people. It would have been impossible to organise a rescue on this large a scale through helicopters, which would require more centralised coordination and deployment. The state control room coordinated the efforts but dealt with only the larger issues. It did not intervene or try to organise each and every issue on the ground.

The Unity and the Diversity

The volunteer activity was led by entities like youth and student organisations, self-help groups, women's groups, unions and activity clubs. There was no dearth of talent in the groups. Cooking food, paramedical help, unloading relief materials, packing food for air drop, as drivers, for rowing boats and caring for elderly were some of the areas where people from all walks of life took part. There was no gender disparity: both men and women came forward and joined the collective workforce.

Formal and Informal Volunteerism

Both formal and informal volunteers participated in flood rescue and relief in the disaster that happened in Kerala in August 2018. There were organised and unorganised efforts. The major groups who took part in the activities included student groups, clubs, resident organisations, non-governmental organisations (NGOs), political groups, youth wing organisations, religious organisations, workers groups and trade unions. Mostly, the district officials were in charge of coordination of volunteers in the district. Officials used various media including social media widely to coordinate and control the activities of these groups. The different groups helped in activities like food packing, loading/unloading materials, rescue, post-disaster cleaning, medical aid, Information Technology and dissemination aid (which included creating

websites and activating Facebook accounts) and help in control rooms, among others.

Relief Activities and Community Participation

Cleaning Houses, Wells and Public Spaces

The critical factor that made the situation difficult in the Kerala floods was that it affected cities, towns and dwelling places as much as it affected high lands and forests. With every square kilometre of area inundated, thousands of houses, shops and public spaces got submerged. When the water receded, bus stations, public places, schools and colleges were left with heaps of mud and waste and when people returned from camps to their homes, the grief only multiplied seeing the plight of their dwellings. It was impossible for individuals alone to remove the accumulated dirt, and wash and bring back the places to their previous condition. At this juncture, various volunteer groups were formed locally and came forward. Groups ranging from a strength of three to ten took over the cleaning activities lane by lane, ward by ward, with the help of house/shop owners. The work continued for almost a month.

This was associated with well cleaning initiatives. All drinking water sources were polluted by flood water and there was a high chance of water-borne epidemics breaking out. College and school students under the leadership of officials divided themselves into groups and went out to selected wards/villages to clean public as well as private drinking water sources. They also provided information to the inhabitants regarding how to ensure water quality and the necessity of well cleaning. An epidemic outbreak immediately after the flood would have killed more people than the actual disaster did and this was avoided by the timely intervention of hundreds of such volunteers across the state.

Packing of Food Materials and Take-home Kits

When people returned to their houses, irrespective of whether they were rich or poor, they had nothing left at home to cook or eat. Tons of food materials and clothes

were pouring in from various corners of the country and abroad. The problem was how to send them to the houses. Hundreds of volunteers came forward to district headquarters and occupied areas allotted by the administration. In Thrissur they utilised indoor stadiums and auditoriums whereas in Kochi they used automobile showrooms. In rural places like Idukki, the packing centres operated from the civil stations. Packing started early in the morning and continued until midnight or early morning. It all fell in perfect harmony and officials had to just supervise.

Community Kitchens

Community kitchens started by women groups provided food to camps, schools and also to volunteers who were working day in and day out. Truck and lorry drivers became volunteers themselves to transport food and raw materials from one place to another.

Counselling and Support

Once the water receded, and when the grief-stricken people returned to their homes, it was another shock for them to see the dirt-filled houses. The sight of damaged or fully crumbled houses put many in a state of mental depression. Several cases of suicide were reported after the breadwinners couldn't stand the sight of homes that they had built over decades. Children lost their bags and books and had a difficult time coping with the situation. Hence volunteer groups organised themselves to visit schools and homes to give counselling to adults and children. The district-level health teams and doctors gave them necessary training and directions regarding how to deal case by case.

Temporary and Permanent Shelters

Using portable materials and locally available resources, volunteers made a large number of temporary structures before the victims could be transported to permanent shelters and the relief camps. Amenities were provided in these shelters for making food and providing necessary clothing. During the relief and

rehabilitation phase, volunteers collected assistance in kind to reconstruct a large number of houses for the victims who were made homeless by the floods.

Digital Volunteerism and Use of Social Media

The common citizens who come forward as volunteers, who have technical skills and can solve the problems of society or emergency with the use of digital tools and techniques, are generally called digital volunteers. They can be useful both in disaster preparedness and in post-disaster response.

Media in general and social media in particular acted as the lifelines of volunteer coordination. There are many examples that worked worldwide earlier, like the "Tweak the tweet(TtT)" platform on Twitter. During the floods in Kerala, based in district administration headquarters, a minimum of two to a maximum of ten WhatsApp groups functioned every hour of the day. One group was exclusively kept for the key officials to discuss issues and make decisions. Others included volunteer heads and different volunteer groups and included relevant people based on the area of their intervention or their geographical limits of action and some others a mix of both. All the major affected districts had an official coordination group also which included various departmental heads. The requirements, availability, distribution, works completed, pendency and updates were regularly monitored through these groups.

District administration as well as police widely used official Facebook accounts to invite, direct and organise volunteers. It was easier to give instructions to large groups as well as individuals and also direct the public regarding major issues and concerns.

"Kudumbashree" as a Model Volunteer Group

Kudumbashree is a poverty eradication and women's empowerment programme in Kerala which organises neighbourhood groups or women's self-help groups at a community level. Kudumbashree members participated in cleaning activities immediately after the flood water receded. Four lakh volunteers of

Kudumbashree participated in the cleaning campaign and 2 lakh houses and 12,000 streets, roads, public places were cleaned during the drive as per the official records of Kudumbashree.

Kudumbashree Neighbourhood Group members supported people in distress by cleaning the houses of victims. Women from other districts came forward to help the affected, which shows the true solidarity and collectiveness of the group. In many places, families of the women welcomed the affected people to take temporary shelter in their own homes and provided basic amenities also. Around 30,000 families were rehabilitated in this manner. Kudumbashree members acted as volunteers and were active in all packing centres that functioned across the state.

Around 5000 members provided services at various packing centres and about 3 lakh take-home kits were distributed across the state under their leadership. In Ernakulam district, which was among the worst affected by the disaster, the members operated the packing centre round the clock for six consecutive days to provide the required materials. They were involved in all works including loading, unloading, sorting, packing and transportation of the materials to the concerned places. Here, the packing centre was opened at Volkswagen Fox Showroom in a place called Kalamassery. About 300 volunteers were involved in the work in the centre which functioned in 3 shifts. The food for the members as well as local volunteers who were involved in packing was prepared by a Catering Micro Enterprise unit run by the self-help group. In addition to this, a large number of homes and relief camps were fed by the community kitchens run by the members locally.

Community counsellors under Kudumbashree made timely interventions in flood-affected districts. They provided mental health services and helped the population, especially women and children, to deal with the trauma. Individual as well as group counselling sessions were provided in rehabilitation camps and in the houses separately to adults and children. Also they gave health awareness classes in the camps to prevent communicable diseases and other health issues. Nearly 40,000 people benefited from this initiative.

The members also made a large number of field visits and helped the officials as well as local bodies to initiate and modify multiple activities based on local needs and demands.

Tasks Which Require Special Skills

Risky and hazardous jobs require special training. The sudden influx of volunteers in large numbers can cause trouble at the scene, such as overloading of volunteers, volunteers eager to help but requirement not matching, or the situation may need trained volunteers but most of the volunteers are untrained. In those situations, trained personnel and officials may have to use a lot of time to handle so many volunteers, which hinders the efficiency of disaster response. Then dealing with the influx of volunteers becomes an issue during disaster response.

For example, the disposal of animal carcasses was one of the least talked about but most difficult tasks during the first week immediately after the disaster. Most of the volunteers refrained from taking up this job. The Ananda Marga sadhus from Kolkata, who worked along with the Army in disposing dead bodies after the tsunami in 2004, took up the task of burying hundreds of cattle and fowl which drowned in the floods in Kerala. The other volunteers who were engaged in the rehabilitation and cleaning work were reluctant to dispose the half decayed carcasses due to lack of training and for fear of contracting zoonotic diseases. The volunteers of the Ananda Marga disposed nearly 1500 carcasses at different places in Thrissur and Ernakulam districts. The 20-member team had 15 volunteers from outside the state and the rest were locals.

Risks in Engaging Volunteers

Disasters lead to a high sense of altruism in the local population and common people will want to help those affected by the disaster. This behaviour can be beneficial but can often add to the risks of relief activities.

Though they come forward with good intentions, these volunteers rarely have formal disaster

management training or field experience. Also, they often come without appropriate provisions for shelter, food and water, supplies or any personal protective devices. This unplanned convergence on the disaster site places a burden on the official response agencies in terms of safety and it becomes inevitable to provide personnel to register, train and monitor the volunteers and prepare them for the roles assigned to them.

Volunteer Management for Better Disaster Response

Volunteers do both direct and indirect services during a disaster. The direct services include providing food, water, clothing and their distribution, medical service, counselling and sanitation. Indirect services include arranging donations in kind, fund-raising activities, communicating and clarifying public enquiries, logistics support, transportation of goods, promotion of disaster preparedness and training.

A. Comprehensive volunteer management system:

Adequate preparation is essential for responding effectively to a disaster. Hence, we should develop a comprehensive volunteer management system which includes demand assessment, recruitment, training, supervision and recognition of volunteers. For better volunteer management it is essential that we have a database of volunteers available locally as well as centrally. The requirement is to recruit willing citizens and provide them adequate training. The database can be prepared simply by calling for volunteers through an open recruitment process either through a cell or through a website. Many established organisations and non-governmental groups can also share a list of volunteers available with them along with their capabilities and qualifications including any previous experience.

B. Caution: There is a potential for criminals to take advantage of the vulnerable situation under the guise of volunteering and harm or loot the already affected victims. They can also create problems between volunteers for their personal interests or hidden agendas. It is good to make sure there are no antisocial elements in the groups. Though this may not always be possible, once information is received about any

such person, it is better to avoid keeping him at the scene further.

C. On the field support: The volunteers in the field should be tracked and taken care of. Sometimes when they are on the scene for a long time, it can be stressful for volunteers. Providing on-site counselling can be productive. Also, make sure they consume food and water in time and get adequate rest after work before they return to work.

D. Ongoing training and updation: Once we have a database, the next step is to qualitatively improve and update it. Also, we should develop an effective communication channel so that they can grasp the most updated information and they know when they have to lend a helping hand. This can be done by giving brief hands-on training and regular drilling exercises after dividing them into small working groups. This shall also include experience sharing, debriefing or feedback sessions after each small assignment.

E. Assurance and ensuring safety: We should develop a working relationship with the volunteers because it helps us to identify suitable duties for each one of them and show our concern for their needs. It is necessary to include them under guaranteed insurance schemes and make sure the worker compensation coverage includes the duties that are assigned to them.

F. Supervision and feedback mechanism: For organised and successful functioning of volunteers during disasters, they must be registered, briefed, credentialed, assigned appropriate tasks, and monitored and/or supervised. This process requires personnel and resources, but it helps to create a database that catalogues volunteer capabilities, matches skills to an appropriate role, tracks them during the event, and collects information and feedback from the members at the end of their deployment.

G. Skilling and merging with the local systems: Skilled volunteers can take up otherwise difficult and technically demanding jobs with equal efficiency as professionals. Once the functionally equipped volunteer is liaising with the locality, they can play an important role in raising awareness within their communities about the importance of disaster preparedness. After receiving early warning information through the

national early warning systems and electronic media, the volunteers can spread messages by using the public address systems and microphones of churches and mosques. The volunteers shall regularly attend local government meetings so that they can guide the leaders and people regarding the preparedness and the primary response to be undertaken at the community level.

H. Creating database of community-based functional volunteers: This data shall be readily available for future use so that tasks are assigned based on their skills in future. Thus we can organise community-based functional volunteer teams with each member assigned tasks based on his interests, skills and capabilities.

I. Information on possible career development opportunities for participants: Many of the participants might be interested in further activities and assignments related to disaster response and building a career related to it. Hence providing them with information on career development can help the system recruit and retain a group of individuals having true aptitude and skill in managing disasters.

J. Space for innovation: There is always scope for more innovative techniques to reap the best outcome of volunteerism. The space for research and development in the field can result in better management of volunteers. Use of information technology and real-time monitoring can pave the way for improved methods of volunteerism in future.

Conclusion

The study pinpoints the areas which need to gear up based on the learnings of volunteer participation in the Kerala floods of August 2018. The findings show that for more adaptive and inclusive flood relief and rehabilitation, it is required to harness capacities and resilience which already exist within the communities. The way forward for optimal utilisation of volunteerism includes requirement of registration with data on record, training, volunteer management, utilising digital volunteerism and finally the scope of improvisation and innovation. An inclusive approach to disaster response is the need of the hour and building disaster resilience should definitely acknowledge the role of volunteers in building such resilience.

(NB: Views expressed are personal)

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Disaster and Culture

Researching Disaster from a Cultural Perspective: Insights into Disaster Meaning-Making

Sara Talitha Merkes^a

ABSTRACT: People encounter disaster in different ways. So what is disastrous for whom in a disaster? This paper suggests that studying disasters from a cultural constructivist perspective can help researchers as well as practitioners to understand the multiplicity of factors contributing to disasters, including diverging perspectives on what is considered as disastrous or catastrophic.

Firstly, this paper introduces the conceptual framework “Cultures and Catastrophes” which was developed by the Disaster Research Unit, Freie Universität Berlin. Secondly, the framework is applied to the South African drought in 2015–2016 in order to inquire into specific issues surrounding disaster culture. Specifically, it asks how these experts make sense of ‘disaster’ with reference to their responsibilities and roles: What constitutes that which is experienced as disastrous for the specific group with regard to the drought? How does the group’s attempt to solve the crisis mirror its view on disaster?

KEYWORDS: disaster culture, meaning-making, drought, South Africa

Introduction

Although oftentimes conflated with hazards such as floods, droughts, storms and so on, disasters exceed their geophysical components in complexity. From a social science perspective, disasters are at their core social and not natural phenomena (cf. Dombrowsky 1989; Felgentreff and Dombrowsky 2008; Kenneth Hewitt 1983; Oliver-Smith et al. 2016; World Bank 2010). Human encounter and societal coping ability are, among others, greatly shaped by historically evolved vulnerability and resilience patterns (Clausen 1983; Oliver-Smith and Hoffman 2002).

In the scholarly debate, the term disaster culture has been coined to describe disaster (sub)cultures of coping mechanisms and adaptation behaviour (e.g. Bankoff 2015; Engel et al. 2014; Kulatunga 2010). For example, Bankoff (2002) conceptualises ‘cultures of disaster’ as the integration of hazards into local

adaptation where threat becomes ‘the normal condition of daily life.’ At the same time, culture also influences risk perception (Xue et al. 2014) and limits corrective capacities of disaster prevention (Felgentreff and Dombrowsky 2008). Here, culture is understood holistically as a web of meaning within which people interpret and shape their experiences (Geertz 1973). Unlike how it is often portrayed, culture is not simply one factor among social, economic and political ones but an overarching, cross-cutting concept. Likewise, disaster culture is broadly defined as a collective frame for coping with issues of societal failure (cf. Dombrowsky 1989; Felgentreff and Dombrowsky 2008).

To facilitate researching, sketching and analysing disaster cultures, the framework “Cultures and Catastrophes” was developed by the Disaster Research Unit, Freie Universität Berlin, during the course of the research project FloodEvac. The framework (cf. Fig. 1) is the outcome of an inductive–deductive process

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of collection and clustering of roughly 200 variables, as well as of a comparative field study through expert interviews on the 2013 Elbe floods in Germany and the 2005 Mumbai floods in India.¹ It pursues a multi-dimensional approach building on Theo Rauch (2009) and can be flexibly expanded, adapted and adjusted based on the particular context studied. In essence, it assists in grasping the over-complex nexus of cultures and disasters with the goal of contextualising disasters and allowing for the culturally sensitive development of technical and organisational solutions within disaster management. The framework accounts for dimensions of time and space to trace historically-rooted and location-specific socio-cultural contexts of disasters. These contexts are organised along the dimensions of ecological, political, technological, economic and administrative conditions, as well as social structures and competences, and take into consideration different geographical scopes, actor

levels and vulnerability/resilience patterns. Of course, culture is not to be understood as homogenous, monolithic and static, but rather as flexibly changing and milieu- and group-specific. Each condition can be unpacked in further detail. Disasters, their perception and experience, as well as decisions and practices within the field of disaster management and civil protection, are informed, influenced and shaped by the above-mentioned socio-cultural aspects.

Bledau L, Upadhyay H (2018) Indo-German comparison: cultures and catastrophes in the case of flood events. Unpublished research report from the project FloodEvac. Disaster Research Unit, Freie Universität Berlin, Berlin

This paper will focus on interpretations and perceptions of disaster with regard to different actor groups in order to trace logics of disaster meaning-making and investigate into the question of what exactly is considered to be disastrous by whom.

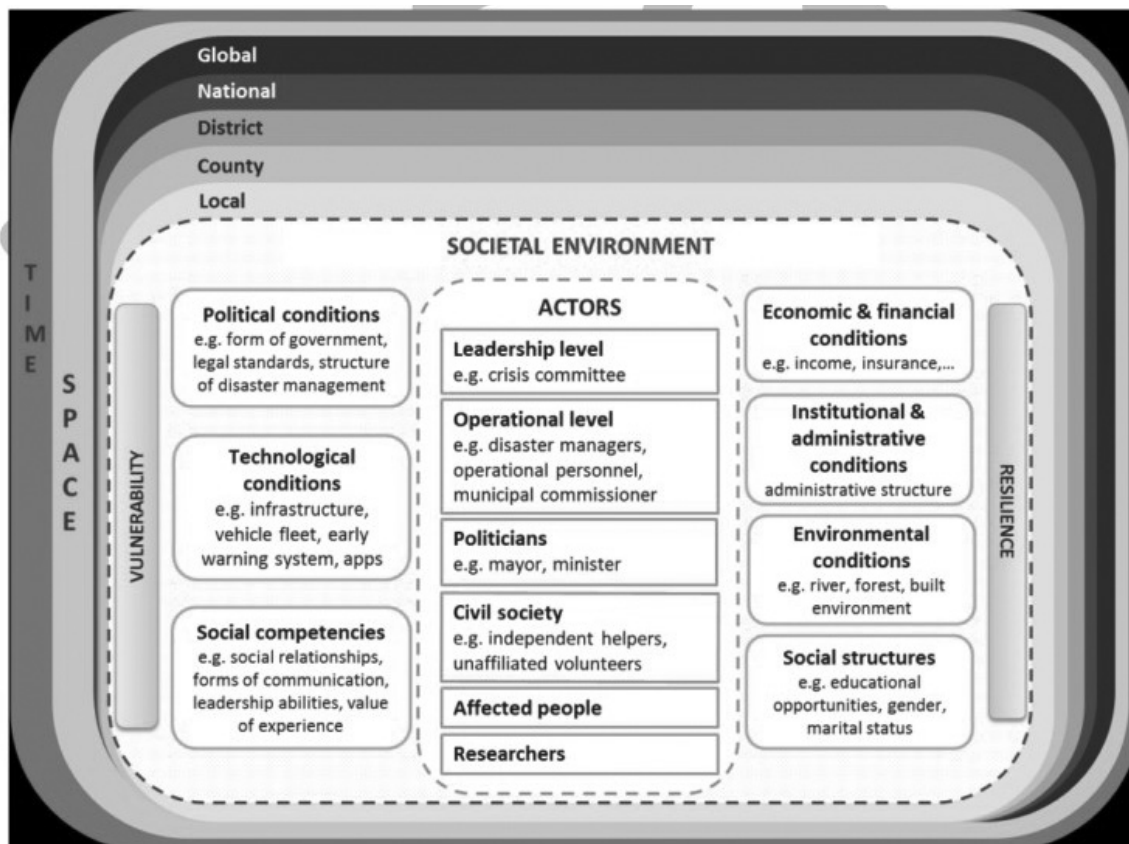


Figure 1: Framework cultures and catastrophes © DRU

Material and Methods

The paper applies parts of the framework “Cultures and Catastrophes” to South Africa, which faces many challenges with regard to water management. Affected by the El Niño/Southern Oscillation phenomenon, South Africa is a cyclically drought-prone and, with an average of 464 mm of annual rainfall, a water-stressed country (van Zyl 2006). In the financial year of 2015–2016, the state of disaster was declared due to drought in all South African provinces, with the exception of Gauteng, whereas six declarations were issued for the whole province and four on municipal level (NDMC 2016). Drought, understood as an extended period of below-average rainfall (Müller-Mahn 2008), started developing progressively from 2011 onwards (NDMC 2016) and was exacerbated by massive heat waves in the end of 2015 and the beginning of 2016 – for January 2016, 11 fatalities were recorded (Guha-Sapir et al. 2016). South Africa’s legal framework, in the form of the *Disaster Management Act* of 2002, defines disaster judicially as a

... progressive or sudden, widespread or localised, natural or human-caused occurrence which - (a) causes or threatens to cause (i) death, injury or disease; (ii) damage to property, infrastructure or the environment; or (iii) disruption of the life of a community; and (b) is of the magnitude that exceeds the ability of those affected by the disaster to cope with its effects using only their own resources. (RSA 2002)

In order to explore disaster meaning-making of various actors, this paper empirically draws upon a study which included 26 qualitative interviews with South African experts² from political bureaucracies, non-governmental organisations engaged in development and disaster relief activities, research institutions and the water service delivery sector. The analysis of the interview material focuses on differing perspectives on and responses to disaster by exploring how the experts make sense of ‘disaster’ with reference to the responsibilities and roles of operational managers, politicians, civil society, affected people and researchers:

1. *What, if anything, constitutes that which is experienced as disastrous for the specific group with regard to the drought?*

2. *How does the group’s attempt to solve the crisis mirror its view on disaster?*

The results portray, of course, fluid perspectives at a particular point in time. Whereas individual and collective perceptions may change over time, the analysis reveals a more fundamental finding, namely, that disaster does not imply the same experience and understanding of that which is threatening or disastrous.

Results and Discussion

National Leadership Level

Disaster management responsibilities in South Africa are distributed along the local, provincial and national levels, whereas the National Disaster Management Center (NDMC) as part of the Department of Cooperative Governance and Traditional Affairs (CoGTA) coordinates cross-sectoral activities among different departments (NDMC 2015). The executives within the different tiers of government can declare a disaster for a three-month period; from this point onwards, management is centralised and funds are released at the respective level of declaration (RSA 2002). Concerning water management, the national Department of Water and Sanitation is in charge of bulk water allocation, dam construction and the sale of bulk water to various water boards, responsible for purification and supply for the cities’ water authorities (I8; I15; I21). In the yearly System Operating Forum, the Department of Water and Sanitation determines water availability and allocation to bulk user groups, such as agriculture, industry and domestic, depending on their water licenses’ level of supply assurance and share (I24). But due to their political unpopularity, the decisions for domestic water restrictions at national level are at times delayed for several months by the director generals and the minister of water (I26).

The national political leadership level is confronted by the fact that declaring a national disaster requires national funds, drought interventions already drain the state budget and the economy is suffering (I12). As a highly unequal, post-Apartheid country, South Africa faces many challenges and political leadership, voted for and kept in power by a disenfranchised majority, feels pressured towards fulfilling their development

promises in the form of modern and, to the voters, visible solutions, which are not necessarily aligned with the country's water scarcity (I6).

My water must come from a dam. The politician says this is how we have arrived [...] the promised land. So it's those types of social acceptance things that we struggle and we start to see it with ground water as well. [...] This is what you had to do, go to the hand dug well and [use] the bucket and scoop water. [...] That is old school. The Neanderthals used that. We want a dam. (I6)

I think, we as South Africa should realise that we are a country that is prone to drought and actually for me the problem is not necessarily the drought but we must realise that we are a water scarce country. And the way that we manage water must definitely change. So the way if there is a drought or not a drought, our water management needs to be improved because, I think, we do not value the water when it is there. (I23)

Political people are scared to make that decision [...] they want to be popular, it's carry on, carry on, carry on, and then suddenly it's a big problem. (I8)

[P]olitician's life is [...] basically from day to day because they are at the beck and call of number one. [...] nobody who is a political appointment wants to rock the boat [...] water has become a very, very politicized commodity. (I21)

[...] it was] delayed for quite some months [...] because the DG [director general] and the minister was hesitant to actually approve the restriction. Was it, 20 per cent restriction whatever, and some municipalities there were saying now, we can't. Because [...] already the amount of water that they have is not enough. (I24)

What this particular group experiences as threat in a drought situation is, according to the experts' statements, the political delicacy of preventative action, in the sense that unpopular decisions can cost voter support and one's own job. In disaster management, coordination can become difficult because of information flow challenges, which are very much dependent on the "the promptness of the lowest

structures" (I23; cf. also I12). From a government perspective, long-term water planning poses challenges because of social acceptability, population growth, highly unequal living conditions as well as water realities and immediate development needs (I8; I9; I12; I17; I20; I21). Therefore, there is a tendency to focus on supply rather than demand management, towards political promises rather than technically viable ones and towards expensive quick fixes in times of crisis to appease voters (I6; I8; I9; I12). An infrastructure repair programme that at the same time serves as a job-creation measure has been launched (I15). To mitigate the crisis, the Department of Agriculture promised feed for the animals and seeds, so that small-scale farmers can pick up their farming activities (I18; I26).

Operational Level

From an operational perspective, the calamity of the drought disaster entails a variety of water and disaster management issues surrounding infrastructure decay, timely introduction of water restrictions, water mismanagement due to lack of expertise and short-term 'firefighting' rather than long-term measures and adaptation (I6; I8; I12; I21). The core of what is experienced as disastrous by this particular group is, according to the experts' statements, that functional operation of water management is limited, sometimes even inhibited, by political considerations and (non-) choices.

But then from a political point people say 'but yeah we can't tell the people we haven't got water while we've still got lots of water in the dam.' But you've got to apply a precautionary approach which we often do not do and then it catches you unaware because last year it has rained, the year before has rained and so for. (I21)

[A]bout a year ago, I tried to give advice to our director general, said okay right if there is now rain, then you've got limited amount of water available. What we've got to do first of all is to restrict water use when water gets scarce. Then after restrictions, if you don't achieve your results and whatever, then you've got your rationed water. That is the sequence. She said but we cannot do that. We must think out of the box, we

must get water from somewhere because that will be a sign of government failure. (I21)

We can't have more water. We've now worked out, this is what the country gets in a year and it's all been allocated and distributed to whatever. So if they are alert they will say make rules and laws now that will ensure that you minimise any effect of another drought [...]. Limit your gardening water, limit your industrial water on a permanent basis, [...] so they are not keen to make those brave decisions. (I8)

People basically like to manage the bottom of the curve once you are in trouble. (I6)

Whereas from an operational perspective, water demand management, for example, in the form of restrictions, water-saving measures and monitoring of non-revenue water, is imperative, political actors mostly prefer and push for, to the frustration of technical operators and experts, supply management solutions (I6; I8; I9; I12). Technical experts have experienced that their warnings, as early as in 2011–2012, were neither appreciated nor taken seriously (I6; I15; I21). One problem this group faces is the degree of uncertainty in their predictions (I8, I17, I21). In their range of competence and being dependent on political decisions, operative actors tend to focus, among others, on the following solutions: providing advice where local management expertise is insufficient (I21), communicating with each other on an operational level to find solutions (e.g. formal information challenges are addressed by following the press and then calling the local contact person to find out about the issue and necessary measures (I12)), connecting smaller systems to bigger ones, if possible, or supplying them with water tankers (I12) and trying to reduce delivery rates for municipalities to get them to address water loss through leakages (I8).

Local Politicians

The regulation and restriction of domestic water consumption is most effective at the city level, for example, through raising awareness, infrastructure maintenance and repair, or water pressure reduction

(I8; I15). In order to implement these measures, local politicians are required to approve and publish local restrictions in the government gazette (I21, I23). However, this is not very popular.

[T]he government also says, we will wait till the municipality, the municipality must do it. Municipality says, we wait for big brother tells us to do it. It doesn't happen. [...] Nobody wants to be [unpopular]. Municipality says, big brother must do it, then you can be mad at big brother. Big brother says, no it's your responsibility. We don't want them to be mad at us. So it doesn't get done. (I21)

[A]nd in theory the restrictions should be sufficient to make the water last forever to a point where everybody gets a cup of water a day [...]. It doesn't always work out that way because the local councils are sometimes resisting restrictions for political reasons. And they don't like the loss of revenue etc. etc. So sometimes they are a bit slow in applying the initial restrictions which put you into trouble, which means a second set of restrictions needs to come in quicker, which they don't like either so it doesn't always work out that well. (I12)

[E]specially small towns, you may find that the water revenue is the only source of income [...]. If they say, there is no water, then they can have protest. So they also want to sort of process it. They have to go to the council, the mayor has got to understand it, politics has got to take place. We have got to change our tariffs. It's going to affect our revenue and people may have complaints, labour whatever. (I24)

The one is the problems local authorities have in terms of infrastructure maintenance. They really want money to catch up in terms of repairs and refurbishment but by law you are not allowed to use funds released for disaster management to fix maintenance problems. [...] Government refused them all the money they need, they refuse to accept anything but the whole package. (I12)

According to the experts, the drought disaster implies for local politicians the **loss of water revenue and few resources for its management, whereas peoples' dissatisfaction and protest threaten their political posts**. At the same time, many municipalities struggle with an aging and ailing water infrastructure, as well as lacking capacities, technical expertise, equipment and financial resources (I3; I8; I15; I23). Facing the challenge to implement unfunded national government provisions (I15), municipal leaders attempt to solve the crisis by applying pressure on national level for nationally funded infrastructure repair, which is legally a local responsibility, and not to be financed out of national disaster funds (I12; I23; RSA 2002). Similar to the question of which governmental entity is imposing restrictions first, this funding dispute contributes to delayed action. Experts claim that some municipalities are not doing anything to solve the crisis (I3; I18).

Civil Society

During the 2015–2016 drought, more than 32 civil society organisations, supported by individuals and businesses, engaged in drought relief (NDMC 2016). Civil society mostly focuses on the humanitarian side of the drought.

[W]e shared some images and some horrific stories of people suffering [...]. Clean drinking water, they just didn't have access to clean drinking water. And there was this debate because two gentlemen were fighting for the last five liter bottle of water and a murder was committed. And on our group we were discussing this. [...] Was it a fight out of survival or was it, was it a crime? [...] we all decided that we are going to send water [...]. And we shared this message on our groups, on our social media platforms, and more and more people came and assisted us. [...] a personal experience of mine when I drove into the town [...] I couldn't find a cup of coffee in the town. And this is just 280km from Joburg. So to us, it was quite surprising, quite shocking that people are suffering so close to home. [...] We couldn't find a bathroom because the toilets in the town were

all chained up. But I think it was only when we went out into the rural areas around Senekal, we realised how bad people were suffering. We saw people without water for months, we saw farmers letting their animals off their farms, opening their gates [...] so they don't have to deal with the carcasses. [...] we saw hundreds and hundreds of carcasses just lying around. And I think, I think all that touched everyone of us [...] we needed to do more. (I14)

Poor people in South Africa are pushed to their limits in terms of what they can afford and what is not being delivered to them. [...] We penalize and punish the poor in South Africa every day while we allow and continue to greed. (I11)

[S]ewage [...] slowly leaks out into the storm water drains [...] nothing is being done to handle the situation which is highly dangerous because with the drought and with children playing in this water, we get a lot of diarrhea. (I7)

For many civil society organisations, the core disaster of the drought is not only **human suffering and environmental destruction, but also issues of political governance**. As a response, civil society organisations distribute water and drill boreholes, provide food and hygiene packs as well as feed for the animals, raise awareness and increase political pressure. They also support communities through teaching more sustainable farming, capacity-building, sensitisation on water and environmental issues and filing requests for government support (I2; I3; I4; I5; I7; I11; I13; I14; I16; I18; I19; I22; I25; I26).

Affected People

In a drought, the rural areas largely experience water shortages at first and then the cities. Rural livelihoods oftentimes depend on subsistence or small-income agriculture and cattle-herding, but large-scale farmers also struggle, causing rising food prices which affect especially poorer rural as well as urban people (I16). During 2015–2016, many small-scale farmers lost their harvest and cattle (or had to sell it for cheap) and thus lost ability to plant and maintain a source of revenue

(I3; I20). Social distress and worries increased as incomes and subsistence farming failed, and people had to spend more money on water and food (I1; I3; I17; I26).

[M]ost of the guys that are having cattle, they [the cattle] died last six, seven months. (I3)

Most of their understanding would be the problem is there is no rain. [...] They understand the dams don't have even water, even municipalities can't connect the land for you. Because there is no water they don't have a solution. (I3)

But from my view a number of smallholder farmers are really struggling to come out with minimum food production in the context of the climate change. If you look at this current drought, there are farmers who are already reduced to nothing. (I13)

[P]oor quality and they cannot market these produces and get a meaningful reward from the seed that they have put in their production process. So they are made worse off already. [...] the only coping approach they can use [...] is to use the grants that they are getting, the old age grants that they are getting to support their initiatives to address the food insecurity at household level. So they are diverting their resources from where they are supposed to be [...]. there is also erosion of livelihoods in their way of addressing or in their way of coping with the current situation. You find that most of the smallholder farmers they are selling whatever assets they are having, for instance, their goats, cattle, chickens so that they need to cope with the current drought, they need to support their household in terms of accessing food for household consumption. (I13)

People experience the drought in different ways and intensities; for many, the **erosion of livelihoods and economic capacities** is disastrous because it affects them way beyond the drought. To give some examples, people cope by directing all their resources towards food and water purchase, engaging in traditional, indigenous and religious coping mechanisms such as rituals, prayer, building of sand dams and rainwater

harvesting, walking long distances to fetch water, requesting government support, sometimes working together in community (e.g. fix water pumps) and culling cattle but also on a larger commercial scale trying to support each with feed for livestock or getting loans for re-starting their business (I2; I3; I16; I13; I25; I26).

Researchers

Researchers view the drought from different technical, governance and social angles. They stress the normality of drought, including its cyclical nature, and water scarcity in South Africa even if this drought may be particularly intense (I6; I17; I20).

These guys don't accept the science [...] he is gonna ask you how many jobs are you gonna create? So those are the election feed, he is not really necessarily caring about a solution. If it fails, it's the next guy's problem. (I6)

And what it is doing is it's finding all the weaknesses in the current policy legislation and institutional frameworks. And these weaknesses are now being met in some cases by immediate reactions that are not well-thought through and are probably exacerbated the problem. [...] A worry of the drought was whether the dams were empty or full. And that is too late. You should have already implemented drought relief strategies before that. [...] that [...] basically turned a bad drought into a national disaster. (I17)

[A]round 2011, 2012 [...] we said there is a drought cycle, a big one that is coming. [...] get prepared. We were dismissed by the politicians. h yah, making too much noise and this and that. [...] Years later,] there was a debate and the minister would come to us. Do you have information? Provide information. And yet it is the very same information that we warned them about many years ago and then we were dismissed. [...] So there has been a huge interest generated from that but not from the point of view doing research per se but from the point of view to mitigate against this crisis. (I6)

Researchers perceive *ill-informed decision-making, disregard for research findings and short-term actions* as disastrous in the drought. They cannot give predictions with an absolute certainty (I24) but offer information on water and drought issues, which, however, is often only of interest in times of crisis.

Conclusion

The inquiry into varying definitions of ‘the disastrous’ reveals heterogeneous and contested experiences of disaster itself. The concept of disaster is, hence, shaped by social interpretations and construction through different actors. In essence, the drought implies different calamities for the various groups. Different definitions of disaster lead to entirely different responses and solutions:

- National politicians tend to consider the political viability of measures.
- Operational actors stress the need for more technical management.
- Local politicians aim for greater national support.
- Civil society engages in humanitarian actions.
- Affected people try to cope with their means.
- Researchers point to the importance of taking science into account.

This is by no means to say that the groups totally disregard all but their own concerns. However, even if the individual actors recognise the need for a different kind of change, they are, based on their roles, caught in wider societal dynamics and logics which they cannot escape or alter very easily. One could ask from a sociological perspective: Does disaster (not the physical hazard itself) evolve, at least partially, from the lack of a common societal definition on what to prevent?

To conclude, the culturally sensitive analysis of disaster exposes the logics of different responses and coping mechanisms. Such insights may help decision-makers to align actor-specific strategies toward a societally broader and more integrated approach to resilience-building.

Notes

- ¹ cf. Bledau L (2018) Rahmenkonzept Katastrophenkulturen. Unpublished research report from the project FloodEvac. Disaster Research Unit, Freie Universität Berlin, Berlin
- ² The interviews (I1-I26) were conducted between March and July 2016 as part of a master’s thesis [Merkes ST (2017) South African Disaster Management, Hydropolitics, and Development Perspectives in the 2016 Drought: Understanding Disaster Within the Societal Context of Its Emergence. Master’s thesis, Freie Universität Berlin, Humboldt-Universität zu Berlin, Universität Potsdam] and are for the purpose of this paper analysed based on a different research question.

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Irrational Cultural Binds in the Wake of Recent Natural Disasters in South India

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ABSTRACT: Pre-disaster preparedness is indispensable to handling any form of unforeseen incidents or in this case natural disasters. These recent instances of natural calamities pouncing over various states of our great nation have indeed raised a notion of debate and discourse.

The paper will be analysing the cultural binds in the wake of such natural disasters, namely, instances where rescue operations had to trouble to appease mere cultural blindness, among so-called higher strata of society.

In the recent instance of a 14-year-old turned to her death during the Gaja cyclone in Anaikudi, a village situated in Nagapattinam, the girl was on her menstrual cycle and thus by the village customs had to be separated from the family, and she was put in a hut when the cyclone hit, she yelled and screamed but bound by these blind customs her father couldn't help her. As a result of the cyclone, a tree fell on the hut killing her. While during Kerala floods, individuals wouldn't climb on the rescue boat saying the person crewing the boat was a Christian and stated they would only climb if they would not touch them.

In these instances rationality seems to have vanished, people instead tend to side with blind cultural norms rather than save a life.

The paper will analyse and comprehend such instances where racial prejudice seems to hinder rescue operations and furthermore cost innocent life just to appease the so-called racial supremacists.

KEYWORDS: culture, social taboos, menstrual taboo, caste hypocrisy, community-level preparedness

Introduction

Disasters are defined as sudden actions that bring disturbance to the social order with human, material, economic and environmental losses or effects that outdo the ability of the affected community to cope up with by using their own resources. Due to the advanced technological know-how, the impact and the early warning of the disasters can be predicted in most of the times. Implementation of proper disaster risk reduction (DRR) mechanism is the first and important aspect while the disaster warning is broadcasted. In the recent past, the number of natural disasters is in the alarming rise and the loss of the people is too in the alarming

rise. If the people survive these disasters, then they have to start from the trash. It is not so natural that a natural disaster solely can disturb the lives during natural disasters, it is too much depending upon the social and cultural stigmas surrounded in that area.

This study examines the social stigma surrounding the South Indian culture by defining from what culture is and how it affects the disaster evacuation as well as disaster preparedness. This is followed by several case studies which stand as the supporting documents for my hypotheses. Finally, the paper concludes with suggestions and ways the government and the young people like us can do to overdo this generations-old cultures and taboos.

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What is Culture?

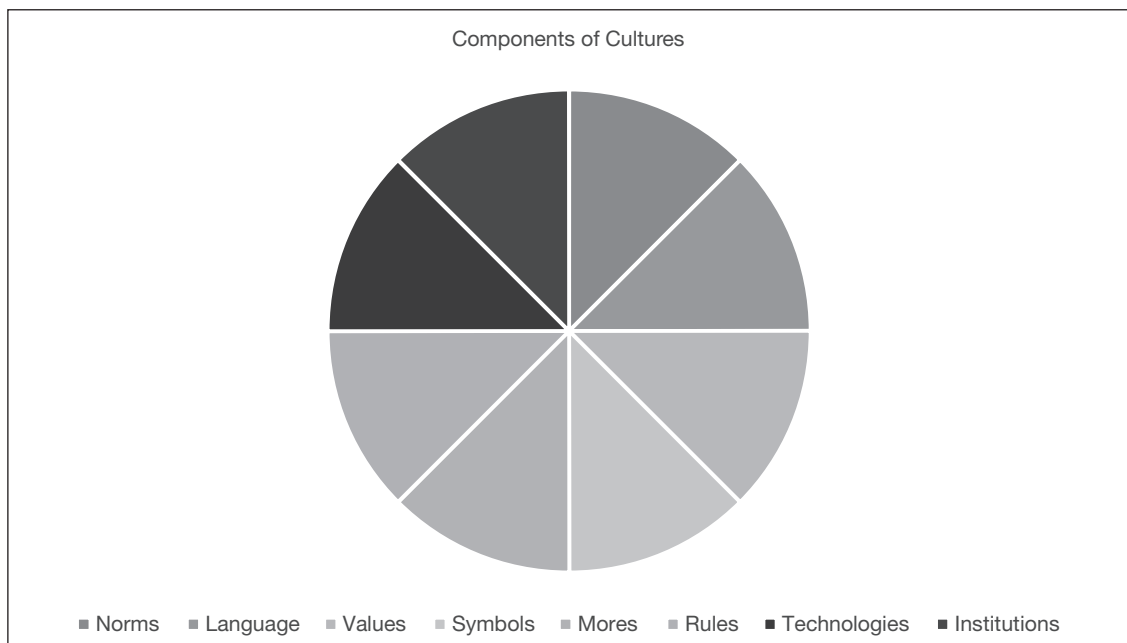
The famous anthropologist Edward Taylor claims that culture is the “*complex whole which includes knowledge, belief, art, moral, law, custom and any other capabilities and habits acquired.*”

Aristotle said “*Human beings are social animals.*” They began to live in together from ages. Human beings cannot live separate and when the people began to live together with the same habits and occupations as well as traits will form a society. Society gradually creates many rules and regulation, which are needed for living in that period.

Cultures are unwritten rules prevailing in the society, which are practised with religion so that the binding towards these cultures get strong because of the sense of fear and irrational faith in religion. Now think of a situation where a person wants to stand aloof of this cultural bind, he/she will be perished by these cultural forces and will not allow living peacefully in the society.

Prof. P.C. Joshi (Department of Anthropology, Delhi University, India) suggests that: Culture, as a shared, learned and transmitted body of knowledge, beliefs and practices, plays a very important role in our (hereby ‘our’ I mean all the stakeholders in a

situation of disaster) perception, understanding and activities undertaken to mitigate, manage and face the disaster.¹ Mohammad Ahsan Khan (Rural Development Project, Pakistan) finds that: Socio-cultural settings do affect the ways in which people choose to respond to any disaster. Proactive, passive or poor responses to any disasters are inextricably linked with different socio-cultural settings. Culture, the way of living (set of values, norms, beliefs and social organisation) of any community, plays a catalytic role in developing people’s responses. Different social settings within a given culture not only shape people’s knowledge but also influence their skills and practices thus affecting their behaviours towards a given situation... [and] are the key driving forces to shape people behaviours to respond to any disaster like situations.² The modern and traditional societies of our nation still give importance to the traditional practices and belief system. Especially in rural areas, the people are more bonded to their tradition and some of the traits and practices of the culture are inhuman in nature. The people are following the traits because of the fear of getting the curse from God and/or the fear of excommunication. Culture prevailing various kinds of institutions and those institutions are the core part of the culture.



Some traits of culture act as a villain role in the time of pre-preparedness phase of a disaster. Sometimes the cultural traits and the pre-preparedness phase would reach in the confrontation. Most of the times the cultural traits can take over the pre-preparedness attempts. And these cultural traits would lead to an increase in the casualties of the disaster. Menstrual negative taboo, caste hypocrisy and concept of purity and another such kind of traits of culture made disaster much worse.

Taboos

Taboo is one kind of institution in the culture. It has a major role in the dynamic existence of society. Most of these taboos are essential to the existence of society. "A culture or a society guides the behaviour and the thoughts of their members by agreed upon expectations and rules. The list of behavioural guidelines is typically referred to as social norms and taboos" (Chaim Fershtman; Uri Gneezy; Moshe Hoffman 2011).³ The taboos are interfering in every aspect of life such as behave, dress, eat, and drive, as well as our sex life (Chaim Fershtman; Uri Gneezy; Moshe Hoffman 2011). Anthropologists are studies about the taboos thoroughly because taboo is a cultural reality. It has its own merits and demerits. There are several kinds of taboos like food taboos, sex taboos, menstrual taboos and so on. Menstrual taboo is some times becoming a barrier in the pre-preparedness phase of a disaster. According to the observations of Knight C, and Wilson HC, the menstrual taboo likely pre-agricultural, pre-modern-brain, and likely even pre-language (1995; 1964).⁴ Formation of culture has not taken place in one day, it has a long run of history, and the menstrual taboo is becoming the part of the culture from its inception time onwards. That means it is deep-rooted in the culture. In every culture, we can see one or another form of the menstrual taboo system. Anna Druet concluded that the menstrual negative taboo is a universal phenomenon (2017).⁵ Very rarely we can see some positive taboo about the menstrual blood. The practice of menstrual negative taboo is also visible in various cultures in India. In rural areas, the taboo practice is strong, and in some areas, the girl or woman who is in period has to live in temporarily made kutchra

house. This kind of practices sometimes leads to an increase in the impact of the disaster.

Menstrual Taboo

Menstruation is the monthly bleeding of women till the period of menopause. Bleeding and the menstrual cramps are not new to a woman as it is old before the human being evolved as species. Myths surrounding around menstruation is not only hung in India, but Roman Author and Philosopher Pliny the Elder also wrote that *a menstruating woman could stop hail storms and lightning, as well as kill crops*.⁶ It was also believed they could kill bees, dim mirrors and rust weapons just by looking at them. As like today the shame surrounding periods were very prevalent in medieval times, so women were carrying a pouch of perfuming herbs on the belly and ashes of toad in a small pouch around the waist which will reduce the cramps and ease the heavy flow.

- In many world religions, women are seen as impure during their period.
- They are restricted from entering places of worship and following religious rites.
- The Chhaupadi tradition followed by Hindus in western Nepal is the most extreme version where women are banished outside during their monthly cycle.
- In India, women are not allowed to enter some Hindu temples and Muslim mosques while menstruating, but there have been court cases to overturn this.
- In the Dogon tribe in Mali, women of the village also live in a hut during their period.
- In Karnataka, the neighbourhood women perform Aarti of the young menstruating girl who's well dressed up like a bride. The married women from the neighbourhood sing songs in celebration.
- In Tamil Nadu, the celebrations are not so simple as they are in Karnataka. The menstruating girl is celebrated with much pomp and show. The ceremony is called '*Manjal Neerattu Vizha*' (turmeric bathing ceremony).

In traditional Indian culture, a girl reaching puberty is celebrated with a party and presents, the young women are bathed in turmeric water and dressed in bridal finery and garlanded with aromatic flowers.

In this paper, I am co-relating the deaths occurred due to the taboos relating to menstruation and the disasters of the country by citing few case studies all around south India.

Case Study No.1

The recent instance of a 14-year-old turned to her death during the Gaja Cyclone in *Anaikudi*, a village situated in Nagapattinam, S. Vijayalakshmi, the girl was on her menstrual cycle and thus by the village customs had to be separated from the family, and she was forced to stay in the hut adjacent to her home. Her home was surrounded with coconut grove far from the village mainland. When the cyclone hit, she yelled and screamed but bound by these blind customs her father couldn't help her. As a result of the cyclone, a tree fell on the hut killing her. She was taken to the hospital hours later and...¹

There are some villagers who believe this incident as a 'wake up call' as it was common practice to segregate menstruating girls. And subsequently, a large group still upholds this inhumane cultural restriction and glorifies this practice with citing it as their culture and is followed by generations. Kavya Menon, Head for Project Safe Active Periods, AWARE India, says that Vijaya's death is a result of systemic violence against women by a community as a whole.

This incident happened due to the lack of efforts by the government or the lack of understanding the ground realities of the people living there. Why I came into this conclusion is because the elected representatives in the villages of the cyclone warning should have made community-level preparedness. The practice of segregating the women while menstruation is not a new practice in the society and the panchayat-elected representatives should have made a proper facility for it. I am wondering that there were no women who were menstruating during this cyclone period in the house of these elected representatives?

Caste Hypocrisy and Concept of Purity

The concept of purity is a by-product caste system. The concept of purity and pollution lead to untouchability.

In the state Kerala, untouchability (*Thottukoodiama*) and unapproachability (*theendikoodiama*) existed. Based on the theory "there were recognised the scale of distances in which the members of the polluting caste must stand from the members of a higher caste or his house" (Biju, Amrita Joti 2012)⁸. The idea of purity and pollution's role are strengthening the hierarchy of the caste system.

The untouchability and unapproachability were banned by the law, but still, the concept of purity exists in some parts of the state. The purity concept made the caste as endogamous groups. In the deep heart, the concept was still existing and one of the saddest and shameful minds of this caste hypocrisy came out at the time of Kerala flood from the people of a higher caste.

Case Study No. 2

August 2018 saw a much devastating flood since 1924. Over 483 people died and a subsequent number of people are missing. The flood shattered the dreams of millions and about a million are evacuated and staying in relief camps. As shocking floods hit Kerala, thousands scrambled up to the higher floors in their buildings and ducked together on balconies, waiting desperately for help. All along with the Army persons, the Royal Navy of Kerala, The Fishermen community who had loaded their boats onto trucks, voluntarily travelled to Kerala's inner towns and villages, inundated with more than 10 feet of water. Most people gave them a hero's welcome, grateful to be evacuated after a long wait.

But the higher caste people humiliated these volunteers by insulting by asking their caste, and there were instances of refusal to enter into their fishing boats. Marion George, a 47-year-old fisherman, reached a home in the city of Kollam on Friday with a family of 17 trapped inside. When he told them that he was there to help them, he was asked, "Isn't this a Christian boat?" These Brahmin people refused to get on to the boat and waited for the other boat to come. Fortunately or unfortunately, none of the rescue boats came on that way and the same Marion George was on return to the same place after about five hours and they were still stranded. These people only agreed to get on to the fishing boat after asking the fisherman not to touch them.

So these two incidents show the need of a community-level preparedness to make the people face disasters and make them overcome the unscientific traits of the culture at least during the disaster time.

Attachment Towards the Belongings

Bondage of the people to their house and house holdings will rise the death rate during the disaster. The person is highly attached to his belongings because the house is everything for him; it may be only the earning in his lifetime. So mostly in rural areas, the people are not ready to leave their home. So this 'attachment' will affect the effectiveness of preparedness phase and also affect the rescue operations. In a recent flood, in Kerala, some of the people who are trapped in their homes said to rescue mission team that "we are not ready to leave, but ready to die in our own homes". These words show their attachment to the holding and also their fear of loss of the holdings.

Community-Level Preparedness During Disasters

Disaster management is not a single handjob, it's a collective responsibility of the government, NGOs and the people for mitigating the coming disasters. Disaster preparedness should not be the aftermath of any disasters of the past. It should be an evolving one. Disaster preparedness phase has a significant role in reducing the impact of the disaster. Red cross defined "Disaster preparedness refers to measures taken to prepare for and reduce the effects of disasters. That is, to predict and, where possible, prevent disasters, mitigate their impact on vulnerable populations, and respond to and effectively cope with their consequences".⁹ The aim of disaster preparedness is saving the maximum number of lives and livelihoods from the impact. The community members have a great role in this phase. The effective preparedness reduces the loss of lives and livelihoods and gives courage to the people to face the situation. The community-level preparedness has a significant role to minimise the loss of the lives and livelihoods. Above-mentioned case studies pointed out the deep role of volunteers to aware the communities to overcome the cultural traits and cultural binds.

Suggestions and Conclusion

The awareness programme and pre-preparedness phase have a role to reduce the risk and loss of disaster. The proper awareness can help the communities to overcome the cultural binds. For this, we can take a beautiful example from Kerala at the time of Nipah outbreak. The communities from the disease-affected area broke the rules of the culture and accepted the directions which are given by the medical experts from the state. The Muslim communities were ready to leave the bodies to hospitals, and Hindu communities also allowed the same, so here both communities compromised their cultural rules to stop the spreading of the disease. Christian communities are always giving Eucharist to the mouth of the devotees by the priest, but the time priest give it to the hand of the devotee and they take it by themselves. Here we can see all communities were ready to sacrifice their cultural traits emotions to save other people and save the society. So this kind of will we need in the time of the proper awareness of what they got helped to save the masses from the disease.

In spite of substantial effort and huge spending of huge public money on public hazard education, the levels of disaster preparedness remain low. But the efforts by the government and the NGOs are not reaching the rural communities and the disaster-affected areas. This is substantially proved in the above-mentioned two natural disasters. So giving education on rural areas about disaster and preparedness may eradicate the tragedies mentioned above.

So here we are suggesting our remarks to reduce the tragedies by the blind practice of cultural traits at the time of natural disasters. We have to identify and categorise areas prone to disaster and identify the possible preparedness to be made for better sustainability.

Notes

- ¹ https://www.preventionweb.net/files/11039_icimodculture1.pdf
- ² https://www.preventionweb.net/files/11039_icimodculture1.pdf
- ³ Taboos and Identity: Considering the Unthinkable by Chaim Fershtman, Uri Gneezy, and Moshe

Hoffman, American Economic Journal: Microeconomics 3 (May 2011): 139–164.

- ⁴ Blood relations: Menstruation and the origins of culture by Knight C. Yale University Press; 1995 May 24; On the origin of menstrual taboos by Wilson HC, American Anthropologist. 1964 Jun 1;66(3):622–5.

- ⁵ How did menstruation become taboo? A look at the historical roots and theories behind menstrual stigma by Anna Druet, Researcher; Science and Education Manager, September 8, 2017.

- ⁶ <https://www.knixteen.com/blogs/the-rag/the-history-of-periods>

- ⁷ <https://www.bbc.com/news/world-asia-india-46286284>

- ⁸ The paradigm and practices of pollution in caste system by C M Biju, C Amrita Jothi, in *International Journal of Scientific and Engineering Research*, Vol-3, Issue 12, 2012.

- ⁹ <https://media.ifrc.org/ifrc/what-we-do/disaster-and-crisis-management/disaster-preparedness/>



Disaster and Governance

Gaps and Challenges of Coastal Risk Governance in India: A Meta-Analysis

Karumoju L. N. Sridhar Achari^a, Sameer Deshkar^a, Shruthi Dakey^a and Manish Kulkarni^a

ABSTRACT: Coastal settlements are often described as dynamically complex systems, where decision-making is critical and requires addressing uncertainties. Approaches and methods followed in coastal planning and disaster studies are changing over time with increasing focus on disaster risk reduction and adaptation. In Sendai Framework 2015, risk governance is emphasised in its second priority, i.e. 'strengthening disaster risk governance to manage disaster risk'. The same is reflected in National Disaster Management Plan (NDMP) of India, 2016. In urban planning context, risk governance is perceived as an add-on feature rather than an integral part of process. International Risk Governance Council (IGRC) explored the concept as a process which is split into four stages and involves stakeholders through communication. Stakeholders are to be identified with respect to scale and location of plans. Level of interaction varies with the stages in the process as the decision-making responsibilities are also varying.

Risk governance process addresses the uncertainties in the system effectively through risk assessment, in which scenarios are generated. Scenarios are created using global climate changes and local vulnerabilities. There are various studies conducted for risk governance at local, regional and global scales. But there is no clear identification of stakeholders. And in case of India, responsibility matrices are prepared for managing hazards and risks at central and state levels by National Disaster Management Authority (NDMA). This study conducted a meta-analysis after a structured literature review for identifying research gaps in coastal risk governance and examines risk governance practices in India. Gaps in the research and practice of risk governance are discussed for further studies.

KEYWORDS: coastal risk governance, disaster risk, local governance, meta-analysis, responsibility matrices

Introduction

Urban settlements along the coastal belt of India are the major economy generators (Siemens, 2013) contributing to national growth and security. Natural disasters witnessed by these regions have proved detrimental in the past not just for the respective states but also for the national economy. National Disaster Management Authority (NDMA) formed under the NDM Act 2005 is entrusted with the responsibility for preparing the

National Disaster Management Plan (NDMP, 2016). The report identifies nine coastal hazards (NDMA, 2016) with floods and cyclones being the most frequently occurring among all hazardous events (Table 1). Data also reveals that there has been a phenomenal rise in the frequency of floods in the recent past (Figure 1). The Eastern coast of India is reportedly prone to cyclone, which further leads to floods along coastal cities and regions (Chittibabu et al., 2004; Kumar, Mahendra, Nayak, Radhakrishnan, & Sahu, 2010; Raghavan & Rajesh, 2003).

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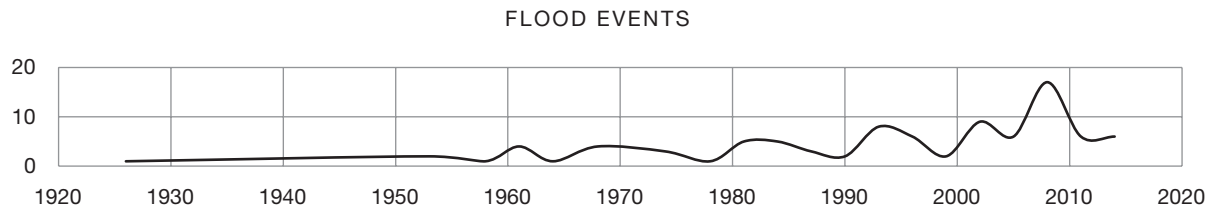


Figure 1: Flood events data, India; Source: CRED-2015

Floods and cyclones are the phenomena of nature which have caused great havoc of disastrous dimensions in India particularly in coastal areas. Among the natural hazards that affect the coastal line, these hazards are known to be the most destructive to human life together with assets like building structures, agriculture and infrastructure, vegetation and animals (K.J. Anandha Kumar & Walia, 2013; Rao et al., 2009). The resultant environmental damages and loss of physical as well as economic resources aggravate the future hazards and generate new vulnerability factors to the existing natural and built systems.

Table 1: Recent Data on Various Disasters in India, Source: CRED, 2015

Type	Years	Event
Drought	13	14
Earthquake	26	30
Epidemic	29	68
Extreme temperature	36	56
Flood	59	264
Insect infection	1	1
Landslide	28	44
Mass movement	2	2
Storm	67	172
Wildfire	1	1

Governance was worldwide perceived as an exclusive component of public sector till 1980 (Rhodes, 1996). Subsequent literature after 1980s identified civil society together with private sector to be an integral part of governance mechanisms (Rhodes, 1996; Salmen et

al., 2017). Governance is defined as a process or manner of decision-making which includes three major actors, public sector (state actors and institutions), private sector (individuals and companies) and civil society (non-governmental organisations). These actors work in hand to hand to achieve common good which is the highest priority of planning. In this context, 'networks' play an important role in defining the significance of each and every actor in the overall process (Salmen et al., 2017). On the other hand, risk governance is also an emerging concept both in literature and in practice to deal with the increasing global and systemic risks that are associated with changes in the growing world (Hermans, Fox, & Van Asselt, 2012). Risk governance implies enabling societies and states to benefit from change and development while minimising the negative consequences of the associated risks (Routledge, 2011). These associated risks are sector specific and integrated as well. It depends on the type of hazard that is causing the threat. In this study, nine coastal hazards are considered.

Installment of governance principles, in context of risk and risk-related decision-making, and applying them can be called as 'Risk Governance' (IRGC, 2008). Risk governance deals with the complex web of actors, rules, conventions, processes and mechanisms concerned with how relevant risk information is collected, analysed, characterised and communicated and how management decisions are taken. IRGC explored the risk governance as a process and addressed the stakeholder partition and their communication as central element of the overall process (IRGC, 2008).

Methodology

Literature review of existing knowledge base for coastal risk governance is done in the study. 'Scientometrics'

analysis, use of terms in title, abstract and keywords at the level of corpus literature, reveals the trends in the focused areas for various studies. Key terms for the analysis are selected from the risk governance process of the IRGC. In our analysis, the terms ‘Costal Risk governance’, ‘Coastal Risk Assessment’, ‘Coastal Risk Characterization’, ‘Coastal Risk Management’, ‘Local Governance’ and ‘Local Administration’ are explored. It summarises the current state of research based on original studies published in peer-reviewed journals. The term ‘Costal Risk governance’ is used as key term in the main search string. Followed by a network analysis of literature for which Citespace Visualization Software is used to do the cluster analysis of the peer-reviewed article journals. It utilises smart algorithms to identify clusters and group the papers based on the key terms used in the similar studies (Chen, 2017). Analysis followed by a brief discussion elaborates the changes that are taking place in Indian policies and plans related to disasters.

Knowledge bases selected for the analysis include Clarivate Analytics’ Web of Science and Elsevier’s Scopus. From Web of Sciences, 244 article papers (1999–2019) are selected through advance search option and from Scopus, 167 papers (2002–2019) are selected in which the term ‘Coastal risk governance’ is used in title, abstract and key words (see Figure 2).

Result (1): Scientometrics Analysis of Coastal Risk Governance

From the collected research papers, analysis is conducted over period of time and the categories given under specific categories. It is observed that the research is still on the conceptual understanding, and recent publications are focusing on the application of different tools such as networks at different scales. Time period-wise analysis reflects that the research in this area is increasing. For further analysis, from the above-mentioned search strings, AND function is used to identify the papers that have common terminologies mentioned above along with ‘Coastal Risk Governance’. Results are showing that risk governance is studied at different scales, but very few studies are conducted it as an overall process. The above-mentioned components of risk governance process are used as search strings. Along with these, also the two terms, Local Administration and Local Governance, are used to identify the studies that are conducted at local level. It is observed that in recent times focus is shifting from risk management to risk governance. But in the risk governance, it is studied as separate study than the process which includes the components such as risk assessment and risk characterisation. Table 2 shows the output of search strings and formulae used.

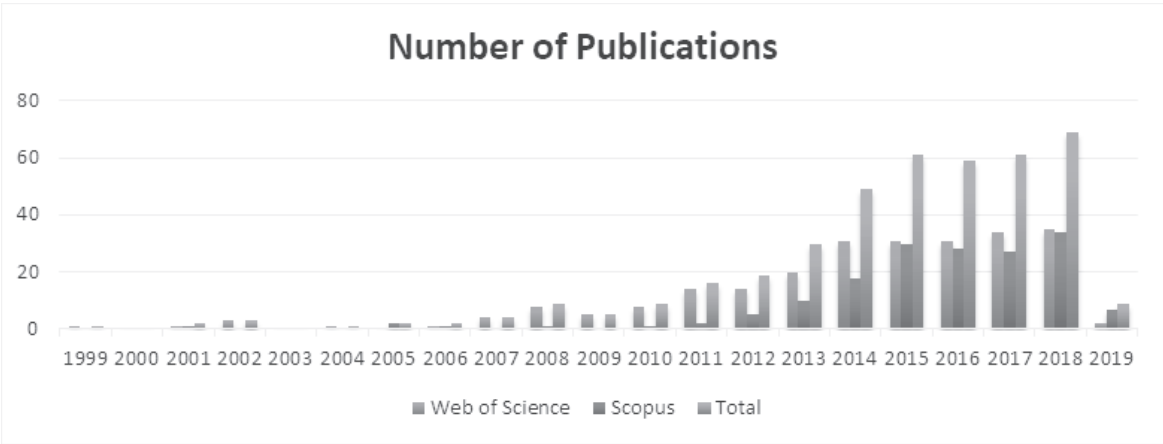


Figure 2: Publications on coastal risk governance

Table 2: Search Strings and Publications

Terms	No. of Papers (Web of Science)	No. of Papers (Scopus)	Formula Used
Coastal Risk Governance	244	167	(Coastal AND “Risk Governance”)
Coastal Risk Governance & Risk Assessment	69	99	(Coastal AND “Risk Governance”) AND “Risk Assessment”
Coastal Risk Governance & Risk Management	181	129	(Coastal AND “Risk Governance”) AND “Risk Management”
Coastal Risk Governance & Risk Characterization	2	4	(Coastal AND “Risk Governance”) AND “Risk Characterization”
Coastal Risk Governance & Local governance	94	15	(Coastal AND “Risk Governance”) AND “Local Governance”
Coastal Risk Governance & Local Administration	3	7	(Coastal AND “Risk Governance”) AND “Local Administration”

Result (2) Cluster Analysis

Study is further carried out by performing cluster analysis in the same platform. Peer-reviewed articles from the Web of Sciences are considered for the analysis. In the software, after analysing the papers it generates the clusters by their year of publications and title terms, indexing terms and also abstract terms. It reveals the most used terms in the literature in the context of ‘Coastal Risk Governance’ and gives the current trend of research in the context. From the analysis it is found that 10 clusters are the most prominent ones with different labels. These clusters are labelled using log-likelihood ratio. From this analysis it is found that the mean year for the research of various terms, Silhouette values which gives the homogeneity of the cluster values. Each mode here represents a peer-reviewed research paper and links established are the references quoted in them. $Q=0.775$ for the conducted analysis reveals that the network is reasonably divided into loosely coupled

clusters. Identified clusters by the application are (1) Institutional Risk, (2) Marine Social-Ecological System, (3) Coastal Risk, (4) Stakeholder Analysis, (5) Global South Megacities, (6) Local Responsibility, (7) Hong Kong, (8) Designing Future Coastline, (9) Managing Fisheries and (10) Coastal Residents Perceptions. Figure 3 is the output of timeline view in the model.

Similar analysis is performed only to identify the key terms in these papers in a different platform to identify the relation among them in various papers. The platform selected for the analysis is NVivo. It is also a network visualisation application to analyse the research papers and to identify the linkages among them. From the density map of the analysis, it is found that words such as ‘governance’, ‘climate change’, ‘risk’, ‘vulnerability’, ‘management’ and so on are strongly associated with other, whereas other governance aspects such as ‘local administration’, ‘communities’, ‘politics’ and so on are having weak links in these papers (Figure 4).

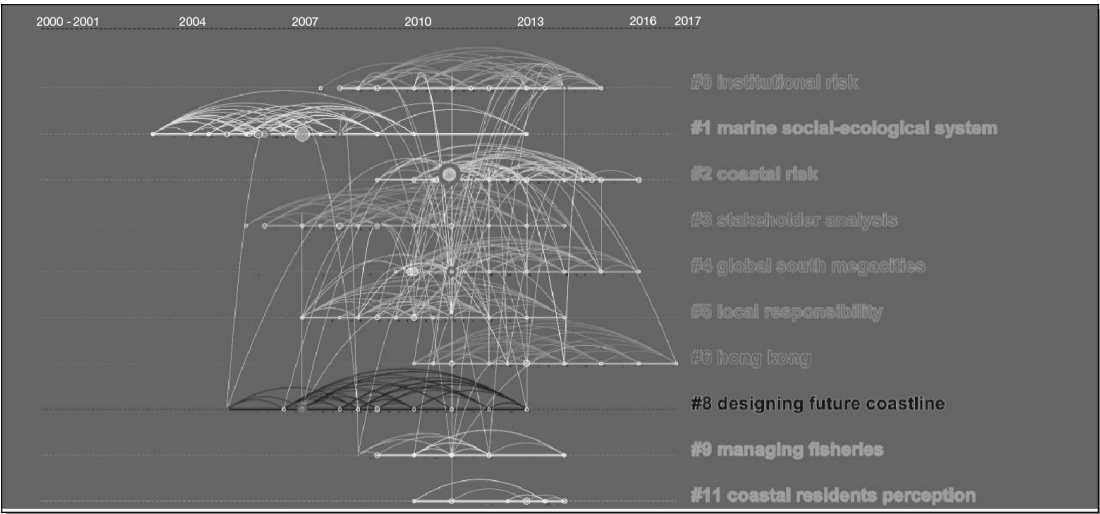


Figure 3: Output – cluster analysis

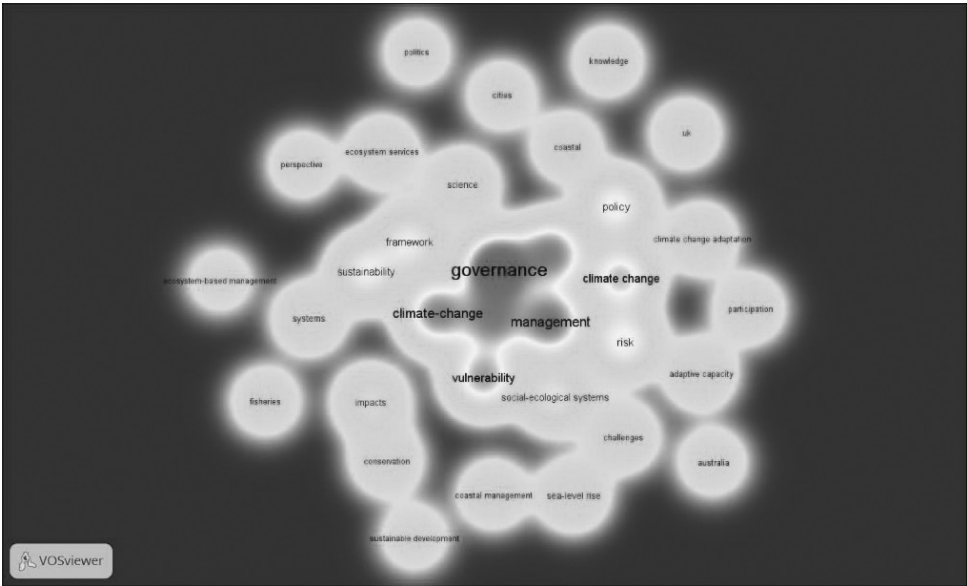


Figure 4: Output – density analysis

After performing the systematic literature study, ‘coastal risk governance’ is explored in Indian context. India’s coastal line is 7517 km out of which 6100 km is of main land and the remaining is of islands in Bay of Bengal and Arabian Sea (Murali, Ankita, Amrita, & Vethamony, 2013; Nayak, Chandramohan, & Desai, 1992). Being a developing country, India is focusing on economic development. But the country is also leading the globe with more focus on environmental focus and the battle against climate change. Paris agreement is an example for Indian government initiatives(Harrison & Kostka,

2018). India is having many regulations supported by plans and policies in the field. Recently after the Sendai Framework, 2015, India has also brought changes in its policies and plans. It is changing its focus from post-disaster management to disaster risk reduction and adaptation. Recently enacted plans and policies are standing as examples for this change. For this study such three major policies/plans are studied. They are (1) NDMA – National Disaster Management Plan May 2016, (2) NDMA – Incident Response system, (3) Coastal Regulation Zone & Integrated Coastal Zone management.

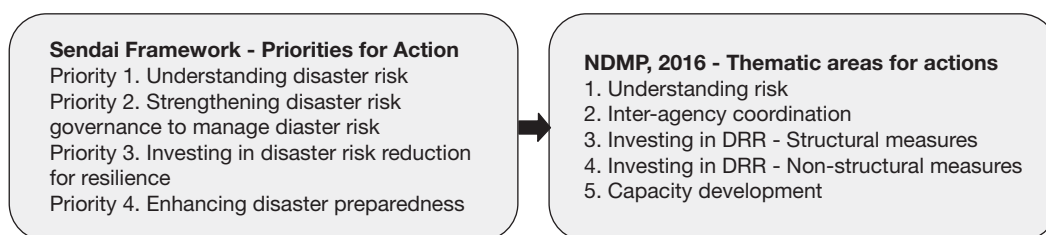


Figure 5: Integration of Sendai Framework in NDMP, 2016

NDMA: National Disaster Management Plan May 2016

NDMA Act was enacted in 2005 and National Disaster Management Plan was prepared in 2016. And it considered Sendai Framework focus areas. Responsibility matrices are prepared for Strengthening Disaster Risk Governance for different hazards. The National Disaster Management Plan of 2016 identifies nine coastal hazards that are (1) Geological and shoreline changes, (2) Rip currents, (3) Cyclones, (4) Sea level rise, (5) Coastal flooding, (6) Storm surges and flooding, (7) Flooding from heavy rainfall events, (8) Saline ingress and (9) Tsunamis. And in the plan, responsibility matrices are prepared for different hazards, which are showing the responsible institutions at different scales of governance in various stages of any disaster. Hazard-wise institutions responsible based on disaster risk reduction are identified under the five thematic areas for actions. They are (1) Understanding Risk, (2) Inter-agency Coordination, (3) Investing in DRR – Structural Measures, (4) Investing in DRR – Non-structural Measures and (5) Capacity Development Hazard-Specific Actions & Institutions. But the major drawback in the plan is national- and state-level agencies are given with their responsibilities but it is up to local-level plans for sharing responsibilities among the local agencies. Communities, and local people's responsibilities and their involvement are not explored and explained. In Figure 5, integration of Sendai Framework in NDMP plan is shown.

NDMA: Incident Response System

In the response phase, the Incident Response System (IRS) is one of the important mechanisms that is established by NDMA (NIDM, 2015). At the time of disaster, the system is bound to follow both the links which are from top to down and also bottom to up. Officers responsible at higher order prepare plans and strategies and the personnel who are working on ground gives feedback to the officers so that plans can be modified time to time. The system ensures the support to the people affected by involving interdisciplinary agencies. IRS works at three levels, national, state and at a local scale, i.e. incident level. It has got three major command sectors that are (1) Operations, (2) Logistics, and (3) Planning, and it also works at three levels, i.e. (1) National Level, (2) State Level and (3) Local Level (Incident Level) (NIDM, 2015). It gives its immediate support at the time of incident. But it is not part of any further stages of disaster (Figure 6).

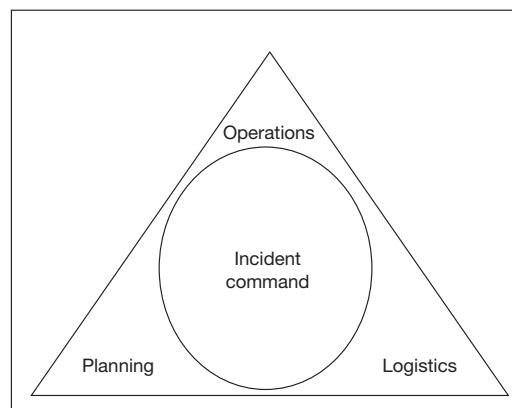


Figure 6: RS and its command sectors

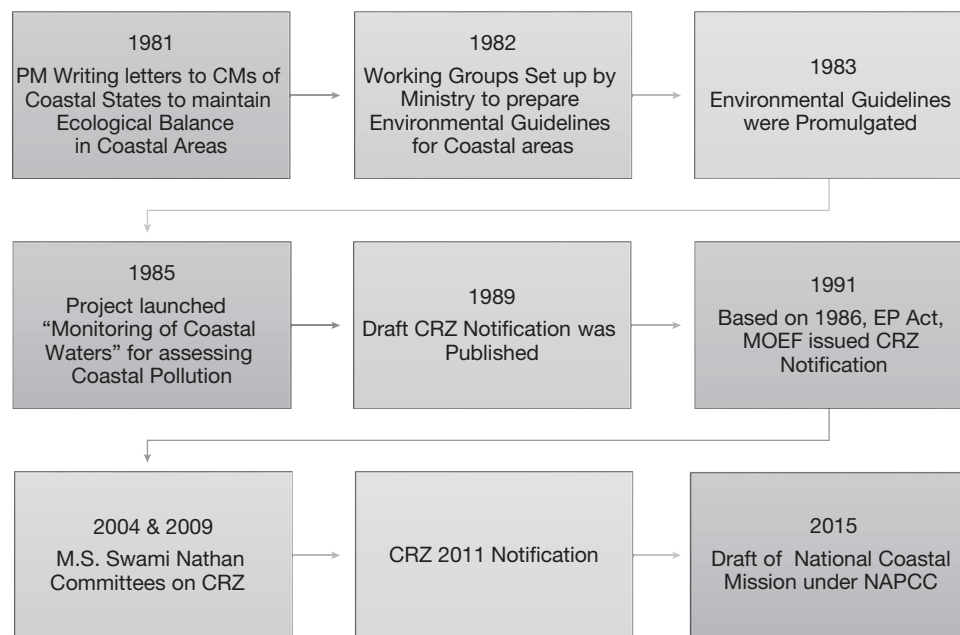


Figure 7: Timeline chart of CRZ notification

Coastal Regulation Zone (CRZ) and Integrated Coastal Zone Management Plan (ICZMP)

CRZ notification released in 1991 and new CRZ notification released in 2011 with modifications under Environment Protection Act (Viavattene et al., 2018). The major change that took place is its approach. It is changed from regulatory approach to management approach (Krishnamurthy, Rajarshi DasGupta, Chatterjee, & Shaw, 2014). The notification again went through modifications which was under draft stage in 2018 (Ministry of Environment, 2018). Anyway it considers disaster risk and it comes out in its various statements in notification (Krishnamurthy et al., 2014; Nayak et al., 1992). The changes that took place regarding coastal line are given in the time chart given in Figure 7.

There are many stakeholders suffered prior to the amendment of the notification. Sectors affected are housing especially of fishermen, tourism because of minimum or no setbacks, infrastructure that is to be laid down within No Development Zone (NDZ), thermal power and certain industries and so on, and the new notification released in 2011 ensured some of the

important concerns and it is reflecting the disaster risk reduction components. It ensured public participation before its amendment. Hazard line is prepared by Survey of India for the entire country at macro (1:25,000) and micro scales (1:5000) (Krishnamurthy et al., 2014). And in the notification, traditional communities are given importance. Coastal ecosystems are given importance in the notification, and mangroves (with area more than 1000 square metres) are asked to be protected by giving 50 metres buffer around its boundary.

Discussion

- Policies and national plans are useful and helpful in preparation of spatial and strategic plans at local level. The policies on coastal risk governance are adopting disaster risk reduction (DRR) approach. But these policies are to be reflected at local-level plans for addressing at basic level. Urban Planning process in India follows traditional Synoptic Planning Process, which is also known as Comprehensive Planning. It is a top-down process in which public participation is low and are consulted at the time of primary surveys in which their opinions are considered. But in risk governance process, public participation and their interaction are central and

significant. And the decision-making power is in the hands of communities and the systems are studied in that perspective.

- Research in risk governance is carried out and it is shifting from risk reduction to risk governance. In between there are other research areas as well such as risk management. But risk governance is covering all these areas as the stages in the process. It is required to extend it to the implementation level.
- Researchers in recent studies are concentrating on risk assessments and applying the networks on the involvement of stakeholders in the process. The study of networks by considering stakeholders as nodes and their relation as links enables to understand the system.
- In Indian policies, lack of roles for respective departments at local level is one key concern and it depends on state-level and local-level plans whether to include the concepts of risks and so on. The local policies and plans for disasters are to be updated by inclusion of DRR/risk governance approach. Andhra Pradesh state in India has updated all the district- and city-level plans by considering DRR approach.

Conclusion

From the study, research gaps are found. Risk governance is further to be studied as a process especially in coastal studies. A shift from regulatory approach to management approach in case of CRZ notification, a shift from risk reduction process to risk governance in case of coastal-related disasters' research. Role and responsibilities of local stakeholders are to be explored and defined at all different stages of disasters as they are limited only to one or two stages (Response in most cases). As the current CRZ notification of 2011 is also going under further modifications, hazard lines are to be studied case specifically. From the literature, it was found that risk characterisation studies are very limited till date, and this is a good area for future research and it helps to limit uncertainty in spatial planning and policy planning. Role of communities in climate-related disasters plays a significant role, and their role should be extended in all the plans and

policies. 'Institutional risk' is the first cluster in the cluster analysis; it is reflecting its prominence in the study. Intuition setups are important and they are separate from public and private authorities and they help in capacity building to face the disasters. Shifts in the research are identified from the study.

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Strengthening Governance through Government-to-Government (G2G) Framework to Better Communicate among Government Agencies for Effective Disaster Risk Management in Nepal

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ABSTRACT: Nepal suffered a great earthquake in 2015, the Gorkha Earthquake. The response in the post-disaster phase exposed the lack of coordination among the concerned government agencies. The lack of coordination was mainly due to the traditional way of communication and information storage and sharing followed by the government. During the disaster response, almost all of the agency representatives worked from the same command control centre set up at the National Emergency Operation Center (NEOC). However, once the post-disaster phase started all the representatives shifted to their premises — the working method slowed down the post-disaster response activities, mainly due to the traditional structured method of communication and coordination. The event exposed the lack of electronic government (e-Government) system within the government agencies, which could provide a common digital platform for information storage and exchange even when not working on the same premises. In the case of e-Government implementation, the system adoption model is the first stage of model formulation which paves the pathway for the development of an acceptable e-Government system.

KEYWORDS: - e-government, G2G, adoption model, ICT, DRM

Introduction

Disaster Risk Management (DRM) is a complex and multidisciplinary approach that requires coordination between various working agencies. The effectiveness of the DRM depends upon communication among different concerned organisations. Information and Communication Technology (ICT) is extensively being used in government to enhance public service delivery. DRM is also a public service delivery that

demands coordination and action between multiple agencies. The government of Nepal (GoN) have to learn lessons from the 2015 disaster and other countries facing a similar situation and adopt the use of ICTs in government for improving DRM. Technology is becoming more approachable and reliable; GoN can also take advantage of such technology to enhance DRM. The disaster communication starts with an early warning system to pre-inform about the risk of any natural or human-made dangers. The communication

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helps in preparedness to counter the disaster and prevent any unnecessary accidents and casualties. Right information conveyed at the right time will help in the search, rescue and relief operations. The Government to Government (G2G) system will help to share information that helps to become proactive as well as track the resources available, necessary or used. The presence of a G2G system enhances the accuracy in the decision-making of the government agencies which in turn will help in developing effective governance (Benssam, Nouali-Taboudjemat, & Nouali, 2014).

Many governments have improved their governance system with the extensive use of ICT to digitise and re-engineer their process and operations (Manolopoulos, Sofotassios, Spirakis, & Stamatiou, 2012). The use of technology helps in data acquisition, storage, access, analysis and verification. The government agencies working for DRM need to obtain and share information proactively, and ICTs can provide interconnection and access among the government agencies establishing a type of e-Government service known as Government-to-Government (G2G) service delivery. The G2G framework provides a digital interaction platform among government agencies to share information and coordinate in common tasks. Use of technology seems obvious in the modern era, but its acceptance and adoption are quite challenging in the government sector. Unified Model of Electronic Government Adoption (UMEGA) comes up with a unified model that could explain the adoption of technology in government (Dwivedi et al., 2017). UMEGA is the base model to do this research study, as it unifies all of the technology acceptance models to come up with a unified adoption model of technology for the government sector. Various factors associated with the adoption of the technology vary from attitude and psychology of the user, mission and vision of the government to the working environment of the organisation, whose measurement is necessary to come up with an adoption model for GoN.

Existing Situation

Nepal is a landlocked developing country prone to many natural disasters; an earthquake is one of them.

The National Disaster Response Framework (NDRF) guides government and other agencies during the disaster headed by Ministry of Home Affairs (MoHA) for any disaster management activities through the Disaster Management Division (Government of Nepal, 2015). The division works in making disaster management strategies and policies, implementing them, coordinating between various ministries and development agencies, monitoring the disaster management activities and constantly upgrading the policies and strategies. There are various sub-divisions under this division; National Emergency Operation Center (NEOC) is one of them, which has technology like early warning and communication systems useful for information collection and dissemination during disaster preparedness and response. It also has an incident reporting information system that maintains the digital log of any incident throughout the nation and is posted for public view through the web portal *drportal.gov.np* once the concerned authority verifies it (MoHA, 2015). The verification process follows the traditional method of data collection through Nepal Police as it is the only agency responsible for security-related tasks. They are the first one to collect information at any places of Nepal and report to the local- and district-level offices. The NEOC requires fax or e-mail from the district offices verifying the occurrence of the incident to upload the information into the portal. The figure below shows the present working scenario of NEOC.

NDRF defines the roles of various organisations according to the scale of the disaster and also mandates NEOC to operate as a command centre during disaster events. When many agencies are active simultaneously, information generation and exchange increases, which needs regulation and monitoring to track the progress of associated tasks. Technology can be a supportive measure to ease the information flow among the agencies. At present, NEOC uses technology to acquire, store and process data. GoN is struggling to use technology for the betterment of public administration due to various factors like economy, energy, technology unfriendly employees and lack of commitment from leadership (Dhami & Futó, 2010; Kharel, Shakya, Jha, & Pokharel, 2014).

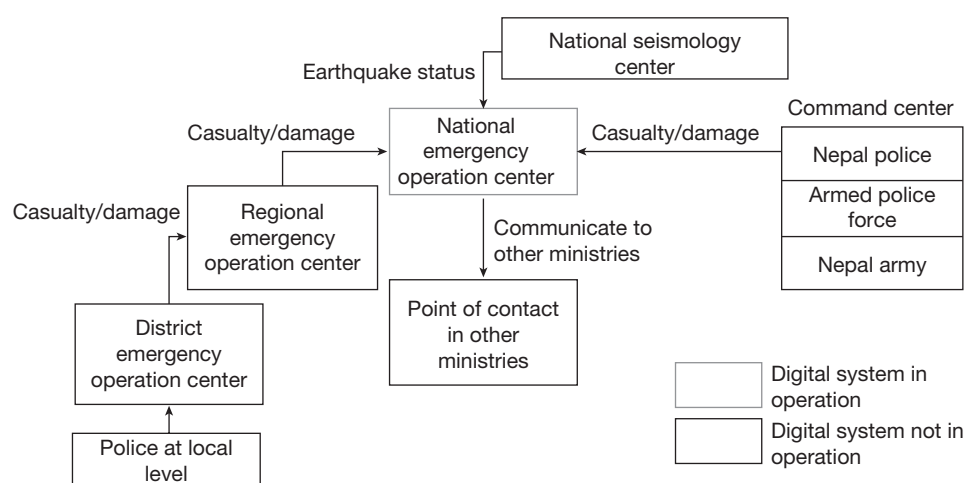


Figure 1: Working scenario of NEOC

E-Government Initiatives in Nepal

The use of ICT in facilitating government service delivery, mainly for information sharing, coordination, and communication, is the root cause for e-Government initiation in any government (Gupta, Dasgupta, & Gupta, 2008). GoN initiated the e-Government initiatives with the

establishment of NITC as a technical institution in 2001, supported by High Level of Commission of IT (HLCIT) established in 2003 (Pariyar, 2007). Though it has been more than a decade of e-Government implementation in Nepal, researchers at various points of time have pointed out various challenges to implement the system. Table 1 lists the challenges under various factors.

Table 1: Factors Identified as Challenges to Implement e-Government in Nepal By Various Researchers

Factors	(Pariyar, 2007)	(Dhami & Futó, 2010)	(Kharel & Shakya, 2012)	(Sharma, Bao, & Peng, 2014)	(Kharel et al., 2014)	(Shrestha, Devkota, & Jeong, 2015)
Vision		Less priority		Lack of government awareness		Lack of a clear strategic vision
Technical factor	Communication between ministries by paper, correspondence with email regarded as having only an informal role	Inadequate ICT infrastructure and access	Poor infrastructure	Energy supply, digital divide, e-readiness, privacy and security, Internet bandwidth and infrastructure	e-Government system design, ICT infrastructure	Inadequate IT infrastructure, lack of security and privacy

(Continued)

Table 1: (Continued)

Factors	(Pariyar, 2007)	(Dhami & Futó, 2010)	(Kharel & Shakya, 2012)	(Sharma, Bao, & Peng, 2014)	(Kharel et al., 2014)	(Shrestha, Devkota, & Jeong, 2015)
Education and public participation	e-Literacy in government is also modest	Insufficient education, lack of awareness of the public as well as government officials about ICT	Low literacy rate	Low ICT literacy and education	Awareness and motivation	Lack of awareness on e-governance services
Political factor	Low level of political commitment to the change process and the deeper utilisation of ICTs in government	Lack of government 's strong will and stand due to political instability	Political instability, lack of leadership and commitment/ coordination	Regulation and legislation, political instability, government priority, frequent change of ministers and high-level officials	Stable government	Policy vacuum and legal framework
Cultural factor	The poor culture of technology	Employee resistance to change, limited information sharing and transparency		Employee resistance to change, corruption	Technical coordination	Lack of confidence/ trust in e-Government services, lack of e-Government transformation/ resistance to change
Human resource factor		Inadequate skilled human resource capacity	Lack of human resources	Inadequate human resource	Capable human resource	Insufficient skilled human resources

(Continued)

Table 1: (Continued)

Factors	(Pariyar, 2007)	(Dhami & Futó, 2010)	(Kharel & Shakya, 2012)	(Sharma, Bao, & Peng, 2014)	(Kharel et al., 2014)	(Shrestha, Devkota, & Jeong, 2015)
Training on human resources	Modest human resources training capacity of local institutions	Lack of reliable training programme among the government officials	Lack of awareness/training	Public sector awareness, lack of training, limited information sharing and transparency		Lack of training and knowledge transfer
Financial factors		Sustainability	Low per capita income, limited financial resources	Investment issues, sustainability		Lack of public-private collaboration or partnerships, budgets and operating costs

Ministries initiated ICT Development projects to provide e-Government services in the form of Government to Government (G2G), Government to Business (G2B) and Government to Citizen (G2C), which lacks a common backbone of system development and functions in standalone approach (Shrestha et al., 2015). Lack of a solid vision of development did not support the urgency to use technology.

Research Methodology

The research methodology is a structured interview-based survey and descriptive statistical analysis of the response. The present functionality of the concerned organisation is observed along with the structured interview to understand the use of technology in the present scenario of GoN. This method helps in gap identification, which is necessary for developing an adoption model for technology use in government service delivery. The survey questionnaire consists of questions to collect personal information like age, gender, work experience, current service level and educational qualification; other questions capture the personal thoughts of the responders on the use and adoption of ICTs in government service delivery

in a five-point Likert scale with options ranging from strongly agree (1) to strongly disagree (5).

Gap Identification to Implement a G2G Framework in the GoN

The gap lies in the formulation of a technology adoption model that is best for the development and adoption of e-Government system in developing country like Nepal. To identify the important factors that affect the adoption of technology use, a survey was conducted with the government officials working at the central ministries of Nepal. More than 300 government officials from non-gazette second class to gazette second class participated in the survey. The survey contained 41 questions, grouped into 10 measurement factors with the help of existing literature, previous works and focus group discussions with the government employees. Two hundred and thirty-four officials gave a complete response to the survey questions.

The analysis of the personal information from the survey shows that in the sample population 60 per cent is male and 40 per cent is female. The age of participants varies from 21 to 58 years; in a range of 10 years, 92 per cent of the participant fall into the 20–29,

30–39 and 40–49 age groups. The work experience ranges from 1 to 38 years; 59 per cent respondents have 1–9 years; 21 per cent respondents have 10–19 years; 17 per cent respondents have 20–29 years and 3 per cent respondents have 30 years or more work experience in government. The education profile of the respondents is 72 per cent postgraduate degree and 22 per cent graduate. The respondents are 66 per cent gazette first class, 21 per cent non-gazette first class, 12 per cent gazette second class and 1 per cent non-gazette second class. The descriptive statistical analysis of survey responses of the questions under various constructs are as follows with their description and the gap indicated by the statistical data. The standard constructs are used from the UMEGA model, whereas the constructs like trust of technology, commitment from leadership and transparency are added with the help of various literatures and focused group discussions with the government officials of GoN to contextualise the adoption model.

Trust of Technology

Trust of the Internet, the trust of the government agencies and disposition to trust are the key components in use of either online system or e-Government services (Belanche, Casalo, & Flavian,

2012; Bélanger & Carter, 2008). The response statistics in Table 2 shows that most of the respondents trust in the use of technology and they find it reliable and helpful in their job. The second question tends to shift towards neither agree or disagree as the respondents are not completely convinced about the risk associated with the use of technology.

Commitment from Leadership

Senior leadership commitment and participation in the use and promotion of technology have always provided a positive effect in the better performance of the organisations as well as helped in the better knowledge management process of the organisation (Analoui et al., 2012; Authors, 2015; Donate & Pablo, 2015). The organisations are suffering from the personal attitude towards the use of technology from senior leadership, which affects the knowledge management process, as well as the use of technology in government process as the success of any e-Government system lies with their active participation (Scholl, 2002). The response statistics in Table 3 shows that the majority agree on the commitment from the leadership on the use of ICT. The mean values of the responses indicate that significant mass thinks leadership has to step up in their commitment.

Table 2: Survey Questions

Trust of Technology						Mode	Mean
1	I trust the use of technology in interaction between government agencies.	1	2	3	4	5	1.49
2	I find no risk in using technology for G2G service delivery.	1	2	3	4	5	2.32
3	I find reliable service delivery with the use of technology in G2G services.	1	2	3	4	5	1.78
4	I find that the trust of technology will enhance its use in G2G services.	1	2	3	4	5	1.64

Table 3: Survey Questions

Commitment from Leadership						Mode	Mean
1	The organisational leadership is aware of ICT use in G2G service delivery.	1	2	3	4	5	2.28
2	The organisational leadership is committed for ICT use in G2G service delivery.	1	2	3	4	5	2.38
3	Organisations have plans to use ICT in G2G services.	1	2	3	4	5	2.54
4	The leadership is ready for policy reformation for any technological intervention.	1	2	3	4	5	3.02

Perceived Risk

Perceived risk is a likelihood that a system has inadequate protection from different forms of damages. It consists of behavioural and environmental insecurity. The behavioural insecurity exists because of the unfriendly nature of the Internet, and environmental insecurity occurs due to the capricious nature of Internet-based technology. The risks associated with the use of technology will be more with the user when they are new to the system (Dwivedi et al., 2017). There is a correlation between perceived risk and trust, so whenever the trust in the system is high, then the perceived risk decreases regarding the loss of anything by using the system (Bélanger & Carter, 2008). The response statistics in Table 4 shows that the officials are very much aware that G2G use will not have any negative consequences to their jobs. The mean values of the responses indicate that officials are doubtful on the risk-associated system as no system is completely risk-free.

Performance Expectancy

Performance expectancy defines the degree to which a person believes that using the system will assist in enhancing their job performance. The variables of

the technology adoption models for this factor are perceived usefulness, relative advantage and outcome expectations (Dwivedi et al., 2017; Venkatesh et al., 2003). The response statistics in Table 5 shows that most of the officials agree that the use of technology in the government services will be very much beneficial to their job. The mean values of the responses indicate that the majority of respondents agree with the benefit they will receive with use of a G2G system.

Effort Expectancy

Effort expectancy defines how much the officials have to make an effort to use the system. The G2G system should not consume too much individual effort from the user for the adoption of the system. The variables perceived ease of use, complexity and ease of use formulate the concept of effort expectancy (Dwivedi et al., 2017; Venkatesh et al., 2003). The response statistics in Table 6 shows that most of the respondents are aware of the effort they have to put once the G2G system gets implemented. The mean values of the responses also support the idea that the officials are ready to do training so that they can use the new system, which shows the respondents are technology friendly.

Table 4: Survey Questions

Perceived Risk							Mode	Mean
1 Use of G2G system may cause the organisational information to be at risk.	1	2	3	4	5	4		3.02
2 I would feel uneasy psychologically if I used the G2G system.	1	2	3	4	5	4		4.02
3 I think it is unsafe to use G2G system because of the privacy and security concern.	1	2	3	4	5	4		3.65
4 I believe there could be negative consequences from using the G2G system.	1	2	3	4	5	4		3.75

Table 5: Survey Questions

Performance Expectancy							Mode	Mean
1 G2G system will be useful to do my job.	1	2	3	4	5	1		1.58
2 The G2G system will help me to accomplish my task quickly.	1	2	3	4	5	1		1.54
3 If I use the G2G system, I will increase my productivity.	1	2	3	4	5	1		1.68
4 Using the G2G system will help me to increase the quality of my work.	1	2	3	4	5	1		1.66

Table 6: Survey Questions

Effort Expectancy							Mode	Mean
1 I would find the G2G system easy to use.	1	2	3	4	5	2		1.95
2 Learning to operate the G2G system would be easy for me.	1	2	3	4	5	2		1.93
3 It will be easy for me to become skillful at using the G2G system.	1	2	3	4	5	2		1.88
4 My interaction with the G2G systems would be clear and understandable.	1	2	3	4	5	2		1.92

Table 7: Survey Questions

Social Influence							Mode	Mean
1 People who influence my behaviour think that I should use the G2G system.	1	2	3	4	5	3		2.71
2 Leadership is focused on technology use in government services.	1	2	3	4	5	2		2.62
3 The leadership is helpful in the use of the G2G system.	1	2	3	4	5	2		2.48
4 The leadership think that I should use the G2G system.	1	2	3	4	5	2		2.45

Table 8: Survey Questions

Facilitating Conditions							Mode	Mean
1 I have the technological resources necessary to use the G2G system.	1	2	3	4	5	2		2.93
2 I would have necessary technical guidelines to use the G2G system.	1	2	3	4	5	2		2.82
3 I have the necessary technical knowledge to use the G2G system.	1	2	3	4	5	2		2.66
4 I would get help from others when I have difficulties using G2G system.	1	2	3	4	5	2		2.27

Social Influence

It defines the degree to which a person perceives that important others believe that he or she should use a new system. This variable is composed of other similar variables, including subjective norm, social factors and image (Dwivedi et al., 2017; Venkatesh et al., 2003). The response statistics in Table 7 shows that the officials agree that people around them affect their behaviour in the use of the G2G system. The mean values of the responses indicate that there is a certain mass of officials who are doubtful whether the surrounding people or leadership can impact in the adoption of technology.

Facilitating Condition

It includes both technological and infrastructure facility and defines the level to which a person believes that an organisational and technical infrastructure is

available to support the use of a system. It captures concepts from other root variables, including perceived behavioural control, facilitating conditions and compatibility (Dwivedi et al., 2017; Venkatesh et al., 2003). The statistics in Table 8 shows that the officials agree on the availability of facilitating condition for a G2G system. The mean values of the responses indicate that the officials are still unsure of sufficient facilities, guidelines or knowledge for the adoption of the G2G system.

Attitude

Attitude towards the behaviour defines the level to which an individual has a positive or negative evaluation or appraisal of the behaviour in question. The individual's attitude towards using the system and subjective norm jointly determines a person's behavioural intention (Dwivedi et al., 2017). Even though the system is good, a person may not use the

system until and unless the person likes the system. The survey statistics in Table 9 shows that most of the officials agree on their thought of using the system, which gives a clear indication that the officials are ready to accept the use of technology in the government. The mean values of the responses also support the positive attitude of the officials towards the adoption of technology.

Behavioural Intention

Behavioural intention is an important variable in studying the e-Government adoption as it directly reflects the attitude of the officials in using the system. The questions mainly target the plan and intention of the officials to use the system in the future. The response statistics in Table 10 shows that the majority of officials agree that they do plan or have the intention to use a G2G system in the future. The mean values of the responses also indicate that officials have the good intention of technology adoption.

Table 9: Survey Questions

Attitude							Mode	Mean
1 Using G2G system would be a good idea.	1	2	3	4	5	1		1.43
2 Using G2G system would be a wise idea.	1	2	3	4	5	1		1.49
3 I like the idea of using G2G system.	1	2	3	4	5	1		1.56
4 I am ready for extra training to use the G2G system.	1	2	3	4	5	1		1.51

Table 10: Survey Questions

Behavioural Intention							Mode	Mean
1 I plan to use the G2G system in future.	1	2	3	4	5	2		1.90
2 I predict that I would use the G2G system in future.	1	2	3	4	5	2		1.87
3 I intend to use the G2G system in future.	1	2	3	4	5	2		1.94
4 I support the use of G2G system.	1	2	3	4	5	2		1.60

Table 11: Survey Questions

Transparency							Mode	Mean
1 The use of G2G system helps in getting information on time.	1	2	3	4	5	1		1.51
2 The use of G2G system makes it easy for tracking of use of resources in any project.	1	2	3	4	5	2		1.68
3 The use of G2G system make it easy for tracking government expenditure.	1	2	3	4	5	2		1.76
4 The use of G2G system helps in getting the status of ongoing work.	1	2	3	4	5	2		1.68
5 The use of G2G system helps in archiving the organisational knowledge.	1	2	3	4	5	1		1.60

Transparency

One of the main objectives of implementing e-Government is to obtain transparency in government service. The information on any project or expenditure done by the government should be available on demand basis as per requirement in time without any hassle of data collection; then the exact points can be identified to minimise corruption (Sun, Ku, & Shih, 2015; Sun et al., 2015). The transparency is not only monetary value but also the availability of required information in time that increases accountability and trust towards the government (Cho, 2017). The statistics in Table 11 shows that most of the respondents agree that G2G system will be very much useful in establishing transparency, which indicates they have a positive mindset towards the use of technology in the government process. The mean values of the responses also support the thought that the majority of the officials agree on the improvement of public service delivery through the adoption of technology in the government service.

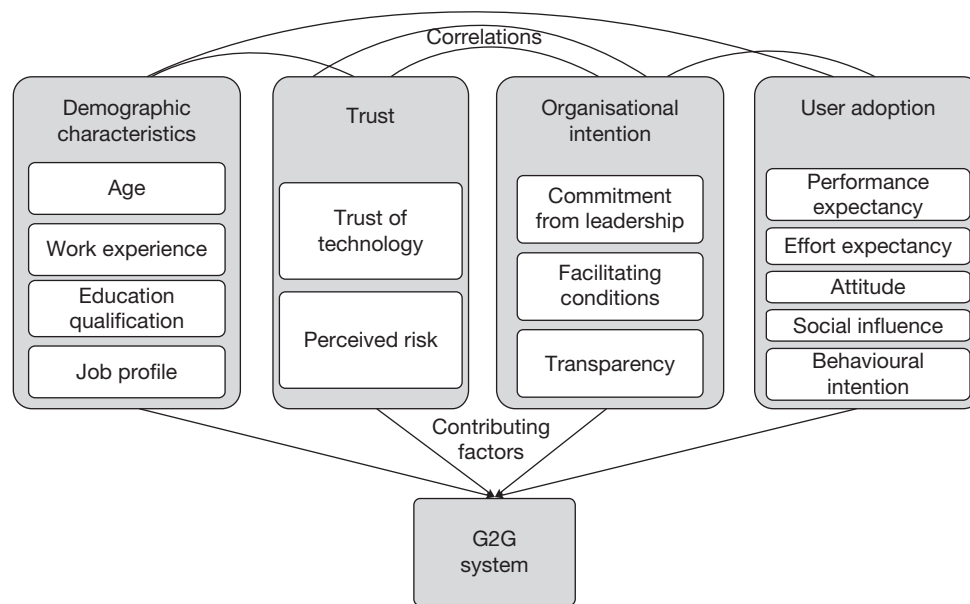


Figure 2: Factors influencing the acceptance of G2G system in GoN

Findings: Factors Affecting the Adoption Model for G2G Framework in GoN

The identified factors measured through the survey questionnaire are the key variables for the development of a G2G framework suitable for GoN. These factors are clustered into four groups – Trust, Organisational Intention, User Adoption and Demographic Characteristics to represent e-Government use determinants. Demographic characteristics include information about the respondents like education, work experience, age and job profile. Trust includes the factors measuring trust of technology use and risk associated with it; Organisational Intention includes factors that represent the organisational commitment from leadership, facilitating condition and transparency need; User Adoption includes factors that represent users' idea on the system adoption like performance expectancy, effort expectancy, attitude, social influence and behavioural intention. Each of these groups has direct influence in the acceptance of the G2G system as indicated by the directly connected lines; also the factors are correlated to each other as indicated by the dotted lines. Figure 2 represents the findings of the contributing factors that affect the acceptance and adoption of the G2G system. The

conceptual model of G2G system adoption is further explored through UMEGA to come up with an exact model of G2G system acceptance and implementation.

Conclusion

The descriptive statistics of the survey response shows that majority of the officials are in favour of technology use as they are aware that G2G system will enhance their performance in the job, brings transparency in service and they do not require much effort to use the system. The gap is in the understanding from the leadership whose role is crucial in ICT use and implementation, as their commitment can provide better direction to an organisation. There is room for improvement in providing better facilitating conditions for ICT system use addressing the necessary security and privacy issues so that officials will not have any insecurity to use the system. A suitable technology adoption model specifying the factors influencing the adoption with their contribution in adoption will help to close the gap. The gap also lies in understanding the mindset of the government officials who directly interact with the system. They require adequate training, education and awareness on the use of the technology that will enhance their capability in the use of technology in service delivery. This lacking has affected in the

establishment of a G2G system that can be used within the government to make quick decisions.

Adequate research on technology acceptance seems to be lacking in GoN, which reflects the poor implementation of e-Government systems. The organisational leadership needs to encourage technology use as the leadership can provide direction to the organisation. E-Government provides a digital platform where the necessary stakeholders can interact with each other, then communication with each other becomes easier. DRM with the implementation of a G2G system will be a well-coordinated and communicated event within the accountable organisations. The better communication between the stakeholders will enhance the accountability which in turn will strengthen the governance of DRM, thus establishing an effective DRM system in GoN.

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Leveraging Existing Institutional Capacities for Strengthening Disaster Management: A Study on the Potential of India Post

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ABSTRACT: Department of Posts, India, a.k.a. India Post established in 1854 is one among the oldest and largest government undertakings in India. With a vast network that spread across 154,965 post offices with 1,39,067 in rural areas, IndiaPost holds the title for the largest postal network in the world (*Annual Report*. Department of Posts, Govt of India 2018). However, this jumbo network was completely kept unturned in the disaster management framework in the country so far. The National Disaster Management Plan 2016 that stipulates various institutional mechanisms under the Government of India for execution in different phases of multiple hazards has not awarded any role to India Post (The National Disaster Management Plan 2016), India's official logistics service provider. This paper attempts to identify the strengths and weaknesses of IndiaPost which are relevant in disaster management and explores the multiple possibilities of the organisation in aiding to manage disasters. The fact that most of the developing countries which are majorly affected by disasters have well-established postal networks adds up to the scope of this study.

The study examines various guidelines issued by the Universal Postal Union (hereafter UPU) on disaster risk management in the postal sector. Disasters can hamper the functioning of the postal service, disrupting an important channel of trade and communication, whereas a resilient postal department can contribute much to the post-disaster rescue and relief operations (Building Resilience: A Guide to Disaster Risk Management for Postal Sector 2016). Sendai Framework for Disaster Risk Reduction 2015 calls for mainstreaming DRR within and across different sectors and enhancing economic, social, cultural and health resilience of persons, communities, countries and their assets (Sendai Framework for Disaster Risk Reduction 2015–2030, 2015). As a key player in the government sector, postal service can contribute much into sustainable development, climate change and disaster risk management initiatives (United States Postal Service Climate Change Adaptation Plan 2014). The signing of MoU between the UPU and World Meteorological Organization for sharing of climate and weather information predictions can be read along with this (Partnerships on disaster risk management in the postal sector 2015). The postal sector provides daily services including mails, parcels, logistics and financial services and hence resilience of the organisation is extremely important for early restoration of disrupted services (Iscaro 2016). International actors like the UNDP are campaigning for the importance of capacity development of individuals, organisations and societies for disaster risk reduction, by reducing vulnerabilities to disaster risks and mitigating the adverse impacts of hazards (Strengthening Capacities for Disaster Risk Reduction 2011). The study investigates the existing capabilities of the postal department and explores how building up capacities of this institution can contribute to disaster risk reduction and management. This is

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important as restoration of postal services is a signal of government services getting back to normal, with the trust that people still have in the post office (Ferris 2014). This study looks into the measures taken by India Post to incorporate disaster risk management into its operations in the light of recent mega floods that happened in the state of Kerala which resulted in heavy loss of infrastructure to the postal service along with other economic losses. At the same time all major post offices in the state functioned as collection points of relief materials. The various roles that can be enacted by the post office before, during and after a disaster ranging from early warning dissemination to relief distribution, beneficiary identification, transfer of financial assistance into bank accounts and above all establishment of humanitarian supply chain leveraging its own infrastructure, have been looked into in detail. The basic features of a humanitarian supply chain – agility, adaptability and alignment (Lee 2004) – can be attributed to the existing postal supply chain. The results of the study are presented in the form of a project adopting the Logical Framework Approach (LFA).

The best practices in disaster management include tapping of existing capacities for disaster response and recovery and strengthening them for mitigation and preparedness by mainstreaming disaster risk reduction and thereby building resilience of the organisation. While on one hand the study calls for preparation of dedicated disaster management plan/business continuity plan for the Department of Posts, India, with geographical mapping of post offices located in hazard-prone areas, on the other it opens the window of a multitude of tasks the department can undertake in the realm of disaster management which may, to a certain extent, help in bringing back the past glory of the postal service.

KEYWORDS: disaster management, postal service, India Post, resilience

India and Disasters

According to the World Disaster Report 2018 released by the International Federation of Red Cross and Red Crescent Societies, over the last 10 years EM-DAT has recorded 3751 natural hazards which affected around 2 billion people and resulted in an estimated economic loss of \$1658 billion, in 141 countries across the world (World Disasters Report 2018). India also witnessed a number of disasters in the past resulting in huge human, economic and environmental losses. India ranks 75 out of 172 countries in the World Risk Index 2018 based on its exposure, vulnerability, susceptibility, lack of coping capacities and lack of adaptive capacities (BündnisEntwicklungHilft 2018). Many parts of the Indian subcontinent are vulnerable to various types of disasters due to its geographic location and climatic conditions. Fifty-five per cent of the country's total area is vulnerable to earthquakes, 40 million hectare land mass is vulnerable to floods, 68 per cent of net sown area is vulnerable to drought, its lengthy coastline in the east and west are vulnerable to cyclones and the sub-Himalayan/Western Ghats are susceptible to landslides (Planning Commission 2002). India's

high vulnerability to natural hazards can be related to expansion of population, industrialisation and resultant urbanisation, environmental degradation, unplanned development and climate change (NDMA 2009).

Institutional Mechanisms for Disaster Management in India

Even though India has been a hot spot of 'natural' and man-made disasters ranging from floods, cyclones, earthquakes/tsunamis, landslides and drought to chemical/biological/radiological/nuclear disasters, there has not been any concerted action taken till the devastating Indian Ocean Tsunami of 2004. The period saw a paradigm shift in disaster management (DM) from a post-event relief centric approach to a cyclic process which includes mitigation, prevention and preparedness. The 10th Five-Year Plan 2002–2007 formulated by the Planning Commission of India, for the first time in the history of FYPs, included issues related to management and mitigation of disasters into its ambit. The Disaster Management Act of 2005

(‘the Act’ henceforth) forms the basis of disaster management and governance in India which laid down institutional, legal, financial and coordination mechanisms at the national, state, district and local levels for disaster management. At the national level the various dedicated institutional mechanisms stipulated by the Act include the formation of Cabinet Committee on Security, National Crisis Management Committee, National Executive Committee, National Disaster Management Authority, National Institute of Disaster Management and National Disaster Response Force (Disaster Management Act 2005). The multi-tiered institutional system consists of the National Disaster Management Authority headed by the Prime Minister, the State Disaster Management Authority headed by the Chief Minister and the District Disaster Management Authority headed by the District Collector and co-chaired by the Chairpersons of Zilla Parishads/ District Panchayaths (NDMA 2009). The Act calls for the creation of national, state and district level plans for disaster management and following this the central government formulated National Policy on Disaster Management in 2009 and National Disaster Management Plan in 2016.

Central Ministries/Departments and Disaster Management

The DM Act 2005 makes it mandatory for central ministries and departments to have adequate disaster management plans. Section 37 of the Act laid down preparation of separate DM plans for all ministries or departments of the Government of India which should contain the measures to be taken for prevention and mitigation of disasters, integration of mitigation into development plans, preparedness and capacity-building to deal with disasters and roles and responsibilities for promptly and effectively responding to disasters (Disaster Management Act 2005). The National Disaster Management Plan outlines the roles and responsibilities of different central ministries to be played at the national level in managing disasters. The overall coordination of disaster management is vested in the Ministry of Home Affairs. Certain central ministries and departments have been notified for hazard-specific nodal responsibilities (see Table 1).

Table 1: Nodal Ministry for Management/Mitigation of Different Disasters

S. No	Disaster	Nodal Ministry/ Department
1	Biological	Ministry of Health and Family Welfare
2	Chemical and industrial	Ministry of Environment, Forest and Climate Change
3	Civil aviation accident	Ministry of Civil Aviation
4	Cyclone/tornado	Ministry of Earth Sciences
5	Tsunami	Ministry of Earth Sciences
6	Drought/hailstorm/ cold wave	Ministry of Agriculture and Farmers Welfare
7	Earthquake	Ministry of Earth Sciences
8	Flood	Ministry of Water Resources
9	Forest fire	Ministry of Environment, Forest, and Climate Change
10	Landslides	Ministry of Mines
11	Avalanche	Ministry of Defence
12	Nuclear and radiological emergencies	Department of Atomic Energy
13	Rail accidents	Ministry of Railways
14	Road accidents	Ministry of Road Transport and Highways
15	Urban floods	Ministry of Urban Development

Source: *National Disaster Management Plan, 2016, National Disaster Management Authority, Government of India, May 2016, New Delhi*

The national DM Plan proposes a responsibility matrix for preparedness and response using a multi-

hazard, multi-stakeholder approach, identifying 18 major tasks of response and assigning the tasks to various ministries/departments, among others. The tasks include the following:

- Early warning, maps, satellite inputs, information dissemination
- Evacuation of people and animals
- Search and rescue of people and animals
- Medical care
- Drinking water/dewatering pumps/sanitation facilities/public health
- Food and essential supplies
- Communication
- Housing and temporary shelters
- Power
- Fuel
- Transportation
- Relief logistics and supply chain management
- Disposal of animal carcasses
- Fodder for livestock in scarcity-hit areas
- Rehabilitation and ensuring safety of livestock and other animals, veterinary care
- Data collection and management
- Relief employment
- Media relations (NDMA 2016)

Reviewing the plan helped in finding out the gap that the Department of Posts, one of the oldest and largest departments under the Government of India, has not been awarded any significant role in the disaster management framework in the country.

Postal Service and Disaster Risk Management

Postal service has traditionally been considered as one of those departments under the national governments which have both social and economic values. The public service aspect of the postal service caters for the importance of access to information for preserving democracy, fostering commerce and promoting the general welfare (Pindus et al. 2010). With the rampant advancement in electronic communication technologies, the very existence of the postal service has come under question. However, as mentioned earlier, the social reach of the postal service to the last

mile and the influence it has on the economic system, through its incomparable connectivity from metros to the hinterlands, points to the untapped capabilities of the service. Postal service being a public service has unique direct relationships with the general public, affecting their lives on a daily basis. The primary role of it is to provide basic postal services to the general public which includes mail, parcel, logistics and financial services (UPU 2016). In many parts of the world people have trust in the Post Office and the post offices are the only visible agents of government in many small remote communities (Ferris 2014). Postal service enjoys certain privileges and monopolies accorded to it through legal and regulatory provisions (Pindus et al. 2010).

The growing trend of devastating disasters all over the world has significant impacts on the postal sector also. Disasters can disrupt mail services either by destroying the postal facilities and employees or as a result of break in the postal supply chain due to disruption in electricity, information technology and transportation facilities (UPU 2016). With the strong logistics and distribution infrastructure, the postal service is one of the first government services restored after a disaster. When the post office resumes operations, it is a clear signal that government is getting back to normal and that infrastructure is once again functioning (Ferris 2014). The ubiquitous network and the ample human resource can help the postal service effectively used in preparing for, responding to and recovering from disasters by serving as distribution point for emergency supplies, coordinating emergency aid operations, assisting in locating missing persons, facilitating money transfers in the affected areas and acting as basic means of communication when no other systems are available (UPU 2016). However, for the post office to perform these functions after a disaster, the service needs to be restored immediately for which resilience of the organisation plays an important role.

The UNISDR defines *disaster risk management* as ‘the application of disaster risk reduction policies and strategies to prevent new disaster risk, reduce existing disaster risk and manage residual risk, contributing to the strengthening of resilience and reduction of disaster losses’ (UNISDR 2016). Postal service reaches customers six days a week. Adverse weather conditions disrupting postal services are very common and the

postal service updates its transportation and delivery plans to prepare for and respond to such disruptions. Major natural hazards like floods, earthquakes and cyclones can directly impact the postal service exceeding its coping capacities by causing damage to infrastructure, vehicles and equipment, loss of mail items and customer data and even loss of lives of its employees. On the other hand the value of the service is highlighted during the post-disaster response phase. Thus by increasing the resilience of the postal service, resilience of the local communities can be increased which will help in better management of risks (UPU n.d.).

International Initiatives for Disaster Risk Management in Postal the Sector

The World Conference on Disaster Risk Reduction held in Hyogo, Japan, in 2005 underscored the need for

building the resilience of nations and communities to disasters by reducing vulnerabilities and risks to hazards (UNISDR 2005). In this line, in supporting the initiatives of the United Nations towards disaster risk reduction, the Universal Postal Union formulated a global disaster risk reduction and management policy for the postal sector. This policy will ensure that the postal sector adapts strategies to face the challenges of increased natural hazards, thereby increasing its resilience and making it a key component in disaster response (UPU n.d.).

The Sendai Framework for Disaster Risk Reduction (SFDRR) aims at substantial reduction of disaster risk and losses in lives, livelihoods and health and in the economic, physical, social, cultural and environmental assets of persons, businesses, communities and countries (UNISDR 2015). After the adoption of Sendai Framework, the UPU revised its disaster risk management framework to incorporate the priorities for action set forward by SFDRR.

Table 2: Sendai Framework Priorities of Action and UPU Revised Guidelines

Sendai Framework Priorities for Action	Revised UPU Framework
1. Understanding disaster risk	1.1 Support disaster risk assessment through the UPU guide on DRM 1.2 Enhance use of GIS-based addressing systems as a tool for disaster risk identification, assessment and preparedness 1.3 Encourage member countries to raise awareness on the environmental impact of postal activities and to make the postal network an infrastructure with resilience
2. Strengthening disaster risk governance	2.1 Enhance cooperation with restricted unions and coordination with regional development plans 2.2 Improve monitoring and evaluation of each member country's effort with national and local authorities 2.3 Enhance platforms for accumulating and sharing experiences on DRM structures and governance 2.4 Convene seminars/workshops in each region to develop a deep understanding of DRM 2.5 Maintain the UPU greenhouse gas inventory for UPU member countries 2.6 Exchange environmental best practices
3. Investing in disaster risk reduction for resilience	3.1 Promote cooperation between postal operators and national/local governments 3.2 Improve the use of information and communication technology for DRM 3.3 Promote the development and strengthening of disaster risk transfer in close cooperation with partners in the international community, businesses, international financial institutions and other relevant stakeholders

(Continued)

Table 2: (Continued)

Sendai Framework Priorities for Action	Revised UPU Framework
4. Enhancing disaster preparedness for effective response, and to 'build back better' in recovery, rehabilitation and reconstruction	4.1 Support implementation of a DRM policy in member countries through the guide on DRM for the postal sector
	4.2 Provide a guide and training tools/materials for risk reduction, preparedness, response and recovery
	4.3 Enhance UPU-coordinated response and provide assistance in resuming postal services after disasters by strengthening the UPU Emergency and Solidarity Fund
	4.4 Establish postal security standards to define the minimum physical and process security requirements applicable to critical facilities within the postal network
	4.5 Enhance use of the Emergency Information System (EmlS) to share information on emergency situations among member countries
	4.6 Consider the possible participation of the postal sector in early warning systems

Source: UPU. *Update of the UPU Disaster Risk Management Framework*. UPU, 2015

The UPU has come up with specific guidelines for implementing disaster risk management programmes in the postal sector. Major national postal operators across the world such as the Deutsche Post (Germany), the United States Postal Service, Japan Post and Australia Post have conducted research on the social and economic value of the postal service and identified the role the service can play during disaster situations. Many of these postal organisations have implemented disaster risk management policies in their operations, and in turn there are excellent examples of hazard events in which the postal operators intervened successfully to minimise the sufferings of the affected population. As Elizabeth Ferris has noted, there are 6 million people worldwide who work for national postal services and this resource can be used in preparing for, responding to and recovering from disasters (Ferris 2014). The Universal Postal Union has set up an Emergency and Solidarity Fund for providing emergency assistance to revive postal activities in affected areas (UPU 2010). The Union which functions as a primary forum for the postal sector's cooperation extended its helping hands in many disaster and conflict countries which include the South Asian Tsunami, the Pakistan Earthquake, Cyclone Nargis in Myanmar and post-war recovery in Liberia and Sierra Leone to restore postal services quickly (UPU 2010).

The United States Postal Service (USPS) took the lead among other postal operators in extending its service to the disaster-affected communities. Considering the fact that the USPS has become one of the most visible and most trusted federal agencies, reaching every household six days a week, the federal government recognised the contributions of postal service to the society other than mail delivery. This includes assisting the federal and state governments' efforts to prepare for a national emergency and to respond to disasters and terrorist attacks (Postal Regulatory Commission 2011). The postal service infrastructure can be utilised for providing communications between government and citizens and among citizens when electronic means of communication have been shut down. The address data base of the department can be utilised to locate displaced persons after a disaster. Being the only entity with a large enough footprint and rapid regular delivery to distribute medicines to citizens within hours of a bioterrorist attack (Postal Regulatory Commission 2011), the USPS contributed significantly to the recovery efforts after Hurricane Katrina which was possible because of the preparatory measures taken by the organisation. They shifted vehicles to higher ground and emptied the fuel, collection boxes were closed up, employee emergency contact information

was updated and withheld the mail bond for expected-to-be-impacted area, before the landfall of the storm (Katz 2015). The post-cyclone efforts include:

- Quickly restoring its retail service in the devastated areas enabling urgent communication.
- Establishing emergency post offices at temporary shelters to facilitate communications to and from displaced residents.
- Implementing quick routing changes to enable it to deliver mail to temporary delivery points.
- Providing valuable knowledge of the people, streets and neighborhood resources of the affected areas.
- Delivering informational flyers to disaster victims.
- Delivering disaster assistance checks.
- Providing a visible, trusted government presence in local communities and a source of emergency information. (Postal Regulatory Commission 2011)

Australia Post conducted a study on the economic and social value of the organisation which identified the role it can play in natural disaster planning, response and recovery in regional and remote areas with the trusted role it plays in these communities. The postal service establishes temporary bases to quickly restore mail distribution and communications and provides broader community assistance by sending supplies to remote areas. It also partners with other community organisations during the disaster recovery phase (Deloitte 2018).

India Post 'Reach Out Through Out'

History of postal service in India dates back to the rule of the British East India Company which established General Post Offices in the Provinces of Calcutta, Bombay and Madras in the second half of the eighteenth century. In 1854 the present postal system was evolved by the Post Office Act of 1854. The present postal system in India is governed by the Indian Post Office Act of 1898, with amendments from time to time. In the post-independence period, with the integration of hundreds of princely states to the Indian Union together with their postal systems, the Department of Posts helped in binding the nation together, supporting the growth of commerce and ensuring a free flow of ideas and information (Kanniah 2013).

Thus the Department of Posts is one of the oldest and largest government undertakings in India. It functions with the brand name *Indiapost* and comes under the Ministry of Communications and Information Technology, Government of India. With a vast network that spread across 154,965 post offices with 139,067 of them in rural areas, India Post holds the title for the largest postal network in the world (Annual Report 2018). On average, a post office serves 7753 people and an area of 21.56 sq km. As an important institution under the government, Indiapost with its reach to the remotest corners played a significant role in the socio-economic development of India. The post office offers a range of products and services to the customers which include processing, transmission and delivery of mail, money remittance, banking and insurance along with many other retail and premium services. The department also undertakes the disbursal of wages under Mahatma Gandhi National Rural Employment Guarantee Act (MGNREGA) and social security pensions. The mission statement of Indiapost reads as follows:

- To sustain its position as the largest Postal network in the world touching the lives of every citizen in the country
- To provide mail, parcel, money transfer, banking, insurance and retail services with speed and reliability
- To provide value-for-money services to the customers
- To ensure that the employees are proud to be its main strength and serve its customers with a human touch
- To continue to deliver social security services and to enable last mile connectivity as a Government of India platform. (Annual Report 2018)

The organisational structure of the Department of Posts is headed by the Secretary, Department of Posts, and Chairperson, Postal Service Board. The Director General, Department of Posts, handles all matters relating to administration and operations. The Postal Services Board comprising the Chairperson and six members is the apex management body of the Department of Posts. The entire country has been divided into 23 Postal Circles for administrative convenience, headed by a Chief Postmaster General.

The Circles are further divided into regions and further into field units called divisions. The post offices, the operational units of the Department, are categorised into head, sub and branch post offices with presence in both urban and rural areas, covering the remotest parts of the country (Annual Report 2018).

India Post and Disaster Management

Indiapost has a mammoth network which extends out to the hinterlands of the country. Its strong presence as a public service provider, be it mail or financial or insurance, in the semi-urban and rural areas is what distinguish postal service from other government or public sector undertakings. The department reaches every household in the country six days a week. Review of literature revealed that this vast and last mile reaching capacity of the Postal Department has not been taken into consideration while preparing the disaster management framework in India. In countries like the United States, the USPS was designated as supporting agency for 7 of the 15 emergency support functions in the National Response Framework developed by the Department of Homeland Security. However, in India, the National Disaster Management Plan has identified definite roles for various central ministries/departments in different facets of the disaster cycle but has not awarded any roles to the Department of Posts (NDMA 2016).

On a daily basis the Postal Department adjusts itself to the disruptions happening in the transmission and distribution of mails with the amount of resilience it acquired from more than 160 years of its existence. However, India being a country frequented by disasters, many times the department faced extreme natural events which were beyond its coping capacity. In the Bhuj earthquake of 2001 more than 68 post offices were destroyed in Kutch alone and 3 were to be shifted to Ahmedabad.¹ The Uttarakhand flash floods of 2013 washed away the post office at Kedarnath shrine and it took three years to restart functioning of the post office.² In the recent Kerala floods in August 2018, 99 post offices were completely submerged in 12 districts across the state out of which 92 remained inaccessible during the flooded days.³

Out of the 18 major tasks or responsibilities as per the responsibility matrix in the National DM Plan, this study tries to find out the areas in which the Department of Posts can have a significant impact. The following tasks were identified based on extensive literature review and authors' own personal experience as part of the workforce of the department.

- Early warning, maps, satellite inputs, information dissemination
- Search and rescue of people
- Relief logistics and supply chain management

Existing Institutional Mechanisms in India for Early Warning Dissemination, Search and Rescue and Relief Logistics

The National DM Plan has put forward a system of tasks and responsibilities to be undertaken by central/state governments and other government agencies taking into consideration multiple hazards and the secondary disasters that follow a major disaster (NDMA, National Disaster Management Plan 2016). It has also been directed to prepare separate hazard-specific response plans by each of the central ministry/department/agency and the state government.

Proposed Role by Indiapost in Early Warning Dissemination, Search and Rescue and Relief Logistics

Relief Logistics

Logistics accounts for about 80 per cent of the total costs in disaster relief (L. N. Wassenhove 2006), making it the most expensive part in post-disaster operations. There are two main streams for disaster logistics: the first one being the actual disaster relief as an immediate response and the second is the continuous aid work like reconstruction and recovery (Decker 2013). Logistics has evolved from an activity involving movement of goods from one point to another to an integrated supply chain (Wassenhove and Tomasini 2009) which involves

suppliers, manufacturers, distributors, retailers and consumers. The strength of a supply chain process is analysed from its capability to manage the flow of both goods and information to satisfy the beneficiary requirements in a timely manner at an acceptable cost. The process requires warehousing, transport, fleet management, procurement and import and export. According to Hau Lee, the key qualities required for a competitive supply chain are *agility*, the ability to quickly respond to changes in demand and supply; *adaptability*, to adjust over time according to changes in market structures; and *alignment*, by sharing of knowledge and resources between different firms in the supply network (Lee 2004).

The use of supply chain management techniques is becoming more popular in humanitarian arena with cross-functional and inter-agency approaches becoming more common (Wassenhove and Tomasini 2009). Many private sector logistics operators contribute significantly in the disaster management framework internationally. Wassenhove ideates that private sector logistics can and should be applied to improve the performance of disaster logistics (Wassenhove 2006). There have been excellent examples of successful partnership between major logistics service providers and international humanitarian agencies. TNT, one of the giants in the international logistics sector, has been partnering with World Food Programme successfully for more than 15 years which was the first initiative by a UN agency to cooperate with private sector.⁴ IFRC partnered with DHL, one of the world's leading express and logistics companies, to smoothen its operations in disaster-affected areas.⁵ However, humanitarian supply chain management is more complex than commercial supply chain as it requires a greater amount of logistics in a shorter amount of time, involving destroyed infrastructure with collapsed transportation and communication networks, with huge demand that exceeds the stockpiles and a sense of urgency as there is threat of disease and death (TheEconomist 2005). Some major characteristics of a humanitarian supply chain are ambiguous objectives of different stakeholders, limited human/capital/infrastructure resources, high uncertainty of the situation, acute urgency in the operations and highly politicised environment (Wassenhove and Tomasini 2009). All these factors

can cause hurdles in the distribution of relief to the most vulnerable at the receiving stage or the last-mile distribution of relief goods. Hence last-mile disaster logistics management looks at the operational details of final links in the relief supply chain (TheEconomist 2005). A successful response depends on the proper utilisation of local capabilities also (Wassenhove 2006).

The postal department with its vast network of mail and sorting offices and transportation infrastructure can contribute very much to relief logistics in India in various phases including planning, preparedness, procurement, transportation, warehousing and distribution. The UPU envisages while formulating its strategy for disaster risk reduction that the extensive network of the postal department, post offices and mail processing centres can act as distribution points for emergency supplies and can help coordinate emergency aid operations.⁶

Search and Rescue in Disaster

Locating and identifying persons who went missing after major disasters have been a topic of concern for both affected governments and humanitarian agencies. The impact of disasters generally are outside the coping capacity of the affected community and hence the search and rescue operations will be carried out by agencies like the Police, Fire and Rescue, Army and NDRF who would not have clear information about the demography and geography of the affected areas. In such circumstances the postal service can contribute effectively as 'few people like the postal employees know so well the community they serve'.⁷ The letter carriers or the postmen can be useful in identifying vulnerable individuals or in helping to find out those who have been displaced, or have gone missing, by disasters, as they know the families in the neighbourhood (Ferris 2014).

Early Warning Dissemination/Risk Communication

The International Decade for Natural Disaster Reduction observed by the United Nations from January 1, 1990, is considered as a pioneering step in addressing disasters from a holistic point of view. It shifted the emphasis in

disaster management from post-disaster improvisation to pre-disaster planning and preparedness. An important aspect in prevention and preparedness is installation and operation of detection and warning systems, dissemination of warnings and instructions for action and communication of information to and from communities at risk before, during and after the disaster (Lechat 1990). In course of time with the development of science and technology, early warning systems based on sophisticated information and communication technologies have been established, but the dissemination of the warning signals to the forgotten villages without roads or electricity still remains a problem (Wassenhove 2006). Census 2011 reveals that 69 per cent of India's population of 1.21 billion inhabits its around 600,000 villages. In many of such villages located in the far-flung corners of the country, Indiapost is the only presence of government authority. Out of 154,965 post offices in the country, 139,067 (~90 per cent) are located in rural areas (Annual Report 2018).

World Meteorological Organization (WMO) underlines the need for effective dissemination of warning information to enable proper preparedness by organisations and communities. Trust is an important component of risk communication. If the information source cannot be trusted, the targeted population may not respond proactively to the warning which would undermine the purpose of early warning systems. The WMO also calls for the necessity of using multiple communication channels for warning dissemination so as to ensure that the information reaches the people at risk even if one of the channels fails.⁸ The Universal Postal Union had entered into a partnership with the WMO that aims at helping postal services to address disaster risk reduction strategies and increase the level of preparedness by updated information on weather and climate. The partnership also foresees the key role that the post can play in facilitating access to meteorological information to local communities.⁹ In the proximity of disasters the post office can serve as a centre for basic information about the precautionary measures that need to be taken. Considering the last-mile connectivity, vast presence and the level of trust enjoyed by the Post in India among its masses, the

Indiapost can better contribute to the early warning dissemination framework.

Conclusion

Based on the findings of this study a detailed analysis of the existing situation, stakeholders and problems has been done and comes out with a set of objectives that can be achieved through a project framework. Policy level intervention is required to bring the postal department into disaster management programme which is beyond its statutory ambit. If done, tie-up of the Post with the India Meteorological Department (IMD) for early warning dissemination, training of postmen in disaster-prone areas for involvement in search and rescue operations and enhancing of the capacities of major mail processing centres or Railway Mail Service Offices to enable them to handle huge volumes of disaster relief materials, among others, are to be taken into consideration. The scope of this study rests on the concept that it will help in better management of disasters in future in India.

Notes

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- ³ The Times of India. *Postal department struggles to tide over crisis*. August 27, 2018. <https://timesofindia.indiatimes.com/city/thiruvananthapuram/postal-dept-struggles-to-tide-over-crisis/articleshow/65554717.cms> (accessed December 12, 2018).
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Mainstreaming of Disaster Risk Reduction in Development Projects in India: Nexus between Policy Proclamation and Implementation

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ABSTRACT: Land use planning, disasters and development are clearly related. Risk-sensitive development practices and responsible land use planning can contribute to resilience building. At the same time, poorly planned development can intensify social, economic, physical and environmental vulnerabilities of the population and can trigger devastating extreme events. Therefore, the process of disaster risk reduction (DRR) has to be weaved into the developmental framework and India has given its commitment at national and international forums to ensure the same. However, since there is no specific policy on integrating DRR into development planning in India, this paper discusses the extent to which such integration is seen through one of the major projects: the Navi Mumbai International Airport (NMIA) in the planning and approval process, especially in the contexts of environmental vulnerabilities. The study suggests that there are serious gaps between the policy proclamations that seek to ensure sustainable development through DRR integration into development projects and its implementation. Thus, much more work is needed to enforce the idea of mainstreaming DRR to foster risk-aware or risk-sensitive development. Data for this qualitative study were obtained from both primary and secondary sources.

KEYWORDS: disaster, development, DRR, NMIA, vulnerability, environment

Introduction

It has been observed that frequency of disasters has been increasing at an unprecedented scale (UNESCAP, 2016). The year 2017 witnessed 318 disasters worldwide which killed more than 9000 people and affected 96 million people. These disasters also damaged properties and infrastructures of US\$314 billion. However, the average global economic damage for the last 10 years (2007–2016) was US\$153 billion. In the case of India during the last 30 years' time span between the years 1980 and 2010, the country has been hit by 431 major disasters resulting in enormous loss of life and property. These disasters killed 143,039

people and about 1.5 billion people were affected in the country during these three decades. These disasters destroyed properties and infrastructures costing more than US\$4800 million (CRED, 2018).

Disaster and development are clearly related (Pelling, 2003). Protecting life and livelihood is fundamental to any development goal. Poor development can intensify vulnerability and cause devastating impact, but at the same time, wise development practices may reduce vulnerability. Therefore it is essential that development plans and projects consider risk reduction (DRR) (Andharia, 2018). This also means that disaster risk reduction is a development issue and must be integrated into

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development processes to achieve sustainable development (UNDP, 2015).

It is estimated that by 2050 more than two-thirds of the world's population will live in cities, up from about 54 per cent today. The increased concentration of people demand huge requirement of infrastructure and economic activities. In the growing economy of India infrastructure sector plays key role. And the same would argue that India's overall development is propelled by the infrastructure sector which includes power, bridges, dams, roads and other urban infrastructure development. Between April 2000 and June 2017 construction development sector and infrastructure activities sector received FDI inflows amounting to US\$24.54 billion and US\$9.82 billion, respectively.¹ This sector is growing at such a speed that in 2016 India jumped 19 places in the index of World Bank's Logistics Performance (LPI) 2016, and ranked 35th amongst 160 countries (IBEF, 2017). Based upon the nature of services delivered, infrastructure can be divided into three categories: Physical, Social and Financial, and all of these serve financial and development purposes (Ghosh and De, 2014).

Despite the economic growth with a GDP exceeding over US\$2 trillion, India has not been able to manage the challenge of developing safe infrastructure in the era of rapid urbanisation. Lack of proper infrastructure planning and implementation caused by migration of large population, unplanned construction and encroachment into environmentally fragile areas and the government's lack of adherence to mitigation standards has increased the vulnerability and risk to hazards, both natural and man-made (GOI, 2015). A report of the United Nations prepared for the third world conference on DRR argues that the planning and development of infrastructures is still not viewed in the larger perspective of its implication on the whole system. Rather, the approach towards infrastructures is still 'asset based' which affects the visualisation of systematic DRR integration into its planning. Also because of the asset-based approach towards infrastructures, the risk assessments are not done considering the larger system in which the infrastructure lies.²

Infrastructural development and disaster risk are strongly interlinked. Infrastructure can potentially

play a very important role in reducing the vulnerability of the people (Ming et al., 2014). At the same time a construction project which is not cognisant of disaster risk can adversely affect the social, economic, physical and environmental vulnerabilities of the population. Though infrastructures are vulnerable to the impact of climate change, projects which do not weave in the various factors to reduce disaster risk can also cause environmental destruction and hence contribute to the climate change which further increases the vulnerability (IPCC, 2012).

Hence, constructions of infrastructure which do not consider the resilience of communities and safety of environment adversely affect sustainable development of a region. Further, the pressure of increasing population and rapid urbanisation complicates the land use patterns. It also increases vulnerabilities and disaster risk. Rapid urbanisation leads to the construction in economically fragile land and hence damages the ecology and increases exposure to hazards. Land use planning which is cognisant of disaster risk plays a crucial role in reducing vulnerabilities and increases resilience of the population (ADPC, 2011). Even small construction projects which do not consider the provisions for risk reduction such as the considerations of natural drainage system, or earthquake risk, fire risk and so on, can aggravate the impacts of disasters (Wolf, 2013).

Further environmental degradation caused by such unplanned development activities has been linked with the increasing climatological and hydrological or meteorological disasters. These disasters are increasing across the globe and in 2017 caused almost 90 per cent of deaths. In recent years India has been particularly prone to the weather-related disasters. Floods which have been increasing in India at an unprecedented scale contributed to the 60 per cent of the total population affected by disasters. While storms contributed to 85 per cent of the economic damages (CRED, 2018), infrastructure planning without proper integration and consideration of DRR strategies has played major role in environmental degradation and hence to the meteorological disasters. This has been evident in many cases in India such as the case of Mumbai Flood of 2005 and Chennai Floods of 2015, Hyderabad Floods of 2005, displacements caused

due to damn projects such as Sardar Sarovar Dam (Ramachandraia 2005, Kumar et al. 2017, Revi 2005). Therefore, it is very important to integrate DRR into the infrastructure planning and development for resilience building (World Bank Group, 2015).

Post-disaster contexts also attract a huge amount of resources to rebuild the infrastructures. This diverts the resources meant for the development to recovery processes which includes rebuilding and rehabilitation. Therefore, considering the role of infrastructure sector in the economic development of India and the need for embedding DRR into infrastructure projects is important (Palliyagurua et al., 2012).

India has endorsed various international DRR frameworks and has shown its commitment towards reducing people's vulnerability by increasing resilience and safeguarding the environment. Such treaties and frameworks include Hyogo Framework for Action (HFA), Sendai Frameworks for DRR, Paris Climate Agreement and more. India has also implemented laws and policies that are aligned with the commitments it has made at different forums to reduce disaster risk. Though there is no specific policy on integrating DRR into infrastructure planning in the country, there are a range of laws and legislations which address the issue of safer constructions project planning which does not harm people and environment or add to their disaster vulnerability. Such laws and policies are as follows: Disaster Management Act, 2005, National Disaster Management Policy, 2009, National Disaster Management Plan 2016, Environment (Protection) Act, 1986, and Model Town and Country Planning Legislation, Development Control, Building Regulations/Byelaws and Zoning Regulation, among others. These policy documents intend to integrate DRR into development plans and projects including infrastructure projects.

The Case of Navi Mumbai International Airport (NMIA) Project

Navi Mumbai is a part of Mumbai where the universe of this study 'NMIA' is located at. Navi Mumbai spreads over parts of two districts of Maharashtra: Thane and

Raigad. The region is hilly in some parts, and certain areas of the region are protected wetlands. After the enactment of Maharashtra Regional and Town Planning Act 1967 the City and Industrial Development Corporation of Maharashtra (CIDCO) was formed in March 1970 under Indian Company Act 1956. CIDCO was given the authority for planning Navi Mumbai in 1971.

During rainy season, issue of storm water is a critical issue in Navi Mumbai. This is because of 20 per cent area of Navi Mumbai is low lying and prone to tidal submergence. Environmental degradation, reclamation, slum, cutting of mangroves, parking, pollution, removal of hills and so on are the other critical issues in the city (NMMC, 2018).

NMIA project which has been studied here is a large development project which has been recently sanctioned by government to start the construction process. This project has been planned on an environmentally very sensitive land and in a low lying area. The project involves huge impacts on environment and population. Some of the major issues involved with this project are displacement, diversion and trimming of rivers, hill cutting, levelling and filling of marshy land in the coastal areas, cutting and damaging mangroves, and commercial construction in Coastal Regulation Zone (CRZ) areas (CIDCO 2010, Jamwal 2010, Goenka and Patel 2010). The project has received a sanction from government to start the construction.

There are several studies on DRR which have focused on how infrastructure projects contribute to increasing the vulnerability of the people. However, there is a big void in the academic study of Indian practices on the matter of implementation of mainstreaming of DRR through infrastructure planning and construction. There is also a void in the academic literature on how important stakeholders (applicant authority, government departments) while sanctioning a large development project address the issue.

The study with its limitations has intended to understand how the issue of reducing people's vulnerability and safeguarding environment is addressed while planning and approving an infrastructure project. It also aimed at understanding

how the policy level commitment of sustainable development through DRR integration into development projects translates at the implementation level. This helps in understanding the convergence or gaps between the policy level commitment on DRR integration and actual practice in infrastructure planning and construction. This study has looked at the impact of the NMIA project on people and environment and how efficiently the aspect of vulnerability reduction was conceptualised in the NMIA project. The study has also explored how cognisant the different major stakeholders involved in the project planning and implementation were of reducing disaster risk. This has helped in understanding the relationship between policy level commitment of integrating DRR into infrastructure projects for achieving sustainable development and infrastructure planning and implantation in India.

Methodology

To fulfil the research objectives a qualitative research strategy and case study design has been adopted. The case of NMIA project which is also a representative case of infrastructure projects in India has been chosen to address the research questions. Data were obtained from primary and secondary sources. Primary data were obtained through semi-structured open-ended interviews with the stakeholders. These stakeholders involved in the study were civil society representatives who have been working with the NMIA project affected persons (PAPs). The other stakeholders were disasters management policy makers at national and state levels, applicant authority CIDCO and various institutions such as ministries, departments and courts involved in the process of NMIA planning. The secondary data were obtained from the Environmental Impact Assessment (EIA) study report of the project and various documents related to the sanctioning of the NMIA project. The data obtained from these various sources were thematically analysed to reach the conclusion.

DRR framework in the context of sustainable development from ISDR (2004) helped in understanding the integration of DRR into the NMIA project from different aspects of sustainable development.

Selection of an Environmentally Very Sensitive Land for Constructing a Development Project NMIA

The land use pattern in case of selecting site for the NMIA did not cater to the DRR in a way that it has adversely affected environmental sphere of human life along with the vulnerability of the society and the economy as the core areas.

The selected site for the NMIA requires significant destruction to the local environment which has implication on increasing the risk of flood in Navi Mumbai. The construction of NMIA project would require cutting a hill, destruction of a huge mangrove area, diverting and channelisation of two rivers and filling up a huge mudflat area to level it to prepare the ground for the project. Further, the airport site comes under CRZ (1, 2, 3) area. According to the EIA report, the project's entire airport zone of 1615 hectares consists of mudflat, farmland and hills. The selected site for the project is environmentally very sensitive zone as the land cover analysis in the EIA report reveals that total land in project site consists of Mud flats (26.77 per cent), mangrove area (9.29 per cent), area under creek (8.83 per cent) and area which is yet to be urbanised (open) (38.47 per cent) (CIDCO 2010).

The CRZ Notification, 1991 is one of the most crucial legal policies to safeguard coastal environment in India. For regulating any development activities the coastal stretches of high tide line of the landward side are classified under the four coastal zone regulations. These zones are CRZ-1, CRZ-2, CRZ-3 and CRZ-4. Any infrastructure development work is controlled in CRZ areas not only to save any damages to the coastal areas but also to reduce vulnerability of the coastal population and mitigate disaster risks to the population and property (MoE&A, 1991).

The coastal areas are generally prone to the natural hazards such as storms, cyclones and tsunamis.³ It's important to maintain coastal ecosystem as they can prevent natural hazards from turning into disasters (MoEF 2005). CRZ categories play a very crucial role in integrating DRR in infrastructure project by regulating construction activities in to the coastal areas which play a significant role in mitigating the impact of disasters such as flood, tsunami and storm.

But the areas selected for the NMIA project were declared under CRZ categories many years before the formulation of NMIA project which happened in 2007. In that case the question arises why the applicant authority did propose a huge construction activity in a very sensitive coastal area which would cause immense damage to the local environment. CIDCO and Government of Maharashtra (GoM) applied to the Ministry of Civil Aviation (MoCA) for approving NMIA project knowing very well that the site falls under the approved CRZ (1, 2, 3). This explains that CIDCO and GoM were not sensitive enough towards the vulnerability of coastal environment. This also indicates a huge flaw in government's strategy to safeguard coastal environment as despite the provisions of CRZ Notification, 1991, applications for construction activities were entertained by ministries such as Ministry Of Environment and Forests (MoEF) and MoCA. The NMIA project was not a life saving project which would have required amendment in a legal notification which is very crucial to saving lives by decreasing the disaster risk.

Risk of Flood

People in the project affected area have been sceptical about the increased risk of flood in the area due to the NMIA construction. Panvel is a low lying area. This makes it already vulnerable to floods. Coastal ecosystem such as mudflats and mangroves are crucial to reducing the impact of flood. Diversion and channelisation of rivers may intensify the risk of flooding in the area.

Impact of Mudflat Filling

Mudflats help in reducing the intensity of flood in coastal areas. Mudflats dissipate wave energy, thus reducing the risk of flooding low-lying land (JNCC 2008). NMIA project site consists of mudflats which would be filled with concrete and levelled to prepare land for constructing airport. Hence project would completely damage the mudflats in the project site. The study of water level rise pattern conducted by Central Water and Power Research Station (CWPRS) in 2009 indicated that the filling of mudflats in the project site would result in marginal rise in the water levels in the Panvel

creek reach along the proposed airport boundary. But the impact of the water level rise can be mitigated by elevating the project by 7.0 – 8.5 metres.

This explains that despite knowing the fact that project construction will increase the water level in Panvel creek NMIA is hugely dependent on technocratic solutions to avoid the impact of water level rise and hence avoid the risk of flooding.

Impact of Diversion and Channelisation of Gadhi and Ulwe Rivers

The project's location and activities will require diversion of the Ulwe River to the west into the Thane creek from the Panvel creek. River has a catchment area of approximately 35 square kilometres. Project also requires training of the Gadhi River as it flows through the site where airport construction is planned. Gadhi River falling in the airport area will be trained to meet Panvel creek directly.

EIA study agrees that this change in the natural flow of the rivers would adversely affect the aquatic ecosystem. It mentions that 'channelisation leads to altering of original dimensions of the rivers along with extreme physical disturbances, alterations in river bed morphology, change in flow characteristics and elimination of bank cover'.

On the recommendation of MoEF CIDCO appointed CWPRS, Pune for mathematical modelling on the hydrology of the NMIA project area. The idea behind this study was to reduce and mitigate any risk of flood or any adverse impact of channelising these rivers in and around the airport site and to see the impact of NMIA on the water level rise in the region. CWPRS, Pune studied 100 years rainfall pattern. The study indicates that the channelisation of rivers would cause rise in the Panvel creek's water level and also along the airport site. Due to diversion of the Ulwe River, there will be a rise in Ulwe's water level too. This rise in the water level will be more near the point of diversion of the Ulwe River (CWPRS, 2009).

But CWPRS rejects any possibility of additional flood due to the airport project in the area.

Though it suggested that to mitigate and prevent flood risk airport complex should be built at an elevated height of 8.5 metre from the earlier planned 7.0 metres.

The other stakeholder and the project implementing authority, CIDCO said that the mitigation measures suggested by the CWPRS have been incorporated into the NMIA project. EIA study of the project is also easily convinced with any finding that goes in the favour of the NMIA.

However, people in the project affected area are concerned over the issue of flooding in the project site due to those drastic changes in the local environment and alteration of natural flow of two rivers. A respondent who has been working on the environmental issues shared: 'The past experiences with the Mithi River diversion and its impact during the floods of 2005 on the CSIA airport and the other parts of Mumbai is well known. It is ironic that we are not learning from our past mistakes and still planning another airport in Mumbai at the cost of the natural flow of two rivers. Technocratic solutions have failed in the case of Mithi River.'

Another respondent who is an environment journalist by profession and has been closely watching and participating in the proceedings of NMIA shared: 'During Chennai Flood of 2015 the Chennai International Airport got seriously flooded. Chennai International Airport is built on the floodplains of River Adyar. Due to the flooding of the airport all the operation at the airport were fully suspended for five days. This also suggests that dependence upon technocratic solutions and constructions in the flood planes or on the natural course of the rivers can never be fully safe. But NMIA project is repeating the same mistake.'

The natural flow pattern of Mithi River was changed to build the runway of CSIA. But during the floods of 2005 the river breached the airport wall and started flowing through the airport (Goenka and Patel 2010). Also, the Chennai International Airport has built its second runway runs over the river Adyar itself, with a bridge constructed across Adyar extending the runway's length by 1400 metres to a total of 3445 metres. But it couldn't survive the floods of 2015 in Chennai and the whole airport along with the city got flooded (Jamwal 2015).

It could be that reducing the size of the NMIA project or finding another site for constructing the airport was a better idea than having an airport with two parallel runways at the cost of the natural flow of two rivers and have the risk of flooding.

Impact of Mangroves Destructions

Mangroves play a very important role in maintaining ecosystem. Experiences across the globe suggest that mangroves act as natural barrier against the impact of storm and tsunami in the coastal areas. Government in India also realises crucial importance of mangroves in safeguarding coastal ecosystem and hence mangrove protection has been specifically mentioned in the Forest Conservation Act 1980. After tsunami, in the year 2006 Bombay High Court passed an order to stop the destruction of mangrove forest. This order to conserve mangroves has helped the Mumbai region including Navi Mumbai region maintain its mangroves.

The Coastal Regulation Zone Notification (1991) under the Environmental Protection Act (1986) recognises mangroves as ecologically sensitive and categorises them as CRZ-1 which means that this is vegetation spread over an area of protection of the highest order and any construction on that should be a prohibitive action.

The NMIA project site has total of 161.50 hectares of mangroves. But due to the project coming in to that site all of these 161.50 hectares of mangroves will be damaged and lost. Project site doesn't have any forest area, but it has naturally growing trees and vegetation. But due to the location of the project in an environmentally sensitive zone, all of these vegetations in the project area will also be lost. This would increase the vulnerability of the project area to the storm and tsunami.

Despite the fact that destroying the mangroves in the project area would increase the vulnerability of the project area to the storm and tsunami Bombay High Court permitted it with conditions of *growing artificial mangroves at other location to compensate the losses*. *Bombay High Court noted that 'we permit CIDCO to clear mangroves from 108.50 hectares subject to condition that CIDCO shall plant and develop 245 hectares of mangroves at the specific location on the site and also protect 370 hectares of mangroves as indicated in the affidavit dated 18 August 2011 in support of Notice of Motion No.419 of 2011'*.

Though CIDCO has agreed to the conditions of Bombay High Court, success rate of growing artificial mangroves is very poor. The Bombay High Court and CIDCO have not looked at this angle (Goenka and

Patel 2010). However, NMIA has plans to artificially maintain and enhance the natural environment in the airport vicinity which involves development of 245 Ha mangrove park/bio-diversity zone on Waghivali island along with the regeneration of lush green mangroves in an area of 310 ha at Kamothe and 60 ha at Moha Creek which is being proposed for preserving the ecological balance of the project area. In addition, a large water body to the north of the site has been retained (Construction Opportunities, 2016).

This explains that the NMIA project is heavily dependent on adopting technocratic solutions to compensate the losses it would make to the environment and coastal ecosystem. But past experiences of building infrastructures in the flood plains or in the natural course of rivers in Mumbai and Chennai adopting technocratic solutions have failed. Hence, there is always a risk of flood in the project area. However, as per the national disaster management policies a development project should adopt Do No Harm Approach to People and Environment in its construction and planning. But in the case of NMIA, project has severely damaged the coastal environment and has increased the risk of flooding in the area rather than decreasing.

Impact on the Vulnerability of the Project Affected Population

Study found that people whose livelihood concerns are involved in the NMIA project were not involved properly in the process of planning the NMIA. People were not taken in confidence before planning the NMIA project. Site for the project was finalised before consulting the population of that area. Hence, Gol and applicant authority CIDCO planned the project in Navi Mumbai without consulting local people. They assumed that once the project site gets finalised people will eventually have no other option but to accept the project implementation and relocate.

The applicant authority for implementing NMIA project sees PAPs outside of the project planning. There is a legal provision of public hearing to involve people in the process of project planning so that their concerns could be addressed in the most efficient manner for resilience building. But in case of NMIA public hearing

organised by State Pollution Control Board (SPCB) of Maharashtra did not address people's concerns over the issue of livelihood, displacement and damages caused to the local coastal environment. CIDCO went to consult people only during the mandatory public hearing conducted by the State Pollution Control Board of Mumbai. Organising public hearing was mandatory to get clearance from MoEF. CIDCO has limited its responsibility towards the PAPs only till the distribution of compensation and providing them a house in exchange for the house destroyed for project.

This has not only weakened the policy level commitment and institutional arrangements for disaster management but also negatively influenced people's participation, hence increasing people's vulnerability.

Further, the attitude of the applicant authority CIDCO towards the people shows lack of empathy towards the project affected people. CIDCO appeared more concerned about initiating the project. By offering people monetary and material compensation applicant authority feels that people should be satisfied with their offer. CIDCO feels that with the distribution of monetary compensation and a house with new land in a different location they have done best for the people. But local people in the project area have a feeling of anxiety as they are still not mentally prepared to permanently relocate from their native place. People are worried about the sustainability of their future generation. CIDCO didn't consider the social, cultural and mental wellbeing of the displaced people which is crucial to reducing the vulnerability.

The EIA study agrees that project implementation would threaten survival of fishery in the rivers, but still it concludes that project will not affect the livelihood security of the local fisherman communities.

In addition to that the threat to the traditional pattern of securing livelihood (fishing and agriculture) has occurred in the project area due to the dramatic change in land use pattern for constricting the NMIA. Also, the applicant authority doesn't have any plan to ensure any job security to the PAPs in the airport project or anywhere else. These factors have led to the increased socio-economic vulnerability of people due to the NMIA project plan.

The local people are hoping that they will get work opportunity in the NMIA project. However, CIDCO doesn't have any plan of giving them priority in any of its project activity. But it has planned to provide them training programme.

However, till date CIDCO has not started any skill development programme. CIDCO confirmed during the discussion that it has never promised PAPs any priority in the job opportunities arising at the airport. This contradiction in how people understand the project and the planning of CIDCO suggests that there is lack of trust between the two important stakeholders. Efforts should be made to bring project affected people and the applicant authority together.

One of the biggest drawbacks of NMIA project is its inability to consider a long-term livelihood sustainability of the displaced individuals, and therefore the DRR lens has been completely ignored here.

NMIA project is adversely affecting local people's livelihood security which could have serious implications on their vulnerability. Increased vulnerability of population will further complicate their risk to disasters. In that case it would undermine the policy level efforts of integrating DRR into the development projects. The National Disaster Management Plan (2016) and National Disaster Management Policy (2009) intended that every development project should plan in a way that it doesn't increase people's vulnerability. But in the case of NMIA plan it is evident that the project is weakening peoples coping capacity. This indicates a gap in the intension of disaster management policy on integrating DRR into infrastructure projects and its implementation.

Ignoring the Implication on the Whole System

The idea of DRR integration as understood by the NMIA project appeared more like asset-based approach to DRR. The stakeholders involved in the NMIA project have focused more on the safety of airport project area and its safe operation. The project has ignored the overall larger perspective of its implication on the whole system. This is not in line with the policy level visualisation of systematic DRR integration into infrastructure planning.

Cognisance of DRR and the Role of Different Stakeholders Involved in the Process of Project Sanctioning

The case study of NMIA revealed that the institutional mechanism existing in the country to ensure DRR integration into the infrastructure projects still has a long way to go.

The case revealed that the project proposal of NMIA has passed through many ministries and different government departments seeking the legal approval to start the construction. The project proposal also passed through the Bombay High Court, National Coastal Zone Management Authority (NCZMA), and Maharashtra Coastal Zone Management Authority (MCZMA) before the final approval.

In this entire movement of the NMIA project proposal through India's very powerful institutions, it was always known that project would be implemented in an environmentally very sensitive area which also includes CRZ areas. But this is ironic that none of these institutions rejected the idea of a second airport project citing the inappropriateness of the selected site. Other options should have been explored. Rather, they kept on allowing the application of project sanction process to move from one department to another until all the formalities were completed to manipulate facts in favour of the project. Also, the selected site remained the same. And the damages to the coastal environment and its impact on people's vulnerability remain the same even today.

The role of applicant authority CIDCO and Government of Maharashtra needs critical questioning. These government agencies proposed the NMIA project at a site despite the fact that the land was environmentally very sensitive and played a crucial role in the safety of the coastal areas of Navi Mumbai. CIDCO was absolutely aware from the beginning that a significant part of the land used for the construction of NMIA project falls under CRZ-1, CRZ-2, CRZ-3 and CRZ-4.

As per Indian policies the infrastructure development work is controlled in CRZ areas not only to save any damages to the coastal areas but also to reduce the vulnerability of the coastal population and mitigate disaster risks to the people and property

(MoE&A, 1991). But the applicant authority continued to peruse the project till it got final approval and land development work started.

In 2007 starting the process of obtaining environmental clearance GoM applied to MoEF. It was only then that for the first time the issue of the impact of project site on the vulnerability of people and environment was considered. Only at this stage the issue of project area falling into CRZ areas was discussed.

In the year 2006 Ministry of Environment and Forest issued EIA notification to make environmental clearance mandatory for the Greenfield Airport project. This notification is under the Environment Protection Act (1986) which is a very important Act for safeguarding the environment from any adverse impact of the development, projects and ensuring sustainable development and this is important to reducing the possibility of any disaster risk induced by the projects. The notification makes provisions for ensuring that natural resources are used wisely without harming the environment and the society. In today's world of industrialisation and rapid urbanisation this Act plays a major role in dealing with the challenges posed by the rapidly growing needs of the multiplying population. As mentioned in the Literature Review paper, construction of a Greenfield airport comes under category A which requires a mandatory EIA study of the project before granting it permission to start the construction to ensure that the projects do not increase any kind of environmental risk.

Hence, following the norms and suggestions of MoEF CIDCO hired IIT Bombay for Environment Impact Assessment study and CWPRS, Pune for conducting the required hydraulic model studies.

A respondent from the civil society shared during the interview: 'EIA study could be really effective in controlling the construction of unsafe infrastructures. But there has to be a clear cut provision to avoid any chance of its bias. Currently the EIA study is funded by the applicant authority only. Then how can one rule out the possibility of it favouring the applicant authority.'

In this case of NMIA project EIA study conducted by the CESE, IIT Bombay was actually sponsored by

the applicant authority, that is, CIDCO. Many project affected people shared their concerns over this issue. In such a loose institutional arrangement it becomes difficult to rule out the possibility of bias of the EIA study. This can have serious implications on the government's policy level intension and need for the integration of disaster risk reduction into infrastructure projects.

A respondent shared that 'EIA study has been conducted just to complete the formalities on paper to show that people and environment were considered before constructing the project. But actually EIA study was completely biased to favour CIDCO. Study was designed to confirm NMIA project formulation as per the requirement of CIDCO.'

EIA study has tried to justify the destruction of the local coastal environment citing that the vegetation in the project site was already decaying and hence its destruction for building the project doesn't make any serious environmental consequences. The point arises that if there is degradation of the coastal environment efforts should be made to restore it rather than using it as an excuse to destroy the environment for building constructing infrastructures.

Ironically, despite there being exhaustive list of laws and legislations, powerful government institutions, and tools for protecting environment and reducing disaster risk the environment was legally allowed to be altered to suit the needs of the NMIA. Though the ideal case for sustainable development could have been where the project planning was altered to suit the environment.

Conclusion and Way Forward

Despite being the need of the hour for the sustainable development there is no clear cut policy for the DRR integration into the development projects. Unfortunately DRR is still an abstract concept and is open for interpretation. This has led to the manipulation of the idea of DRR integration to favour and suit to the construction projects which can further increase the risk of disasters. The NMIA project which is a large construction project has not contextualised DRR in the contexts of socio-economic and environmental

spheres of sustainable development. The stakeholders involved in the NMIA project have focused more on the safety of airport project area and its safe operation. The project has ignored the overall larger perspective of its implication on the whole system of which it is a part. It has also ignored the long-term livelihood sustainability of the displaced population. This is not in line with the policy level visualisation of systematic DRR integration into infrastructure planning.

Hence, infrastructure projects in India as seen through the case of NMIA project are not cognisant of disaster risk reduction.

Different government ministries and departments involved in ensuring the integration of DRR before approving the infrastructure project also did not address the issue of risk reduction in the larger perspective of the sustainable development. Rather they were only concerned about the sector-specific risk reduction and mitigation in which their department specialises. This lack of coordination among different stakeholders involved in the process of integrating DRR into infrastructure projects creates the loophole through which a risky project can pass to obtain approval for the implementation as has happened in the case of NMIA project.

Hence, the study finds that there is a gap between the policy level commitment to ensuring sustainable development through DRR integration into development projects and its implementation.

Given the importance of DRR integration into development projects to work towards sustainable development there should be a specific policy dedicated to DRR. This DRR policy could have stricter provisions to adapt to risk reduction approach through every development project planning and implementation.

Too much dependence on technocratic solutions which may involve serious alteration to the ecology must be avoided.

EIA study being an important tool for DRR integration should be an independent inquiry. This means that there has to be a mechanism through which applicant authority neither should have the power of selecting the agency for conducting the EIA nor should be allowed to pay the financial cost of EIA study directly to the agency which conducts the EIA study. This could

be a way of ensuring transparency and truthfulness of such a crucial study to DRR.

There is a need to strengthen disaster risk governance system in India. This aspect should be addressed effectively.

Notes

- ¹ See <https://www.ibef.org/download/Infrastructure-October-20171.pdf> (accessed on 10 November 2017).
- ² See Infrastructure and Disaster: A contribution by the United Nations to the consultation leading to the Third UN World Conference on Disaster Risk Reduction. Available at https://www.preventionweb.net/files/40429_infrastructure.pdf (Accessed on March 2018).
- ³ See MoEF (2005): Report of the committee Chaired by M.S. Swaminathan to Review the Coastal Regulation Zone 1991.

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Rain Basera: A Reflection of Balance of Power between Executive and Judiciary

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ABSTRACT: Rain Basera is the initiative started by the executive and monitored by the judiciary in India. This balance of power is essential for the protection of rights of the homeless enshrined in the philosophy of the Indian Constitution. The history of night shelters started in 1889 with Mr Booths night shelters in London. Indian initiative Rain Basera is comparatively new. Both have faced certain challenges which are inherent to the nature of the right and the stakeholders. From the very beginning night shelters have required the balance of power between executive and judiciary for their existence and continuance. Even today, the executive actions are monitored by the judiciary with evolution of a credible body of philosophy for their continuance and providing the homeless with human existence which should never sink below a minimum standard.

KEYWORDS: homeless, shelterless, night shelter, rain basera, right to shelter

Introduction

Homelessness is a global phenomenon. Its dimensions change depending on the socio-economic and climatic construct of the society. The homeless are a highly invisible and vulnerable group, with waxing and waning numbers, which results in difficulties in data collection for any research on them. According to the 2011 Census, there were 1.77 million homeless people in India, or 0.15 per cent of the country's total population (hindustantimes.com, 2017). These include, homeless due to influx from rural areas to cities, women suffering from violence, children of homeless mothers, unemployed, people indulging in drug abuse and people who come to cities for medical facilities for their relatives admitted in AIIMS, New Delhi. In India, homelessness is a serious concern due to the severe cold waves in the northern part of the country and very hot summers. Moreover, they very frequently face malaria, jaundice, pneumonia, viral fever, diarrhoea and vomiting due to unsanitary conditions (timesofindia.indiatimes.com, 2018).

Though night shelters have a long history globally, they have always required a balance of power between the executive and judiciary for their existence. Executive action is essential for execution of legislative and other policies. Judicial monitoring of executive actions is an important aspect of this balance of power. It has resulted in evolution of a reliable jurisprudence relating to right to shelter in general and right to night shelters in particular. In order to appreciate the norms evolved, the author, have divided this paper into three parts followed by conclusions and suggestions. Part I deals with the origin and evolution of the initiative, Part II deals with balance of power between executive and judiciary and Part III deals with the challenges ahead followed by conclusions and suggestions.

Part I: Origin and Development of the Initiative

Though night shelters have been existing in Western countries for a longer time, they are a comparatively new development in modern India. They have been

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defined as a place provided for poor persons to pass a night under the roof, either free of cost or upon payment of a fee (Waldo and Walsh, 1896). The founder of 'The Salvation Army', Booth started night shelters in October 1889 in London, England. It earned fame as a charitable institution, not carried on for the purpose of profit or gain, not open to all comers, only on such condition as the manager might impose in the famous case *Booth v Ferrett* (Walsh, 1900).

In India, in order to cater to the needs of homeless, the Indian Government has started an initiative called Rain Basera, with government departments responsible for them. For example, in Delhi, Delhi Urban Shelter Improvement Board is the authority responsible for the homeless with around 198 night shelters under them. Long back, life-threatening situation of the urban homeless persons during winter season prompted the Delhi Government Authorities to find a solution. Since survival of homeless persons was felt very critical issue to be dealt with mainly during the severe winter season, the provision of night shelters for extending the shelter facility to the homeless persons was initially started by 'Slum & JJ Department, DDA' (an independent department under the control of the Delhi Development Authority, or DDA) for the first time at about eight locations in old Delhi areas on orders of Government of Union Territory of Delhi probably in 1984–1985. Presently, Delhi Urban Shelter Improvement Board (DUSIB), an independent department under Government of NCT of Delhi, is operating and managing about 198 night shelters with capacity of about 17,000 persons, through Shelter Management Agencies (SMAs). These night shelters spread in various parts of Delhi and are operational in 83 RCC buildings and 115 porta cabin structures throughout the year on 24 hours basis. During every winter season, about 50 German-type Pagoda Tent night shelters of waterproof and fire-retardant quality are also set up additionally on temporary basis at about 30 locations, for providing shelter facility to the increased number of homeless persons.

There are about 16,760 homeless persons in Delhi as per the survey carried out by DUSIB/SDMs in the year 2014 and their concentration is mainly in Walled City Area, Central Delhi, Railway stations, ISBTs and so on.

DUSIB was earlier named as 'Slum & JJ Department', which remained under control of DDA till 1992 and thereafter, it was under control of MCD till June 30, 2010. After this, it came into existence as DUSIB with effect from July, 1, 2010 under control of the Government of the National Capital Territory of Delhi through enactment of DUSIB Act 2010. The night shelters are being operated and managed by DUSIB with the funds allocated under one of the planned schemes of the Delhi Government.

In order to make smooth functioning of these night shelters (shelter homes) for the use of homeless persons in Delhi, a Standard Operating Procedure (SOP) has also been devised by DUSIB.

Moreover, rescue operation is also carried out by the SMAs during winter period for the homeless persons found on the roads/lanes to bring them to the nearest night shelter (Sharma, 2018).

These Rain Baseras provide basic amenities like durries, blankets, covered and enclosed structure, water, toilets and electricity.

It is important to note here that the Law Commission of India in its report no. 138 on legislative protection of Slum and Pavement Dwellers recommended: 'Statutory protection should be extended to the pavement dwellers by providing that notwithstanding any provision contained in any local law for the time being in force, no person using a pavement for shelter or for sleeping or taking refuge shall be evicted therefrom unless the Commissioner of Police or his deputy authorised in this behalf has recorded his satisfaction in writing that it is essential to do so for either maintaining law and order or on the ground that public interest so demands having regard to some special circumstances or to deal with a situation calling for urgent action in this behalf.'

Thus, the initiative started in India due to the policies of the executive.

Part II: Balance of Power between Executive and Judiciary

The monitoring of this executive function is evident in the study of homelessness throughout the world. In the United States, we have the landmark judgements

Callahan v Carey in 1981 for more shelters in New York and *Eldredge v Koch* in 1982 for more shelters for women (Stoner, 1983)

Though Rain Basera comes under executive function, it is keenly monitored by the judiciary in India, which is the patron of right to life under Article 21 of the Constitution of India. There are a plethora of cases which reflect upon the balance between executive and judiciary to take care of the rights of the homeless, who are the poorest of all poor, who need Rain Baseras. This part has been divided into three subparts – initial developments, PUCL (Night Shelter) Case and developments other than PUCL (Night Shelter) Cases.

A: Initial Developments

The discourse on right to night shelter begins with right to shelter in general in *Francis Caroline Mullin v UT of Delhi*. It reached its current stature with *PUCL (Night Shelter)* cases with the right to night shelter in particular. The developments can be summarised as follows:

- It was observed by the Supreme Court that the right to life includes right to live with human dignity and all that goes along with it, namely, the bare necessities of life such as adequate nutrition, clothing and shelter and so on. Of course the magnitude of content of components of this right would depend upon the extent of economic development of the country (*Francis Coralie Mullin v UT of Delhi*, 1981).
- It was observed by the Supreme Court that the right to life guaranteed by any civilised society implies the right to food, water, decent environment, education, medical care and shelter. Shelter for a human being is not mere protection of life and limb (*Chameli Singh v State of U.P.*, 1996).
- The case which brought forward a sensitiveness for the pavement dwellers was the famous *Olga Tellis* case which proved to be a watershed judgement, is incorporated in the syllabus of law schools around the world apart and is celebrated by civil rights activists. The Supreme Court held that right to livelihood is an equally important facet of the right to life because ‘no person can live without the means of living, that is, the means of livelihood’ (*Olga Tellis v Bombay Municipal Corporation*, 1986).

- While dealing with the Urban Land (Ceiling and Regulation) Act, 1976, Sections 20 and 21, there had occasion to deal with the human need for shelter in this case. The Honourable Apex Court observed that the basic needs of man have traditionally been accepted to be three – food, clothing and shelter. The difference between the need of an animal and a human being for shelter has to be kept in view. For the animal it is the bare protection of the body; for a human being it has to be a suitable accommodation which would allow him to grow in every aspect – physical, mental and intellectual (*Shantistar Builders v Narayan Khimji Totame*, 1990).
- It was observed by the Supreme Court that right to residence and settlement is a fundamental right under Article 19(1)(e) and it is a facet of inseparable meaningful right to life under Article 21 (*P. G. Gupta v State of Gujarat*, 1995).
- The Supreme Court made it expressly clear that it is the duty of the state to provide right to shelter to the poor and indigent weaker sections of the society in fulfilment of the constitutional objectives and that right to residence and settlement is a fundamental right under Article 19(1)(e) (*Ahmadabad Municipal Corporation v Nawab Khan Gulam Khan*, 1997).

B: PUCL (Night Shelter) Case

The judicial creativity began with the famous night shelter case, *Peoples Union for Civil Liberties v Union of India* in the year 2001. The co-relationship between hunger and deaths due to cold was examined by the Honourable Apex Court. A series of important Supreme Court orders followed. It resulted in a review of state-wise situations and issuing of directions. In the third letter written by the Commissioners to the Supreme Court dated January 25, 2010, the Commissioners sought a direction to all state governments/union territories in India, ‘to build and run 24 hour shelters for urban homeless people, with adequate and appropriate facilities’ (delhishelterboard.in). These developments can be summarised as follows:

- Attention was drawn to the report of Dr N.C. Saxena, Commissioner and Harsh Mander, Special Commissioner of the Supreme Court. It mentions

that malnutrition and hunger are the underlying causes for making people susceptible to extreme weather conditions. It was also appreciated that there is ample evidence to show that due to increase in Basal Metabolism Rate (BMR) with a fall in temperature, higher calories are required by the body to maintain the body temperature. As per the WHO report on Nutritional Needs in Emergencies 'a cold environment increases an individual's energy expenditure especially if shelter, clothing and/or heating are inadequate' (Peoples Union for Civil Liberties v Union of India, 2010).

Thus, establishing a relationship between hunger and deaths due to extreme cold and the first directions for permanent shelters, temporary shelters, community kitchens and AAY ration cards.

This resulted in night shelter cases in which monitoring and directions of the Supreme Court relating to night shelters

- Report submitted by Dr N.C. Saxena, Commissioner, and Harsh Mander, Special Commissioner of the Supreme Court was treated as interlocutory application and registry was directed to supply the copies of all the standing counsel of the states and union territories of India (*Peoples Union for Civil Liberties v Union of India*, 2010).
- Two night shelters in Nehru Place and Kalkaji were demolished by DDA. DDA was directed to re-erect the night shelters, accommodate the homeless in any other shelter, file affidavit of compliance within a week and hold inquiry against the officers responsible for demolition of the night shelters (*People's Union for Civil Liberties (night shelter matters) v Union of India*, 2011).
- The states and union territories were directed to inform the public about availability of the night shelters through print media and electronic media, so that the poor and the needy people may avail the benefit of the night shelters (*People's Union for Civil Liberties (night shelter matters) v Union of India*, 2011).
- It was observed that the state must discharge its core obligation to comply with Article 21 of the Constitution by providing night shelters for vulnerable and homeless people. The states must

ensure that at least temporary night shelters are provided to protect and preserve the lives of people in consonance with the constitutional philosophy enshrined in Article 21 of the Constitution (*People's Union for Civil Liberties v Union of India*, 2014).

- All the states which have not set up the night shelters according to the settled norms were directed to set up night shelters without loss of time because even during summers and monsoon season, it was felt imperative to have night shelters for the homeless people. It was observed that all the night shelters must have the basic facilities of drinking water, toilets, bathing, electricity, security and emergency medical checkup (*People's Union for Civil Liberties (night shelter matters) v Union of India*, 2011).
- The Supreme Court took note of the newspaper clipping depicting the plight of the patients and their relatives who are compelled to spend nights in severe and biting winter without roofs in AIIMS, New Delhi. After assurance from the Additional Solicitor General that whatever possible will be done to ensure there is no loss of life and at least temporary shelters would be erected the court gave directions to give adequate publicity in print and electronic media (*People's Union for Civil Liberties (night shelter matters) v Union of India*, 2012).
- It was directed that the shelter homes may be designed according to the particular geographical or other requirements of each state/UT and that comprehensive rules and regulations be prepared by various states and UTs (*People's Union for Civil Liberties (night shelter matters) v Union of India*, 2013).

Thus, night shelter cases have played an important role in monitoring the executive functions for rights of the homeless.

C: Developments Other Than PUCL (Night Shelter) Cases

The PUCL (Night Shelter) Case was followed by a plethora of cases which are evident to the fact that rights of marginalised and poor get protected in a system where there is separation of executive and

judiciary and a fine balance of power between them. Some of them are as follows:

- *In Court on its own motion v Government of NCT Delhi*, well known as Commonwealth Games Case, temporary night shelter for homeless at the Pusa Road Roundabout was one of the nine sites demolished for reasons of 'city beautification' and 'security' prior to the Commonwealth Games in the midst of winter (www.hic-saro.org, 2011). On January 19, 2010, in an interim direction, the Division Bench headed by Chief Justice A.P. Shah asked MCD to convert a portion of its four-storied commercial building in Motia Khan into a temporary night shelter at the earliest for the homeless people including those from Pusa Road roundabout (www.hindustantimes.com, 2010).

On January 21, 2010, the Honourable Apex Court adopted a total no excuse approach and directed the Delhi Government to provide the night shelters with basic amenities – blanket, water and mobile toilets – to all homeless by 5 p.m. (timesofindia.indiatimes.com, 2010).

- The Hanuman Road Residents Association, Delhi, prayed for an appropriate order or direction to restrain the respondents from setting up any permanent structure in the park and to forthwith remove the temporary night shelter illegally set up therein.

The Honourable Court directed that the prayer for closure of the temporary night shelters is unacceptable and the same was rejected. It was also directed that while improving the conditions in the temporary shelter homes due attention is required to be given to the permanent shelter homes so that the requisite permanent homes are constructed to serve the people in need of night shelters (*Court on its own motion v Government of NCT of Delhi*, 2011).

- In S.P. Mishra's case a petition under Article 226 of the Constitution of India was filed as Public Interest Litigation pleading for directions against the respondent's authority to refrain from constructing shelter home/Rain Basera on the land earmarked for public park in major shopping centre, Habibganj, Bhopal. The petition proceeded on the assumption that the said plot was reserved in the sanctioned

scheme for public park and, therefore, could not have been used for any other purpose.

In the reply affidavit of Deputy City Engineer (Civil), Municipal Corporation, Bhopal (Respondent No. 3) it was stated that the land referred to in the writ petition was reserved neither for 'open area' nor for 'park'. Whereas, the Rain Basera (shelter home) near major shopping centre at M.P. Nagar Zone II, Bhopal, was constructed on vacant land which was earmarked for future development.

Since the petitioner failed to substantiate the case made out in the petition, the petition was dismissed (*Shital Prasad Mishra v The State of Madhya Pradesh*, 2015).

- In Savyasachi Sahai's case, in order to confirm that adequate shelter has been made available to the erstwhile occupants of the demolished Amir Khusro Park night shelter from the demolished shelter home, the court appointed Lorren Bamniyal, Registrar (Appellate), as amicus curiae to conduct a spot inspection that day and submit a report to the court.

DUSIB was directed to ensure that this is only a temporary measure and that the male occupants are at the earliest suitably accommodated at a night shelter, which is close by (Savyasachi K. Sahai v Union of India, 2017).

- E.R. Kumar's case concerns National Urban Livelihoods Mission launched in 2013 under the 'Scheme of Shelters for Urban Homeless', issued by the Government of India, Ministry of Housing and Urban Poverty Alleviation. The NULM document also states that providing shelters that are equipped with essential services to the urban homeless in a phased manner is top priority. Being dissatisfied with the progress of providing shelters and utilisation of the funds under it, the Honourable Apex court formed a committee under the Ministry of Housing and Urban Poverty Alleviation to do physical verification of the night shelters and submit report (*E.R. Kumar v Union of India*, 2017).
- In Sunil Kumar Aledia's case the recent order of the Delhi High Court granted interim stay to the closure of 38 temporary night shelters in Delhi till the next hearing (*Sunil Kumar Aledia v Delhi Urban Shelter Improvement Board*, 2018).

In one hearing the Honourable High Court also directed inspection of all the electrical facilities, took fire safety audit within two weeks and drew an action plan to ensure preparation of a standard document for electrical facilities and fire safety measures at night shelters (*Sunil Kumar Aledia v Delhi Urban Shelter Improvement Board*, 2018).

Part III: The Challenges Ahead

Night shelters result in certain challenges which are a part of their inherent nature. Even the first night shelters started by Mr Booth, faced certain challenges. Even in those times there were discussions before the London County Council that the conditions of life of no human being ought to be allowed to sink below a certain minimum standard. When this principle is infringed, there is a danger not only to the individual but to the community. There are certain challenges in proper implementation of the Indian initiative of Rain Basera which also needs to be approached by both the executive and the judiciary on the same page. To mention a few:

- Women in general complain of safety issues and in particular about their safety when there are drunk men around (www.hindustantimes.com, 2016).
- Lots of homeless still prefer to sleep on street citing sanitation and other issues in Rain Basera (www.dnaindia.com, 2018).
- Since most of the persons are extremely poor and uneducated, there are incidences of crime and consequent issues in relation to administration of the night shelter for the incharge of the night shelter. In *Atul Chandra Dass v State*, it was established that the men who were fighting were sent out of Rain Basera by the incharge. The entries of the Rain Basera records were checked to prove that the three persons involved used to sleep in Rain Basera.

In *Laxman Singh v The State (Delhi Admn.)*, the witness testified that the accused Laxman disclosed that the knife and the identity card of Brahm Pal were hidden by him in the 'rain basera' opposite railway station and that accused Laxman led him and the police to the 'rain basera' and he produced a double-edged knife, the identity card of Chander Bhan and bedsheet from a quilt in the 'rain basera'.

Thus, Rain Baseras might get used for hiding the weapons of offence resulting in recovery thereafter.

- The caretakers in the Rain Baseras also get involved in immoral behaviour. In *State v Akil*, the court framed a charge against accused Akil for the offence punishable u/s 376(2)(n)(k) IPC to which he did not plead guilty and claimed trial. He used to make register entries in the Rain Basera where he met the prosecutrix. It was observed by the court that one Ms Darshana used to have confrontation with the accused regularly, being caretaker of female section of Rain Basera over the issue of timetable and more issues and that Ms Darshana provoke the prosecutrix and prevailed upon her to falsely implicate him in the present case appears to be more probable, tenable and comprehensible.
- People disowned by their influential families also tend to use Rain Basera meant for the poor and shelterless.
- As per Mr N.H. Sharma, Director, Night Shelter, DUSIB, there are three main challenges faced by the authorities.

– Availability Land Pockets

DUSIB requires allotment of land pockets from land owning or developing agencies like DDA, North Delhi Municipal Council and MCD for provision of adequate night shelters at the locations of high concentration of homeless people. But, adequate land spaces for providing proper night shelters as per NULM guidelines or otherwise have not been made available by land owning agencies at said locations. Some land pockets have been provided by DDA in outer periphery, that is, in Dwarka, Rohini, Narela and so on, which are of no use as concentration of homeless in these areas is very low.

– Attitude Problems of Homeless

Some homeless persons do not readily shift to the night shelters in winter season to avail shelter facility and remain on road berms/open areas, either due to alcohol/drug addiction or in the interest of getting some gifts/donations from the donators. They thus create embarrassment to the department in its rescuing efforts.

– Non-availability of Night Shelters for All Categories of Homeless at All Places in Delhi

There are instances when some poor families come to Delhi for some medical treatment purposes or for other purposes and have to stay for some days, but they do not find any family shelter at their place of stay. In fact the provision of night shelters for all categories of homeless persons is still lacking at all places due to non-availability of land spaces.

- While studying night shelters, we must take assistance from the research in foreign countries. Some of the changes in common with the Indian context are:

Availability of land pocket is a very serious concern. The NIMBY (Not In My Back Yard) approach of 'haves' also makes the issue complex (Henig, 1994).

Moreover, there is an essential interlink between violence against women and women's right to adequate housing. Studies show that women in general and rural women in particular face logistic barriers. They have far less access to domestic violence services which result in perpetual battering. Thus, there is a need for domestic violence shelters so that we are able to prevent further violence which results due to isolation of the victim and increase access to domestic violence services (Few, 2005).

Some foreign research confirm existence of drug resistant diseases among the inmates of night shelters. For example, drug resistant tuberculosis in inmates of night shelters in Boston (MMWR, 1985). We need research to handle the possibilities of spread of such diseases in night shelters.

The issue of psychiatrically disabled also needs to be addressed with a sensitive eye, or else we might also set an example of a Rebecca Smith freezing to death because she preferred a cardboard box more to any other home. When the news was published in *Washington Post*, it resulted in a nationwide concern for homeless (Stoner 1983).

One more challenge in the present conditions is how to raise the employability of the homeless so

that tomorrow they have a roof over their heads. We need some smart communities projects like Canada to ensure more employability among the homeless (Moser 2009).

Increasing the literacy of children of homeless or literacy development of the children in shelters is also a challenge since there are many misconceptions about homeless children. This can be done in family shelters, domestic violence shelters and shelters for children (MacGillivray, Ardell and Curwen, 2010).

Conclusion and Suggestions

We must begin with a concern that homelessness is increasing and the fact that it is pathology of society, not individuals.

Rain Baseras would function well only if the schemes are implemented by the executive and monitored by the judiciary. Thus, they depend solely on the balance of power between executive and judiciary.

The authors have the following suggestions:

- The corporates can be involved for financial aid to Rain Baseras. This will increase their resources and bring better results.
- Rain Baseras should be included as a head in the Corporate Social Responsibility.
- We must conduct phased research on existence of infectious disease or drug resistant diseases in inmates of Rain Baseras.
- Trends of unemployment affect the kind of homelessness. These factors must be appreciated by the policy makers.
- Entry to Rain Baseras for women must be restricted to handle the security issues.
- There should be a focus on both quality and quantity of the night shelters.
- We must look forward to Public – Private Partnerships.
- The public sympathy and concern for the homeless must also result in donations for Rain Baseras.
- We must start some smart communities projects like Western countries.

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Game-Theoretic Model-Based Resource Allocation during Floods

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ABSTRACT: In the event of multiple crises caused by the occurrence of natural disasters, it is highly important to allocate resources in a fair manner to each crisis location especially when the available resources are limited in quantity. In this paper, a multi-event crisis management system has been developed based on a non-cooperative, complete information, strategic form game model. In the proposed system, each emergency event is assumed to occur in different locations simultaneously and these locations are represented as the players in the game, who are competing with other players for the optimal allocation of resource units that are available in limited quantities at different resource stations. Each player incurs a cost for obtaining resources from different resource locations. The objective here is to obtain optimal strategies for individual players that will lead to an effective and fair resource allocation.

KEYWORDS: disaster response, resource allocation, game theory, non-cooperative game, Nash equilibrium

Introduction

An efficient and fast response to natural disasters is of paramount importance as a large number of people are seriously affected by such events. Disaster response involves the set of activities that help to minimise the effect of disasters. Flood causes enormous amounts of casualties and damage to properties. Search and rescue operations, evacuation of affected people, medical assistance and providing food, water and other essential materials are activities that should start as soon as possible to minimise the damage caused by flood. If efficiently planned responses are not implemented immediately, the situation becomes worse for the inhabitants of the flood-affected area.

Different resources are required in the crisis locations to cope up with the devastation caused by flood. Faster rescue operations, distribution of food and medicine and so on, are some key requirements in the flood-affected areas. In the event of multiple crises occurring simultaneously due to a natural disaster like flood, all the crisis locations will need a certain type

and certain amount of resources in a time-overlapping manner. So, it is important to perform a fair allocation of resource units to each crisis location especially when the available resources are limited in quantity.

Game theory is concerned with the analysis of strategies to deal with competitive situations and is useful in large variety of applications (Roger 1991). Seminal results such as Von Neumann and Morgenstern (2007) and Nash (1951) have made game theory an invaluable tool for decision-making. Multiple stakeholders such as various government and non-government agencies, private organisations, citizens and others must interact and collaborate for achieving effective disaster response. Since this consists of strategic interactions of different decision-makers, game theory becomes a relevant methodology for modelling disaster response. Recent research shows growing use of game theoretic models in disaster management (Seaberg et al., 2017). Gupta and Ranganathan (2006), Ranganathan et al. (2007), Gupta and Ranganathan (2007) and Wang et al. (2009) use non-cooperative game model where the game is played

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between crisis locations as each location desires the maximum amount of resources. The authors consider a multi-event emergency management system based on strategic game where the cost matrix for the game is computed based on the criticality of the events and the response time of the resources to reach the crisis location. Ranganathan et al. (2007) refer to social fairness as the metric for the utility model. Wang et al. (2009) use a game of complete information model and the Nash equilibrium is attained by using an improved Ant Colony Optimisation-based on computational algorithm. A sequential game is proposed by Yang and Xu (2012) with decision-makers and emergency as two players. A dynamic, finite game model with incomplete and complete information is used in the paper. There is considerable amount of research work that addresses various problems related to the flood-affected areas. Balasubramaniam et al. (2019) address the objective of land-water boundary identification based on information from LiDAR mounted on UAV; Shriwastav and Ghose (2019) present an approach for detection of land-water boundaries using UAV-acquired images of the area; Kashyap and Ghose (2019) present an approach to reroute the resource traffic based on instantaneous inundation information of the flooded region, and Ravichandran et al. (2019) present an approach for detection and tracking of survivors in flooded region by using UAV-based information.

In this paper, the problem of responding to simultaneously occurring multiple crises by allocating required resources has been discussed. A real-life scenario has been converted into a non-cooperative game to find the optimal solution to a resource allocation problem in a situation where resource quantity is limited. Our study is especially motivated by the recent floods in the Indian state of Kerala in 2018 where thousands of people were stranded in different districts. Allocation of resources including rescue helicopters, boats, relief materials and medical help to multiple crisis locations was extremely important. We model the allocation of rescue helicopters as a non-cooperative game between crisis locations and provide an equilibrium solution as an effective way to distribute resources.

The paper models the resource allocation with insufficient resource units as a non-cooperative game. Novel aspect of the proposed approach includes a strategy to select an equilibrium solution when there are multiple pure strategy Nash equilibria (PSNE) of the game. Additionally, our choice of cost function is able to allocate the responsibility of conflict caused by individual players by the demands they make on available resources.

Game Formulation and Nash Equilibrium

Game theory is the analysis of strategic interaction between a number of rational and intelligent decision-makers. In case of non-cooperative games, players will try to improve their utility or payoff (or reduce the cost incurred by them) individually. Here, we use non-cooperative strategic form of game model. These are also called matrix games and we represent these types of games through the use of a payoff or cost matrix.

A strategic form game can be represented as $G = N, (S_i)_{i \in N}, (U_i)_{i \in N}$ where

- (i) $N = \{1, 2, \dots, n\}$ is a set of players
- (ii) S_1, S_2, \dots, S_n are the strategy sets of the players $i = \{1, 2, \dots, n\}$ respectively
- (iii) $U_i: S_1 \times S_2 \times \dots \times S_n \rightarrow \mathbb{R}$ for $i = 1, 2, \dots, n$ are called the utility functions or cost functions.

Given a strategic form game $G = \langle N, (S_i), (U_i) \rangle$, a strategy profile $s^* = (s_{1^*}, s_{2^*}, \dots, s_{n^*})$ is called a pure strategy Nash equilibrium (PSNE) of game G if

$$U_i(s_{i^*}, s_{-i}) \leq U_i(s_i, s_{-i}), \forall s_i \in S_i, \forall i \in N \quad (1)$$

Actions of the players other than the i -th player are denoted as s_{-i} .

Payoff and Risk Dominance

A pure strategy Nash equilibrium is an action profile with the property that no single player can obtain a higher payoff by deviating unilaterally from this profile.

If solving a game leads to multiple PSNE, then we have to choose one PSNE out of the set. We use two properties of payoff and risk dominance to select a unique PSNE. The matrix below shows a two player–two strategy game matrix. Player P1 is the row player who chooses between rows X and Y. Player P2 is the column player choosing columns X and Y.

	X	Y
X	A, a	C, b
Y	B, c	D, d

Let us assume that the above game has two PSNE: (X, X) and (Y, Y). Their corresponding outcomes are (A, a) and (D, d). If $A \leq D$ and $a \leq d$ and at least one equality is strict then we say that the PSNE (X, X) is payoff dominant (Harsanyi and Selten, 1988). Otherwise, (Y, Y) is payoff dominant.

If $(A-B)(a-b) \geq (D-C)(d-c)$, then (X, X) is risk dominant PSNE with the outcome (A, a) (Harsanyi and Selten, 1988). Otherwise (Y, Y) is the risk dominant solution. $(A - B)(a - b)$ is called the Nash product (or product of gains for unilateral deviations) of the equilibrium (X, X) and $(D - C)(d - c)$ is called the Nash

product (or product of gains for unilateral deviations) of the equilibrium (Y, Y).

A Realistic Example

There was a devastating flood that occurred in Kerala during July–August 2018 (Mishra and Shah, 2018). The main reason behind this was unusually high rainfall during the monsoon season. The rivers overflowed, and water was released from the dams. Some districts in the hilly region were also paralysed by repeated occurrence of landslides caused by flood waters eroding the land mass. Most parts of Kerala were under high alert for a long period of time. The rescue work was conducted by Military, Army, Navy, National Disaster Response Force (NDRF), National Disaster Management Authority (NDMA), Coastal Guards, Border Security Force (BSF), and many non-government volunteers. Nearly one million people were evacuated from flood-affected areas to the relief camps. Army and Navy used their helicopters for the rescue and relief operation in flood and landslide affected areas. However, since multiple disaster events occurred simultaneously at different locations of Kerala, it made the resource allocation and other disaster responses extremely difficult.

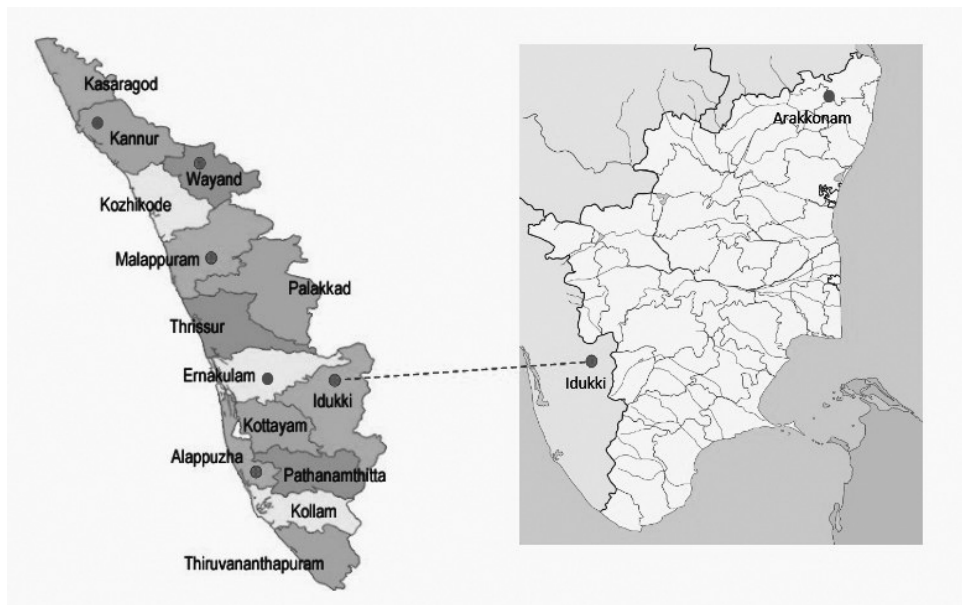


Figure 1: Crisis locations (red dots) and resource stations (green dots) (Image from Wikimedia Commons)

As a case study of our framework, we consider some of the districts of Kerala which were affected by flood and landslides (e.g., Alappuzha, Idukki, Malappuram and Wayanad) as the players. Here onwards, we will use the words “crisis locations” and “players” synonymously. Alappuzha and Malappuram were affected by flood while Idukki and Wayanad were mostly affected by landslides. Mostly, Navy helicopters were used for rescue and relief operations. Helicopters getting dispatched from different Naval base-camps for rescue operations are considered as the resources for which the players or disaster locations compete. We use the words “resource” and “helicopters” synonymously in our discussion.

We consider two naval base stations Cochin (RS1) and Ezhimala (RS2) as the resource stations in Kerala. However, as shown in Table 1, Arakkonam (RS3) in Tamil Nadu is the third resource station which will act as a backup and send helicopters in case the resources available in Kerala resource stations RS1 and RS2 are not sufficient to meet the need of the players.

We formulate this problem as a non-cooperative game and show that the solution to the game leads to a fair allocation of resources.

Table 1: Resource Stations (RS)

Naval Base Stations in Kerala	Naval Base Stations in Tamil Nadu
Cochin (RS1) in Ernakulam	Arakkonam (RS3)
Ezhimala (RS2) in Kannur	

The requirement of the helicopters for a particular crisis location is calculated as a function of:

- Area of the crisis location (A)
- Criticality of the crisis location (ρ)
- Resources needed per unit area (sq. km) of the crisis location (N)

The number of helicopters needed for a particular crisis location is calculated as $A\rho N$. We assume that in the crisis locations, the number of helicopters required is equal to one per 400 sq km. The total number of helicopters required for the players are calculated in Table 2.

Players Alappuzha and Idukki are closer to the resource station RS1 whereas players Malappuram and Wayanad are closer to the resource station RS2. Table 3 shows the sorted order of distances of resource stations from the players.

Table 2: Computation of Requirements of Helicopters

Crisis Location/ Players	Area (in sq km)	Criticality Factor	Helicopters Needed
P1: Alappuzha	1414	0.8	3
P2: Idukki	4358	0.6	7
P3: Malappuram	3550	0.75	7
P4: Wayanad	2132	0.65	4

Table 3: Distances from the Resource Stations and Sorted Order of Distances

Players	Approx. Distance from RS1 (in km)	Approx. Distance from RS2 (in km)	Approx. Distance from RS3 (in km)	Sorted Order of Resources
P1	70	375	650	RS1 < RS2 < RS3
P2	100	350	500	RS1 < RS2 < RS3
P3	186	150	560	RS2 < RS1 < RS3
P4	200	130	530	RS2 < RS1 < RS3

However, the requirement of resources may not be satisfied from the nearest resource stations. We assume that the number of helicopters actually available to the resource stations are as follows (Table 4):

Table 4: Availability of Helicopters in the Resource Stations

Naval Air Stations	Units Available
Cochin (RS1)	8
Ezhimala (RS2)	9
Arakkonam (RS3)	6

From the availability of resources in the considered resource stations, we can see that there is a conflict situation in sharing the resources. From Table 5, we see that the total requirement of the players exceeds the number of available resources in RS1 and RS2. Since P1 and P2 are nearer to RS1, first they will try to get their needed resources from RS1. If the resources available to RS1 are not sufficient for them, they will see the status in RS2. Since RS2 is also in resource-constraint situation, they will take RS3 as a backup resource station. Similarly, P3 and P4 will first try to get their resources from RS2 and then from RS3. As Table 5 shows, RS3 has adequate resources to fulfil the deficiencies of the players.

Table 5: Conflict between Total Requirement and Availability

Players	RS1	RS2	RS3
P1	3	0	0
P2	7	0	0
P3	0	7	0
P4	0	4	0
Total requirement	10	11	0
Availability	8	9	6

For effective disaster response, the players need a certain number of helicopters. However, helicopters in the nearest resource stations are insufficient to fulfil the requirement of both the players. In this situation, P1 and P2 play a two-player game to divide resources available in RS1 in a fair manner. In the same way, P3 and P4 play a two-player game to divide resources of

RS2. A general cost function model is proposed for the players which calculate the cost or penalty charged on the players for requesting several resource units. This cost function gives the entries of the game matrix. Each player has the intention to reduce the cost being charged on them for their own choices. The Nash equilibrium of the game identifies an optimal strategy for the players to choose.

Cost in Terms of Response Time

Mostly Sea King helicopters from the Indian Navy were used for rescue operations which have an average speed of 210 km per hour. From this data, we can calculate the time required for the helicopters to reach the crisis location from the resource stations. Table 6 gives the cost in terms of response time. If resource is coming from a nearer resource station, the response time will be less. If the player is forced to bring resources from a far location, the response time will increase accordingly.

Table 6: Cost in Terms of Response Time

Players	Resource Stations	Distance (km)	P_t (hr)
P1	RS1	70	0.33
P1	RS3	650	3.1
P2	RS1	100	0.48
P2	RS3	500	2.4
P3	RS2	150	0.71
P3	RS3	560	2.67
P4	RS2	135	0.64
P4	RS3	530	2.52

Cost in Terms of Fuel Consumption

For Sea King helicopters, 3700 litre of fuel gives a range of 1500 km. Thus fuel consumption rate is approximately 0.0025 kilolitre/km. Table 7 shows the fuel consumption amount for bringing just one helicopter from the respective resource locations.

Table 7: Cost in Terms of Fuel Consumption

Players	Resource Stations	Distance (in km)	P _c (kilolitre)
P1	RS1	70	0.175
P1	RS3	650	1.625
P2	RS1	100	0.250
P2	RS3	500	1.250
P3	RS2	150	0.375
P3	RS3	560	1.4
P4	RS2	135	0.3375
P4	RS3	530	1.325

Penalty Based on Their Mutual Actions

Players will always try to take maximum possible resources from the nearest resource stations. However, since this may demand more than the number of available resources, another penalty is charged on the players so that they are not inclined to take all their required resources from the nearest resource station. For a two-player game, (2) and (3) give this penalty for P1 and P2.

$$P_{l_1} = f(A_1, d_1, d_2) \left[\frac{n_1 - d_1}{n_1} \right] + \frac{n_1 - d_1}{n_1} + \frac{n_2 - (A_1 - d_1)}{n_2} + g(A_1, d_1, d_2) \left[\frac{\frac{d_1}{n_1}}{\frac{d_1}{n_1} + \frac{d_2}{n_2}} \right] \quad (2)$$

$$P_{l_2} = f(A_1, d_1, d_2) \left[\frac{n_2 - d_2}{n_2} \right] + \frac{n_2 - d_2}{n_2} + \frac{n_1 - (A_1 - d_2)}{n_1} + g(A_1, d_1, d_2) \left[\frac{\frac{d_2}{n_2}}{\frac{d_1}{n_1} + \frac{d_2}{n_2}} \right] \quad (3)$$

where $f(\cdot)$ and $g(\cdot)$ functions are defined as follows:

$$f(x, y, z) = \begin{cases} x - y - z & \text{if } (x - y - z) \geq 0 \\ 0 & \text{otherwise} \end{cases} \quad (4)$$

$$g(x, y, z) = \begin{cases} y + z - x & \text{if } (x - y - z) \leq 0 \\ 0 & \text{otherwise} \end{cases} \quad (5)$$

Here, n_1 and n_2 are number of resources needed by players P1 and P2, respectively. d_1 and d_2 are number of resources requested by players P1 and P2, respectively. The number of resources available to RS1 is denoted by A_1 .

In (2) and (3), the first term corresponds to the under-utilisation by the players, penalising players when the total demand is less than the available number of resources. This term is nonzero when the total number of resource units requested by two players is less than the availability. The second term corresponds to the dissatisfaction due to the player's own choice. The second term penalises the player when the demand d_i is less than n_i . The third term indicates how much restriction one player puts on the other player. The fourth term penalises the conflict created by two players. This term becomes nonzero if the total number of units requested by the players exceed the availability. The fourth term tries to fairly allocate the responsibility of conflict between players.

For P3 and P4 in RS2, we get:

$$P_{l_3} = f(A_2, d_3, d_4) \left[\frac{n_3 - d_3}{n_3} \right] + \frac{n_3 - d_3}{n_3} + \frac{n_4 - (A_2 - d_3)}{n_4} + g(A_2, d_3, d_4) \left[\frac{\frac{d_3}{n_3}}{\frac{d_3}{n_3} + \frac{d_4}{n_4}} \right] \quad (6)$$

$$P_{l_4} = f(A_2, d_3, d_4) \left[\frac{n_4 - d_4}{n_4} \right] + \frac{n_4 - d_4}{n_4} + \frac{n_3 - (A_2 - d_4)}{n_3} + g(A_2, d_3, d_4) \left[\frac{\frac{d_4}{n_4}}{\frac{d_3}{n_3} + \frac{d_4}{n_4}} \right] \quad (7)$$

where $f(\cdot)$ and $g(\cdot)$ functions are defined similarly as (4) and (5).

Here, n_3 and n_4 are number of resources needed by players P3 and P4, respectively. d_3 and d_4 are number of resources requested by players P3 and P4, respectively. The number of resources available to RS2 is denoted by A_2 .

Total Cost

The total cost incurred by the i^{th} player is given as follows:

$$P_i = \alpha_t P_{t_i} + \alpha_c P_{c_i} + \alpha_l P_{l_i} \quad (8)$$

where, $\alpha_t, \alpha_c, \alpha_l$ are positive scalar values and $\alpha_t + \alpha_c + \alpha_l = 1$. This total cost gives the entries of the payoff or cost matrices for all the players.

Choice and Decisions

From the cost matrix we calculate the Nash equilibrium for P1 and P2 in RS1 and for P3 and P4 in RS2. All the players will have the objective to reduce the cost incurred on them.

Case 1: When $\alpha_t = 0.05, \alpha_c = 0.05, \alpha_l = 0.9$, we get multiple pure strategy Nash equilibria (Table 8). All the solutions we obtain for this set of α -values are obvious solutions.

Using the previously explained definitions of payoff and risk dominance in Sect. 2, we can choose a particular PSNE as the desired solution. In the above case, (3, 5) is both payoff and risk dominant solution for P1 and P2. However, in RS2, there is no payoff

dominant solution. However, the equilibrium (5, 4) is the risk dominant solution.

The interpretation of the solution is that in RS1, the optimal strategy for P1 is to choose three units of helicopters and optimal strategy for P2 is to choose five units of helicopters. This is the way to fairly allocate all the eight units of helicopters available in RS1 among P1 and P2. Similarly, in RS2 with nine helicopters available, the optimal strategy for P3 is to choose five units of helicopters and optimal strategy for P4 is to choose four units of helicopters. RS3 being a back-up resource station will supply the rest of the resources needed by the players, but since it is far away from the crisis locations, fair allocation of resources from the nearby resource location is necessary for immediate initiation of disaster response.

Case 2: When $\alpha_t = 0.2, \alpha_c = 0.05, \alpha_l = 0.75$, we get unique PSNE (3, 5) in RS1 and two PSNE in RS2 (Table 9).

In RS2, none of the equilibrium solutions is payoff dominant. However, (5, 4) is the risk dominant and it risk-dominates (7, 2). We can interpret these solutions in the same way as we have done in Case 1.

Case 3: When $\alpha_t = 0.1, \alpha_c = 0.25, \alpha_l = 0.65$, we get unique PSNE for both RS1 and RS2 (Table 10).

Table 8: Nash Equilibrium for $\alpha_t = 0.05, \alpha_c = 0.05, \alpha_l = 0.9$

NE at RS1	Costs on P1 and P2	NE at RS2	Costs on P3 and P4
(1, 7)	(0.92601, 0.71131)	(5, 4)	(0.62423, 0.3531)
(2, 6)	(0.68208, 0.68512)	(6, 3)	(0.6694, 0.59476)
(3, 5)	(0.30006, 0.56369)	(7, 2)	(0.61696, 0.74119)

Table 9: Nash Equilibrium for $\alpha_t = 0.2, \alpha_c = 0.05, \alpha_l = 0.75$

NE at RS1	Costs on P1 and P2	NE at RS2	Costs on P3 and P4
(3, 5)	(0.3072, 0.87798)	(5, 4)	(0.98137, 0.4031)
		(7, 2)	(0.64911, 1.0448)

Table 10: Nash Equilibrium for $\alpha_t = 0.1, \alpha_c = 0.25, \alpha_l = 0.65$

NE at RS1	Costs on P1 and P2	NE at RS2	Costs on P3 and P4
(3, 5)	(0.3503, 1.3613)	(5, 4)	(1.6211, 0.57262)

Discussions

The example in Sect. 2 demonstrates how game theory-based solution gives a clear idea of the way resource allocation can be done in resource-constrained environment. The game has been formulated based on the practical data from the recent Kerala flood.

The crisis locations are the players and they incur some cost for availing resources. For different values of the α -set in (8), we get different pure strategy Nash equilibria. The Nash equilibrium is the best strategy for each player when the other players are also taking their best strategies. The PSNE can be interpreted as the way of allocating resources in a fair and optimal manner.

However, depending on the chosen values of the α -set, sometimes multiple Nash equilibria may come into picture. In case of single unique PSNE, the allocation of resources becomes straight-forward. However, in case of multiple PSNE, the decision about selecting a single solution is taken based on payoff dominance and risk dominance properties of the obtained equilibria. If a particular PSNE payoff dominates the others, we select it as the desirable PSNE. If payoff dominance fails, decision is taken based on risk dominance.

The chosen α -values give pure strategy Nash equilibria for all Cases 1–3. However, if PSNE does not exist, then we can find mixed strategy Nash equilibria (MSNE) as it will always exist. In case of MSNE the players choose their actions with some probability, not deterministically. MSNE solutions tell how the resources can be allocated to the crisis locations by imposing probabilistic notions.

Conclusion

In this paper, a game-theoretic solution for multi-event crisis management has been proposed. This method identifies the crisis locations as the players. The resources are available in a limited quantity hence one player's choice has a direct impact on the choices made by the other players. The players compete for an optimal allocation of resource units. If a conflict situation arises at any resource station, a non-cooperative game is formulated between the concerned players for fair allocation of resource units. The Nash equilibrium-based optimisation is implemented as it provides a fair

allocation to all the players. The entire idea has been explained by using a practical example based on the recent Kerala flood in India. The results produced in the paper shows that in this kind of resource-constrained situation, game theoretic algorithms can be potential and efficient solution for resource allocation.

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Multi-dimensional Approaches in Sri Lanka: National Policy on Disaster Management in Action

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ABSTRACT: On account of climate change, global warming and rapid and growing urbanisation, human civilisations are mostly experiencing the disasters. Currently, the biggest threat to the poor, developing and middle-income economies is the disaster because latterly we have seen that the impact of any particular disaster spread over a particular country, not being present in different countries at the same time. And that's why regional cooperation is still not fully operational. Of late, one of the important South Asian countries, Sri Lanka, has experienced several natural disasters, i.e. floods, cyclones, droughts, landslides, lightning, coastal erosion, earthquake and Tsunami, which is considered as the biggest impediment for the country's economic development and growth path. Sri Lanka's overall development is imitative and exemplary for the regional countries in terms of human development index, education and healthcare, but unfortunately, these achievements are fading due to the disasters. The poor, developing and middle-income countries want to get the long-term resilience with investing a minimum to counter the disaster, which is also permeable by their own economy. But the 2004 Tsunami has taught everyone about disaster management. But the catastrophic Tsunami of 2004 obligate the concerning authorities of Sri Lanka rethink about the disaster management and disaster resilience.

As an effective measure and operational instrument soon after Tsunami, in 2005 Sri Lankan government has adopted Disaster Management Act and later on in 2010 formulated National Policy of Disaster Management to integrate all government, non-government, private, civil society and international communities.

This study will be focusing on how the multi-dimensional national disaster management policy is implementing disaster risk reduction operations in Sri Lanka before and after any event of disasters.

KEYWORDS: disaster resilience, national policy, multi-dimensions, policy actions, multi-stakeholders, multi-sectors, multi-phases

Introduction

Sri Lanka is a small island state in the Indian Ocean with the former name "Ceylon". The total size of the island state is 6610 square kilometres with 1340 kilometres long coastal region (Wikipedia, 2018). This tiny island state is situated at the southeaster zone of Indian Ocean and remains disaster-prone around the

year having two types of monsoon wind (MoDM, Sri Lanka, 2018).

Flood due to heavy monsoon rain, downward pressure and drought due to lack of monsoon rain sometimes are the most frequent natural disasters. Besides these, landslides, thunderstorm, costal region erosion, environmental pollution, tsunami and cyclone are also strikes on Sri Lanka on a regular basis (MoDM,

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Sri Lanka 2018). Alongside the natural disasters, Sri Lanka has been affected with man-made disasters long back. With the movement of Liberation Tigers of Tamil Eelam (LTTE), the country continued civil war since 1982 to 2009. The organisation LTTE was tagged with terrorist organisation announced by 32 countries and agencies in the world, and due to their movement and civil war, severe man-made disasters, i.e. terrorist attacks, explosions and genocide, have hindered the path of overall development of the country (Wikipedia, 2018). But LTTE's civil war ended with the death of LTTE's chief Velupillain Prabhakaran (KIA) in 2009, and soon the Sri Lankan people were exempt from man-made disaster. Though the people of Sri Lanka got relief from the aversion of man-made disasters, but because of tropical monsoon, low terrain, flat in rolling plain land and moreover being a tiny island state, it has remarked as one of the most disaster-prone countries in the South East Asia (DMIS, Sri Lanka, 2018).

In almost every year, Sri Lanka was affected by flood in two occasions along with landslides, drought, storm, thunderstorms and so on. In light of the discovery for the disaster's history of Sri Lanka, we have found that this South Asian tiny country is located dangerously within two fault lines of Indian Ocean and the Bay of Bengal (Tamil Canadian, 2004).

Sri Lanka's warm and tropical weather brings heavy rainfall in the summer. Though it has a vast river channel but with heavy rainfall it fails to accommodate all the drainage water. However, the mainland of Sri Lanka has surrounded with prolonged river channel. The 335-kilometre-long Mahaweli River is the longest river in Sri Lanka, which is originated from Polwathura, Mahaweli area, and took the merge with Bay of Bengal after connecting one-fifth of mainland of Sri Lanka (Wikipedia, 2018). In addition, Sri Lanka has a total of 103 rivers including Malvathu, Kaya Oye, Kelani, Yan Oya, Dedura Oya, which have strengthened and enriched the drainage system of Sri Lanka. But due to extreme heat wave in summer, influence of monsoon and the monsoon wind encounter with the slopes of central highland cause heavy rainfall. This excessive heavy rainfall causes the flood in Sri Lanka; therefore, the central concern of the disaster management authority of Sri Lanka remains within the

hilly declivity and flood. Besides the flood, landslides, thunderstorm, coastal region erosion, tsunami, cyclone and so on agitate Sri Lanka throughout the year (Wikipedia, 2018).

To secure the disaster-prone Sri Lanka, the government is working with non-government, development organisations and other stakeholders continuously. The Sri Lankan government has taken a number of legal measures to ensure effective disaster management. Among these, the National Policy on Disaster Management which was approved by the National Council for Disaster Management in December 28, 2010, is notable (NPDM, 2010).

Profile: Sri Lanka

Democratic Socialist Republic of Sri Lanka is an island nation in South Asia, situated in the Indian Ocean towards the southwest of the Bay of Bengal and towards the southeast of the Arabian Sea. The island is verifiably and socially interwoven with the Indian subcontinent, yet is topographically isolated from the Indian subcontinent by the Gulf of Mannar and the Palk Strait. The administrative capital, Sri Jayawardenepura Kotte, is a suburb of the business capital and biggest city, Colombo. The aggregate territory of Sri Lanka is 65,610 sq. km with evaluated populace 21,670,000 (Wikipedia, 2018).

Physiographic Condition

Over 90 per cent of Sri Lanka's surface lies on Precambrian strata, some of it going back 2 billion years (Wikipedia, 2018). The granulite facies rocks of the Highland Series (gneisses, sillimanite-graphite gneisses, quartzite, marbles and some charnokites) make up a large portion of the island, and the amphibolite facies gneisses, stones and granitic gneisses of the Vinjayan Series happen in the eastern and southeastern marshes. Jurassic residues are available today in little zones close to the western drift, and Miocene limestones underlie the northwestern piece of the nation and expand south in a moderately restricted belt along the west drift. Sri Lanka is using land as arable land 13.96 per cent, permanent crops 15.24 per cent and others 70.8 per cent.

Demographic Situation and Population Density of Sri Lanka

The estimated population of Sri Lanka is 20,359,439 (Sri Lanka Population Census, 2012). The population density is 325 per square kilometres with an estimated growth rate of 0.913 per cent. According to the census report of 2012, the birth rate is 17.04 births/1000 population and death rate 5.96 deaths/1000 population. Average life expectancy is 75.94 years, which is higher than that of average of South Asia.

The fertility rate is 2.17 children born/woman and infant mortality rate 9.47 deaths/1000 live births (FAO, 2005).

Socio-economic Condition

Sri Lanka is a lower middle-income nation with a GDP for each capita of USD 4073 (2017) and an aggregate populace of 21.4 million individuals. Following 30 years of common war that finished in 2009, Sri Lanka's economy developed at a normal 5.8 per cent amid the time of 2010–2017, mirroring a harmony profit and a decided approach push towards reproduction and development, in spite of the fact that there were a few indications of a lull over the most recent couple of years. Monetary development has converted into imparted flourishing to the national destitution headcount proportion declining from 15.3 per cent in 2006/07 to 4.1 per cent in 2016. The country has comfortably surpassed most of the MDG targets set for 2015 and was ranked 73rd in the Human Development Index in 2015. The economy is evaluated to have developed by 3.6 per cent in the primary portion of 2018, after a

16-year low development of 3.3 per cent in 2017 (World Bank, 2018).

Natural Hazard Risk

The most widely recognised natural disasters in Sri Lanka are seasonal flood and other miseries due to the same, i.e. landslides. Though other events, i.e. lightning, drought, extreme wind events, earthquake, animal attack and cyclone, are not periodical like flood but they have great significance over the national growth. The country has experienced the worse hit by the Tsunami in 2004 which caused the death of over 35,000 people (ABC.NET, 2014). The trend of flood in Sri Lanka is changing for the past 10 years enormously. Fifty per cent of private sectors in all spheres of economic cycle got affected by the flood in 2010. Tropical storm Roanu caused flood along with landslides of 22 districts in Sri Lanka in May 2016. Hydrometeorological hazards are increasing since Sri Lanka is one of the worse victims of climate change in the world. Due to this new alarming concept, major flooding event occurred in 2010, 2011, 2014, 2016 and 2017.

The total expenditure of the Ministry of Disaster Management was estimated at RS. 690 million to mitigate the damages and losses due to the flood event in the year 2016 in Sri Lanka. In the course of 2007–2011, the local and central government expenditure for overall mitigation and rehabilitation process caused by disasters had exceeded RS. 1.7 billion (Talking Economics, 2017). According to the prevention.web, the probabilistic gross damage of economics in Sri Lanka is as:

Table 1: Average Annual Loss (AAL) by Hazard

Hazard	Absolute [Million US\$]	Capital Stock [per cent]	GFCF [per cent]	Social Exp [per cent]	Total Reserves [per cent]	Gross Savings [per cent]
Earthquake	0.77	0.000	0.004	0.024	0.012	0.005
Wind	1.70	0.001	0.009	0.052	0.026	0.012
Storm surge	18.57	0.009	0.095	0.569	0.281	0.132
Tsunami	1.75	0.001	0.009	0.054	0.026	0.012
Flood	143.75	0.069	0.732	4.403	2.174	1.023
Multi-hazard	166.54	0.080	0.848	5.101	2.519	1.185

Source: Prevention.Web, 2014

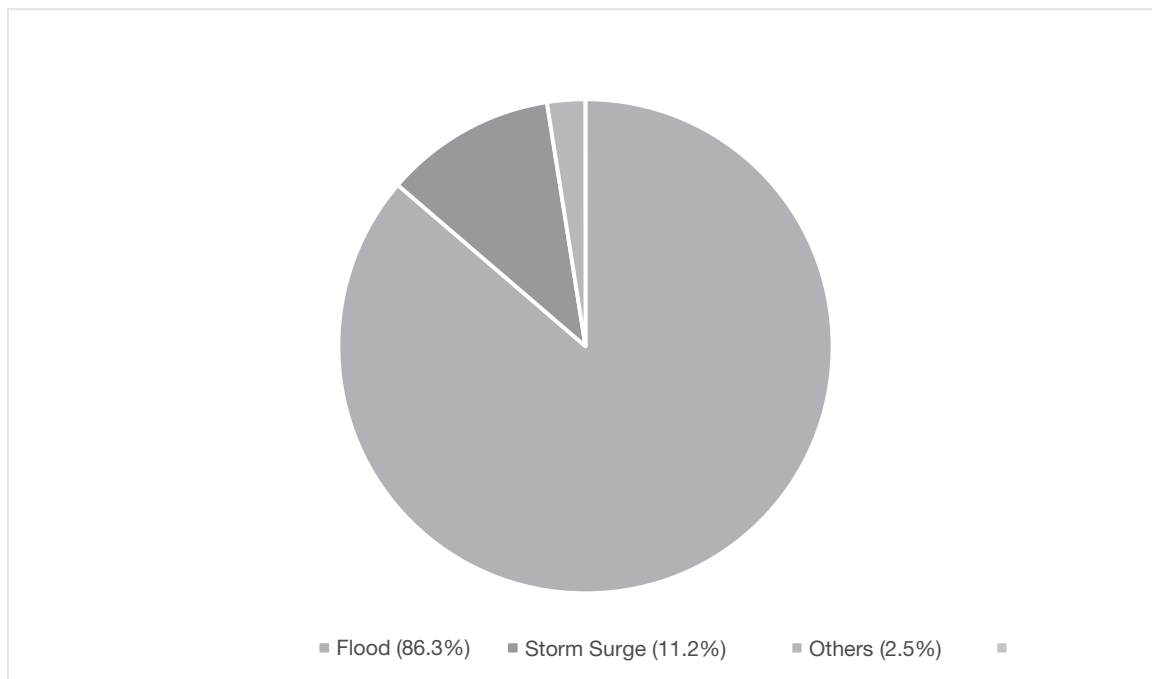


Figure 1: Hazard contribution to average loss of Sri Lanka

Source: *Prevention.Web*, 2014

Legal Framework for Disaster Management in Sri Lanka

Disaster Management Act 2005

After experiencing the devastation of Tsunami in 2004, the government of Sri Lanka initiated many disaster management and resilience programmes to protect this island nation. The most effective way was the formation of national authority for disaster management. In Sri Lanka, we have seen the ministry of disaster management, national council for disaster management, disaster management centre, disaster plans and the collaborative actions of government, non-government organisations, civil society think tanks, voluntary and development organisations towards a common goal and that is the disaster management. To coordinate these huge work force and efforts, a need of legitimate framework was must. With this demand, the Disaster Management Act was approved by the parliament of Sri Lanka in the year 2005.

The main aim of the act was to protect the life, property and environment of Sri Lankan territory from

the threat of disasters. The act broadens the way of collective efforts for the concerning stakeholders. The then parliament approved the act for the prosperity and ensuring the safety of Sri Lanka and from then the act is acting effectively.

National Policy on Disaster Management 2010

Vision and Objective

The vision and objective of the policy is to protect Sri Lanka from disasters, and this protection includes the people, property and the environment.

Considering as the core concept of disaster management in Sri Lanka, the National Council for Disaster Management approved the National Policy on Disaster Management on December 28, 2010. The policy was all about the effective disaster management and building resilience with the participation of all stakeholders. Sri Lanka has experienced the inadequacies during the course of devastating Tsunami 2004. The concerning authorities have identified some major management problems, i.e. coordination

amongst the stakeholder agencies, duplication of the efforts in same places, insufficient policy directives and so on. Though the parliamentarian committee recommended for the formulation of the national policy but, because of some very basic and necessary background tasks, it took a few couple of years to finally get approved. Meanwhile, Disaster Management Act was in action in the year 2005. With the policy guideline by the council and coordination through act, the policy was finally approved in 2010.

While documenting for the policy, it was taken into consideration seriously that:

- In the period of 2006–2016, a road map for DM was finalised with the major 60 outcomes in Sri Lanka. This road map is one of the basics of the policy.
- The policy is deeply rooted with the guidance from DM act. The policy makes the National Disaster Management Plan (NDMP); National Emergency Operations Plan; Disaster Management Plans for every Ministry, Government Department and public corporation and other plans, programmes and guidelines functional.
- The policy suggested the mechanism of operations and
- It rears up the culture of safety.

This study will be focusing on how the multi-dimensional national disaster management policy is implementing disaster risk reduction operations and ensuring disaster resilience to enhance the culture of safety during the course of disaster in Sri Lanka.

Objective of the Study

This study will be focusing on how the multi-dimensional national policy on disaster management in Sri Lanka is effective in precautionary phase. Also, it shall focus on how it works during disaster to minimise the loss of life and property and how it ensures the rehabilitation process shortly after any course of disaster.

Significance of the Study

The significant finding/s of this study will definitely aid the disaster resilience within the legal framework of

Sri Lanka in all management phases. For the disaster-prone nations, it is the prerequisite to activate all races of the society to ensure resilience. To activate and energise the overall resilience, legal framework for the management is a mandatory feature because without the specific policy it is difficult to ensure sustainable management and resilience as well. Thus, every disaster concern and prone nation approve and adopt the laws and policies. Sometimes these work for regional and sometimes for the overall nation. Being aversively experienced by the disasters, the government of Sri Lanka has approved and adopted Disaster Management Act in 2005 and followed by the National Policy on Disaster Management in 2010.

Actually the policy has emerged because of the inadequate coordination amongst the stakeholder's agencies, replication of good practices and avoid the duplication of efforts in same field and provide legal baseline to ensure collective efforts for reducing the overall losses.

The National Policy on Disaster Management 2010 is the key driven force to rear the culture of safety so it has evolved with the multi-dimensional approaches and applications. This study believes that the multi-dimensional applications of the esteemed policy and the real application of that will aid the sustainable disaster management actions. Thus, we believe the significance of this study is immensely positive.

Methodology

This study has explored the applicability of National Policy on Disaster Management through multi-dimensional approach to manage disasters during pre- and post phases. The study has employed both primary and secondary sources of data to explore all possible matters of disaster management in Sri Lanka. For the primary source, we have developed a semi-structured interview schedule to interview government, non-government, civil society think tank and development agencies. The sources for the secondary data are Disaster Management Ministry, government and non-government reports regarding disaster management law and act, online data bank, books, journals and other relevant documents to make the overall conception comprehensive. The concerning

authority of Sri Lanka has taken the national policy as an effective tool for managing disasters effectively so the legislation is the prime concern for this research. Since legislative matter is the main concern of this, the research will be qualitative in nature and ended up with some directions and recommendations.

Sample Size and Target Group

Since this study aims to examine the applicability of the National Policy on Disaster Management of Sri Lanka through both primary and secondary sources of data, we shall not go for the random sampling in the primary source section. In this regard, we prefer to purposive sampling technique. As we have mentioned earlier that, we would like to focus on the real life applicability of national policy on disaster management of Sri Lanka, so the relevant persons are preferable here who are working directly with disaster management through legal framework. For this, the population size was 15; 8 respondents were the government officials, 4 from civil society think tanks and 3 from voluntary and development organisations working for the disaster management and resilience. If we calculated the percentage, then government officials were 53.33 per cent, 26.67 per cent civil society think tanks and rest 20 per cent were the voluntary and development organisations and all of the respondents were based in Sri Lanka.

Instrument

To get the primary data for this study, we have developed a semi-structured interview schedule in light of the National Policy on Disaster Management. This schedule consisted of 25 structured questions or items, and at the end of 25th item, there was an open-ended comment section where the respondents had the independence to write any comment beyond the aforementioned items or questions. Though the official language of Sri Lanka is Sinhalese language, but because of the education level of the respondents, we have administered the scale in English and we have found no significant difficulties for serving the purpose. For the first 25 items, the responses were

‘Yes’, ‘No’ and ‘Maybe’. At the end of these quantitative items, there was one open-ended question concerning the comments of corresponding respondents.

Study Design

Since we had collected data from both primary and secondary sources and we have dealt with the quantitative and qualitative assumptions with analysis so we have preferred the mixed research design best suit here.

Procedure

To collect the data for this study, we have chosen both the qualitative and quantitative approaches within the primary and secondary sources. For the secondary data, we have relied on Disaster Management Ministry, government and non-government reports regarding disaster management law and act, online data bank, books, journals and other relevant documents to make the overall conception comprehensive. And for collecting the primary data, a semi-structured interview schedule was developed with 25 quantitative items and followed by one open-ended optional comment section or qualitative item. This schedule was administrated on the government officials related to the disaster management in Sri Lanka, the NGO, civil society think tanks and the voluntary and development organisations working in the same arena. They were provided written and verbal assurance that their responses will remain confidential and reported anonymously in the study report. It was also assured that their responses will be used in this study only. For the first 25 quantitative items, their responses were marked putting tick mark (√) between the three options ‘Yes’, ‘No’ and ‘Maybe’, and for the qualitative section, they have written their experience and comment at the end. Upon accomplishment, they were thanked for their valuable time and opinion.

Results

As mentioned in the methodology, we have chosen both primary and secondary sources of data, so we

need to analyse the data specially the primary one. As our developed interview schedule has only the 'Yes', 'No' and 'Maybe' options as responses, so the analysis of percentage was applicable here to analyse and the rest we had followed the qualitative approach.

Since the respondents were from three categories, i.e. government officials, civil society think tank and voluntary and development organisations, so the percentage result will be shown in three separate tables below:

Table 2: Percentage of the Responses of the Government Officials, Civil Society Think Tanks and Voluntary and Development Organisations Working at Sri Lanka

SL	Questions	Response								
		Yes			No			Maybe		
		Govt. Officials	Civil Society	Voluntary & Dev.Org.	Govt. Officials	Civil Society	Voluntary & Dev.Org.	Govt. Officials	Civil Society	Civil Society
1	Are you aware of the National Policy on Disaster Management?	08 (100 %)	04 (100 %)	03 (100 %)	0 (0 %)	0 (0 %)	0 (0 %)	0 (0 %)	0 (0 %)	0 (0 %)
2	Do you think that this policy is playing an effective role in disaster management of Sri Lanka?	08 (100 %)	01 (25 %)	02 (66.66 %)	0 (0 %)	02 (50 %)	01 (33.33 %)	0 (0 %)	01 (25 %)	01 (33.33 %)
3	Do you think that this policy effectively combines all the stakeholders to manage disasters?	08 (100 %)	01 (25 %)	01 (33.33 %)	0 (0 %)	02 (50 %)	0 (0 %)	0 (0 %)	01 (25 %)	02 (66.66 %)
4	Do you think that this policy is developing a culture of security in Sri Lanka by managing disasters effectively?	05 (62.5 %)	02 (50 %)	01 (33.33 %)	0 (0 %)	01 (25 %)	0 (0 %)	3 (37.5 %)	01 (25 %)	02 (66.66 %)

(Continued)

Table 2: (Continued)

SL	Questions	Response								
		Yes			No			Maybe		
		Govt. Officials	Civil Society	Voluntary & Dev.Org.	Govt. Officials	Civil Society	Voluntary & Dev.Org.	Govt. Officials	Civil Society	Civil Society
5	Do you think that this policy is capable of ensuring the security of the community, life, resources, and environment during the event of disasters?	08 (100 %)	01 (25 %)	01 (33.33 %)	0 (0 %)	02 (50 %)	0 (0 %)	0 (0 %)	01 (25 %)	02 (66.66 %)
6	Do you think that this policy is capable of creating disaster-resistant structures and economic development in disaster-prone areas of Sri Lanka?	05 (62.5 %)	01 (25 %)	01 (33.33 %)	0 (0 %)	02 (50 %)	0 (0 %)	3 (37.5 %)	01 (25 %)	02 (66.66 %)
7	Do you think that this policy is successful in creating awareness about the disaster?	06 (75 %)	02 (50 %)	02 (66.66 %)	0 (0 %)	0 (0 %)	0 (0 %)	02 (25 %)	02 (50 %)	01 (33.33 %)
8	Do you think that this policy is capable of preventing natural disasters, man-made disasters, and technological disasters?	06 (75 %)	02 (50 %)	01 (33.33 %)	0 (0 %)	0 (0 %)	0 (0 %)	02 (25 %)	02 (50 %)	02 (66.66 %)

(Continued)

Table 2: (Continued)

SL	Questions	Response								
		Yes			No			Maybe		
		Govt. Officials	Civil Society	Voluntary & Dev.Org.	Govt. Officials	Civil Society	Voluntary & Dev.Org.	Govt. Officials	Civil Society	Civil Society
9	Do you think that this policy is playing an effective role in preparing, emerging and rehabilitation for any event of a disaster?	08 (100 %)	02 (50 %)	01 (33.33 %)	0 (0 %)	0 (0 %)	0 (0 %)	0 (0 %)	02 (50 %)	02 (66.66 %)
10	Do you believe that this policy is playing an effective role in disaster management by coordinating assigned and responsible government ministries and offices?	08 (100 %)	01 (25 %)	01 (33.33 %)	0 (0 %)	02 (50 %)	0 (0 %)	0 (0 %)	01 (25 %)	02 (66.66 %)
11	Do you think that this policy is coordinating stakeholders, i.e. government agencies, non-government agencies, civil society and international organisations for disaster management?	04 (50 %)	01 (25 %)	02 (66.66 %)	02 (25 %)	02 (50 %)	0 (0 %)	02 (25 %)	01 (25 %)	01 (33.33 %)

(Continued)

Table 2: (Continued)

SL	Questions	Response								
		Yes			No			Maybe		
		Govt. Officials	Civil Society	Voluntary & Dev.Org.	Govt. Officials	Civil Society	Voluntary & Dev.Org.	Govt. Officials	Civil Society	Civil Society
12	Do you think that this policy is an effective tool in Sri Lanka's regional disaster management?	06 (75 %)	02 (50 %)	02 (66.66 %)	0 (0 %)	0 (0 %)	0 (0 %)	02 (25 %)	02 (50 %)	01 (33.33 %)
13	Do you think that this policy is effective in implementing various periodic plans and projects, i.e. short, medium and long term in disaster management?	05 (62.5 %)	02 (50 %)	02 (66.66 %)	0 (0 %)	0 (0 %)	0 (0 %)	3 (37.5 %)	02 (50 %)	01 (33.33 %)
14	For the disaster management, do the government agencies and the non-government bodies mutually cooperate effectively?	04 (50 %)	03 (75 %)	01 (33.33 %)	02 (25 %)	0 (0 %)	01 (33.33 %)	02 (25 %)	01 (25 %)	01 (33.33 %)
15	Is this policy effective in preventing gender violence or aggression against women during the event of a disaster?	05 (62.5 %)	02 (50 %)	01 (33.33 %)	0 (0 %)	01 (25 %)	01 (33.33 %)	3 (37.5 %)	01 (25 %)	01 (33.33 %)

(Continued)

Table 2: (Continued)

SL	Questions	Response								
		Yes			No			Maybe		
		Govt. Officials	Civil Society	Voluntary & Dev.Org.	Govt. Officials	Civil Society	Voluntary & Dev.Org.	Govt. Officials	Civil Society	Civil Society
16	Is there any effective participation of the people from most disaster-prone areas of Sri Lanka in disaster management planning and decision-making?	05 (62.5 %)	02 (50 %)	01 (33.33 %)	02 (25 %)	0 (0 %)	01 (33.33 %)	01 (12.5 %)	02 (50 %)	01 (33.33 %)
17	Is this policy giving emphasise on appropriate indigenous knowledge and traditional methods of disaster management?	05 (62.5 %)	01 (25 %)	0 (0 %)	0 (0 %)	02 (50 %)	02 (66.66 %)	3 (37.5 %)	01 (25 %)	01 (33.33 %)
18	Does the government encourage volunteers to mitigate the disasters?	08 (100 %)	02 (50 %)	02 (66.66 %)	0 (0 %)	0 (0 %)	0 (0 %)	0 (0 %)	02 (50 %)	01 (33.33 %)
19	Is mental health care service ensures during the event of disaster and rehabilitation procedure later on?	05 (62.5 %)	01 (25 %)	0 (0 %)	0 (0 %)	02 (50 %)	02 (66.66 %)	3 (37.5 %)	01 (25 %)	01 (33.33 %)

(Continued)

Table 2: (Continued)

SL	Questions	Response								
		Yes			No			Maybe		
		Govt. Officials	Civil Society	Voluntary & Dev.Org.	Govt. Officials	Civil Society	Voluntary & Dev.Org.	Govt. Officials	Civil Society	Civil Society
20	Are all the staff involved in disaster management having the proper training of management?	08 (100 %)	01 (25 %)	01 (33.33 %)	0 (0 %)	02 (50 %)	01 (33.33 %)	0 (0 %)	01 (25 %)	01 (33.33 %)
21	Is the knowledge of disaster management included adequately in the textbooks?	05 (62.5 %)	01 (25 %)	0 (0 %)	0 (0 %)	02 (50 %)	02 (66.66 %)	3 (37.5 %)	01 (25 %)	01 (33.33 %)
22	Do students know about first-aid treatment?	05 (62.5 %)	0 (0 %)	0 (0 %)	0 (0 %)	02 (50 %)	02 (66.66 %)	3 (37.5 %)	02 (50 %)	01 (33.33 %)
23	Do Sri Lankan universities have adequate departments, institutes and programmes to pursue higher education in disaster management?	05 (62.5 %)	01 (25 %)	0 (0 %)	0 (0 %)	02 (50 %)	02 (66.66 %)	3 (37.5 %)	01 (25 %)	01 (33.33 %)
24	Are the media personnel trained enough to broadcast the news and information regarding disaster management?	04 (50 %)	0 (0 %)	0 (0 %)	3 (37.5 %)	02 (50 %)	02 (66.66 %)	01 (12.5 %)	02 (50 %)	01 (33.33 %)

(Continued)

Table 2: (Continued)

SL	Questions	Response								
		Yes			No			Maybe		
		Govt. Officials	Civil Society	Voluntary & Dev.Org.	Govt. Officials	Civil Society	Voluntary & Dev.Org.	Govt. Officials	Civil Society	Civil Society
25	Do you think the National Budget for disaster management is adequate?	05 (62.5 %)	01 (25 %)	01 (33.33 %)	0 (0 %)	02 (50 %)	01 (33.33 %)	3 (37.5 %)	01 (25 %)	01 (33.33 %)

Discussion

The objective of this study was to explore the multi-dimensional features of the National Policy of Disaster Management of Sri Lanka to ensure the effective disaster management there. To explore the aforementioned matter, we have chosen the mixed research design with the combination of both quantitative and qualitative assumptions through the access of the primary and secondary sources. For getting the primary data, we have developed a questionnaire consisting of 25 items with 3 possible answers 'Yes', 'No' and 'Maybe' and we would like to focus on the discussion of the primary source. For the data obtained from the primary source, we shall go through item by item where we'll focus on the likelihood and dis-likelihood of that particular item. From the percentage analysis, we have found the following items as similar in responses in three groups. The items are as follows:

Item No. 1. *Are you aware of the National Policy on Disaster Management?* Where all three groups of participants responded as 100 per cent of 'Yes' that means the concerning authority has succeeded in circulation of the policy very effectively among the stakeholders. **Item No. 2.** *Do you think that this policy is playing an effective role in Disaster Management of Sri Lanka?* In this item, we have found the dissimilarities in the responses. The government officials responded 'Yes' as 100 per cent, whereas just 25 per cent of the civil society responded the same and 66.66 per cent of

the voluntary and development organisations responded as 'Yes'. So the civil society has a great scale of dissimilarity with government and voluntary and development organisations. This indicates that the working arena of civil society is not merging with the disaster management through the policy of DM in Sri Lanka. It might happen because of less participation of the civil society in making decision while formation of the policy and the absence of the opinion of them. But the operational hands, i.e. government officials and voluntary and development organisations, are quite pleased with the policy in effectiveness. **Item No. 3.** *Do you think that this policy effectively combines all the stakeholders to manage disasters?* This item also shows the dissimilarity in the responses. The government officials responded 'Yes' as 100 per cent, whereas just 25 per cent of the civil society responded the same and 33.33 per cent of the voluntary and development organisations responded as 'Yes' and another important point to be noted here is that 66.66 per cent of the voluntary and development organisation's participants responded as 'Maybe' which implies the deep meaning of 'No' actually. In item no. 2, we have mentioned that the policy is effective enough to cope with the disaster management from voluntary and development organisation's side, but they believe that it has the lack in combining the stakeholders and the response remains the same for the civil society as well. It might happen that till now the stakeholders of DM are working through their own way, or due to the fragile

management and monitoring system, the coordination may hamper there. **Item No. 4.** *Do you think that this policy is developing a culture of security in Sri Lanka by managing disasters effectively?* In this item, 63.5 per cent of government officials, 50 per cent of the civil society and 33.33 per cent of voluntary and development organisations responded 'Yes', and 66.66 per cent of voluntary and development organisations responded 'Maybe', which means the negative response towards this particular item. This reflects towards the homogeneity in responses but overall negative. Since the government officials have the likelihood to respond positively, even though they have marked this as negative, the policy is yet to achieve the milestones to ensure the culture of safety in Sri Lanka for disaster management and resilience. **Item No. 5.** *Do you think that this policy is capable of ensuring the security of the community, life, resources and environment during the event of disasters?* This item is also highly negative from non-government stakeholders. The response of 100 per cent of government officials, 25 per cent of the civil society and 33.3 per cent of voluntary and development organisations is 'Yes'. So this is not sure whether the security of all the stakeholders is ensured or not, but the disagreement is present among the government and non-government stakeholders on the question of applicability of the policy. **Item No. 6.** *Do you think that this policy is capable of creating disaster-resistant structures and economic development in disaster-prone areas of Sri Lanka?* We have seen the negative homogeneity for this item. The response of 62.5 per cent of government officials, 25 per cent of the civil society and 33.3 per cent of voluntary and development organisations 33.3 per cent is 'Yes', which unveils the negativity of ensuring disaster-resilient structure through this policy. **Item No. 7.** *Do you think that this policy is successful in creating awareness about the disaster?* We have found the uniformity for this item as the response of 75 per cent of government officials, 50 per cent of the civil society and 66.66 per cent of voluntary and development organisations is 'Yes', so all the stakeholders are positive enough. **Item No. 8.** *Do you think that this policy is capable of preventing natural disasters man-made disasters, and technological*

disasters? The response of 75 per cent of government officials, 50 per cent of the civil society and 33.33 per cent of voluntary & development organisations is 'Yes', which demonstrates the weakness of the policy in prevention measures. **Item No. 9.** *Do you think that this policy is playing an effective role in preparing, emerging and rehabilitation for any event of a disaster?* The response of 100 per cent of government officials, 50 per cent of the civil society and 33.33 per cent of voluntary and development organisations is 'Yes'. This indicated the distinction amongst the stakeholders. So we could mention that the policy is not efficient enough for the different cyclic roles of disaster management. **Item No. 10.** *Do you believe that this policy is playing an effective role in disaster management by coordinating assigned and responsible government ministries and offices?* The response of 100 per cent of government officials, 25 per cent of the civil society and 33.33 per cent of voluntary and development organisations is 'Yes', which flaunts the coordination gaps within the stakeholders. **Item No. 11.** *Do you think that this policy is coordinating stakeholders, i.e. government agencies, non-government agencies, civil society and international organisations for disaster management?* The response of 50 per cent of government officials, 25 per cent of the civil society and 66.66 per cent of voluntary and development organisations is 'Yes'. We have found the negative homogeneity for this item. Although the last respondent group has more positivity but that is only because of their international cooperation and affiliation. **Item No. 12.** *Do you think that this policy is an effective tool in Sri Lanka's regional disaster management?* The response of 75 per cent of government officials, 50 per cent of the civil society and 66.66 per cent of voluntary and development organisations is 'Yes', which means the likelihood and the policy have an average impact on regional DM. **Item No. 13.** *Do you think that this policy is effective in implementing various periodic plans and projects, i.e. short, medium and long-term in disaster management?* The response of 62.5 per cent of government officials, 50 per cent of the civil society and 66.66 per cent of voluntary and development organisations is 'Yes', which indicated the effectiveness of preparing plans in different time periods. **Item No. 14.** *For the disaster*

management, do the government agencies and the non-government bodies mutually cooperate effectively? The response of 50 per cent of government officials, 75 per cent of the civil society and 33.33 per cent of voluntary and development organisations is 'Yes', this is also homogeneous and indicates the discrepancy in effective coordination. **Item No. 15.** *Is this policy effective in preventing gender violence or aggression against women during the event of a disaster?* With the responses of 62.5 per cent of government officials, 50 per cent of the civil society and 33.33 per cent of voluntary and development organisations is 'Yes', this is clear that the gender violence matter is not getting prioritised through the culture of safety which is a desirable goal of the policy. **Item No. 16.** *Is there any effective participation of the people from most disaster-prone areas of Sri Lanka in disaster management planning and decision-making?* The response of 62.5 per cent of government officials, 50 per cent of the civil society and 33.33 per cent of voluntary and development organisations is 'Yes'. These homogeneous responses unveil the inadequate participation of the victims. **Item No. 17.** *Is this policy giving emphasise on appropriate indigenous knowledge and traditional methods of disaster management?* The dissimilitude response of 62.5 per cent of government officials, 25 per cent of the civil society and 0 per cent of voluntary and development organisations is 'Yes', and it unveils the less attention towards the indigenous measures or knowledge of DM. **Item No. 18.** *Does the government encourage volunteers to mitigate the disasters?* The response of 100 per cent of government officials, 50 per cent of the civil society and 66.66 per cent of voluntary and development organisations is 'Yes'. Though the responses show a large number of the concept of voluntary mobilisation during the course of disaster is very popular in Sri Lanka. There is no difference whether anyone agrees or not, but the mobilisation is automatic there. **Item No. 19.** *Is mental health care service ensures during the event of disaster and rehabilitation procedure later on?* The response of 62.5 per cent of government officials, 25 per cent of the civil society and 0 per cent of voluntary and development organisations is 'Yes'. This is a homogenous response but the consequence of lack in

mental health care could be very devastating in long run because the physical damage could be mitigated within the time period but the mental damage would be neoteric over time. **Item No. 20.** *Are all the staff involved in disaster management having the proper training of management?* The response of 100 per cent of government officials, 25 per cent of the civil society and 33.33 per cent of voluntary and development organisations is 'Yes'. From this item, we could state that the non-governmental organisations are demanding more training and preparation measures from the government. **Item No. 21.** *Is the knowledge of disaster management included adequately in the textbooks?* The response of 62.5 per cent of government officials, 25 per cent of the civil society and 0 per cent of voluntary and development organisations is 'Yes'. So this is similar for the non-governmental stakeholders. Though the national policy recommended the adequate textbook knowledge to train up the student and make the society aware, the knowledge is not adequate here. **Item No. 22.** *Do students know about first-aid treatment?* The response of 62.5 per cent of government officials, 0 per cent of the civil society and 0 per cent of voluntary and development organisations is 'Yes'. So one important objectivity of the policy has declined. **Item No. 23.** *Do Sri Lankan universities have adequate departments, institutes and programmes to pursue higher education in disaster management?* The response of 62.5 per cent of government officials, 25 per cent of the civil society and 0 per cent of voluntary and development organisations is 'Yes'. This statement supports the previous similar kind of statement in Item No. 21. So more disaster research facility should be arranged at Sri Lanka. **Item No. 24.** *Are the media personnel trained enough to broadcast the news and information regarding disaster management?* The response of 50 per cent of government officials, 0 per cent of the civil society and 0 per cent of voluntary and development organisations is 'Yes'. The response is highly discrepant between government and non-government stakeholders and homogeneous within the non-government stakeholders. This statement is very alarming because media play the most vital role in preparedness and evacuation period, so proper outcomes are very much expected from media.

Item No. 25. *Do you think the National Budget for disaster management is adequate?* The responses of 62.5 per cent of government officials, 25 per cent of the civil society and 33.33 per cent of voluntary and development organisations is 'Yes'. Homogeneously they have complained about the inadequate fund and budget for disaster management, which is very common for developing nations.

Multi-dimensional National Policy on Disaster Management

This part of the policy is the main concern of the study. In the policy, it is clearly mentioned the arena of this multi- or intersecting dimension:

- Multi-hazards, i.e. natural, human-induced and technological events of destructions.
- Different but absolute phases of disaster management have been addressed by this policy, i.e. prevention, reduction, mitigation, preparedness, emergency operations, relief, recovery, rehabilitation and reconstruction and review.
- Multi-sectorial integration within the government sectors to ensure an effective disaster management, i.e. emergency services, meteorology, human and social services, infrastructure, education and training, health, agricultural, defense, water management, environment, climate change, urban management and relevant others.
- Combining all the stakeholders through multi-stakeholders concept. This policy believes in the active participation and engagement of all stakeholders, i.e. national public agencies, the private sector, civil society, the international community and the general public towards the same goal.
- The next concept is the multi-locality concept which engages the international, regional and national efforts covering the entire territory of Sri Lanka, i.e. land, sea and air.
- The final simultaneous sector is based on the time period, the multi-temporal concept which includes the short-, medium- and long-term plan and preparation.

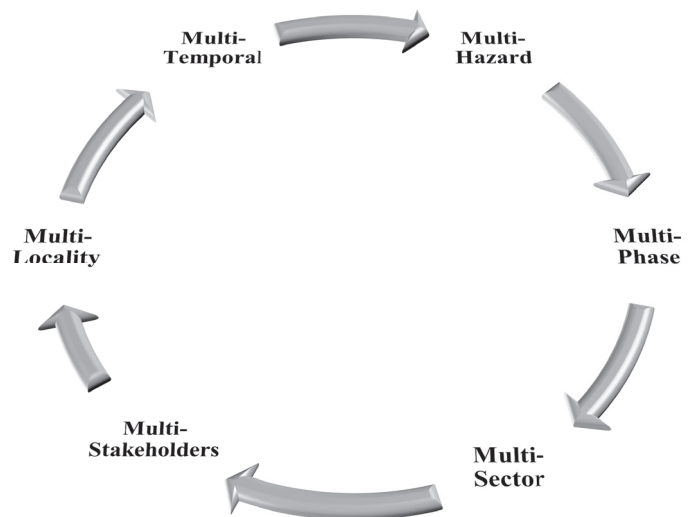


Figure 2: Multi-dimensional Cycle of the National Policy on Disaster Management

One important matter to be noted here is that all these multi functions are concerning to protect the human, property and the environment of Sri Lanka from the grief of disaster/s.

As we are focusing on the multi-dimensional disaster readiness through the national policy, we would like to investigate two cases after the approval of the policy in 2010.

Case 1: Flood and Landslides 2017

Brief History

Sri Lanka is being affected with the southwestern monsoons around the year because the monsoon causes heavy rain followed by flood and subsequent landslides. The situation got worst in 2017 which started on 18–19 May 2019 (Wikipedia, 2018). Two simultaneous matters made the overall situation worsen. On the one hand with the arrival of precursor system, Cyclone Mora affected Sri Lanka with flood and landslides in the end of May 2017, and the drought in the near past accelerated the neoteric development of flood with frequent landslides and flash flood. As of late, more than 700,000 people got affected with the death over 200 people (IOM, 2017).

Record of Loss and Damage

Loss or Damage	Amount/ Number	Costs/ Specification
Affected the life and living of the local people	698,289	
Dead	208	
No. of missing persons	95	
Total number of districts affected	15	
Worse affected districts	04	Kalutara, Matara, Galle and Ratnapura
Families affected	175,660	
Houses destroyed	2545	Houses
Damaged	15,897	
In evacuation centres	21,681	
Estimated total economic loss	\$200 Million	

Source: IOM, Wikipedia

Example of Multi-dimensional Approach or Not

Multi-hazard

There are no reported multi-hazard issues for the flood and landslides in 2017. No case of man-made and technological hazards was found while analysing the background. The flood got worsen because of the monsoons and the previous drought. Although it was bound only into the natural hazard, the devastation was multi-phasic. The flood affected about 700,000 people of 15 districts, and the death toll was highest after the approval of the national policy on disaster management because of flood and landslide. But the authority was prepared for coping with any case of such.

Multi-phasic

We have found some very basic problems in preparatory phase. For this particular reason, we might address the ministry of disaster management

responsible. The evacuation was not so smooth in the worse affected regions. Those who have lost their house completely needed emergency shelter. Local schools and temples were used as the shelter house for them, but because of the lack in preparedness, the people suffered a lot specially they have slept in floor, lack in toilet, food, drinking water and especially for the breast feeding mother was beyond imagination. It took long time to recover the electricity. But overall relief and rehabilitation process was satisfactory in terms of the willingness of different authorities. But we have experienced extreme lack in alerting the people for reducing the loss of property and life.

Multi-sectorial

In this event of disaster, we have seen some collective efforts of the offices from Sri Lankan authority. But we have seen lack in early warning period. But soon after the flood started the different offices and forces collectively started recovery operations and rehabilitation programmes. The operations in brief are as follows:

- For the medical operations, at first the mobile health units were deployed while evacuation and shelters.
- Local authority ensured the temporary shelter at the local schools and temples.
- Soon after the flood started, the National Building Research Organization (NBRO) issued the landslide warning.
- Different departments of Sri Lankan Army, i.e. Commando, Special Forces, Mechanized Infantry and Army medical personnel. BTRs, WMZs troop carriers and 30 Army boats and other machinery were deployed with 1700 personnel for that disaster management.
- 110 search and rescue teams consisting of 776 naval personnel with 116 boats were involved for management.
- Sri Lankan Air Force deployed their aircrafts for reconnaissance and relief operations.
- Overall 77,000 people were evacuated most with the operations of Sri Lankan military forces.

These efforts proved the effective multi-sectional operations in the post-disaster operations.

Country	Assistance	Unit/Amount
India	Rescue, diving and medical and relief	40 tons of relief materials
China	Relief and medical operations	US\$2.2 million's relief goods
USA	Post-flood recovery operations, humanitarian assistance operations	US\$2.3 million cash
Singapore	Cash contribution and relief operations	US\$100,000 cash and US\$50,000 relief goods
UK	Relief	Unknown
Pakistan	Relief and medical operations	Unknown
Australia	Search and rescue operations, relief	AUD \$500,000
Israel	Relief operation	Unknown
Maldives	Cash contribution and relief operations	US\$250,000 cash
Korea	Cash contribution and relief operations	US\$250,000 cash

Source: Wikipedia, 2018

Multi-stakeholders and Multi-locality

The National Policy on Disaster Management of Sri Lanka believes in the active involvement of all national agencies, private sectors, civil society and international community together in different periods of disaster management. In our case no. 1, we have seen the operations from different sectors as like:

- The search-rescue and evacuation operations started over 10,000 military personnel of Sri Lanka deployed collectively through land, air and sea regime.
- Humanitarian Country Team initiated the development of an in-country emergency response plan.
- International Organization for Migration (IOM) initiated the evacuation operations.
- Ministry of Health Offices, District Secretariats initiated the mobile medical team to provide medical support in evacuation and shelters.
- Landslide warning alerts have been issued by the National Building Research Organization (NBRO) in a number of divisions.
- Foreign Minister told "16 countries had rushed relief supplies and medicine".
- During the flood of 2017, we have seen the direct search and rescue operation, relief programme and medical camps conducted by the military and civilian authorities of India, China, USA, Singapore, UK, Pakistan, Australia, Israel, Maldives, Korea and others. The outcomes of the international cooperation are as follows:

Multi-temporal

Though the National Policy on Disaster Management has focused on the multi-temporal matter as an important one, we have seen, for the case of the flood of 2017, the multi-temporal concept was absent there. We have seen the short- and medium term operations but mostly medium term and in the post-disaster management. The preparedness was quite unsatisfactory. The evacuation, shelter, food and immediate medical operations were not successful completely. We have seen the collective measures from different offices and military forces of Sri Lanka along with the active participation of military and non-military personnel of 16 different countries and also some local and international organisations like Red Cross, Sarvodaya and Foundation of Goodness. So the policy was not successful properly in this concept of multi-temporal planning and preparedness phase.

Case 2: Flood and Landslides 2016

Brief History

As we have mentioned earlier, Sri Lanka is being affected with the southwestern monsoons around the year and that was not exceptional for the year 2016 as well. The flood of 2016 started on May 14 when a low-pressure area over the Bay of Bengal caused torrential rain to fall across Sri Lanka, causing floods and landslides and ultimately which affected more than half a million people there.

Record of Loss and Damage

Loss or Damage	Amount/Number	Costs/Specification
Affected the life and living of the local people	500,000 (Appx.)	
Dead	101	
No. of missing persons	100	
Total number of districts affected	22	
Worse affected districts	10	Chilaw, Colombo, Galle, Kalutara, Kandy, Kegalle, Matara, Nuwara Eliya and Ratnapura
Forced migration	223,687	
Houses destroyed	230	
Damaged	2647	
Relief centres	357	
Estimated total economic loss	\$2 Billion	

Source: IOM, Wikipedia

Multi-hazard

Although the flood of 2016 was associated with the landslides, that was only concentrated into the natural disasters. There was no presence of man-made or technological disasters involved. Since Sri Lanka is not a techno-giant, there will be always less chance to have the technological disasters along with the natural one. But the natural disasters got some multi-dimensions like the recovery issue, medical, educational, rehabilitation, water and sewerage and safety issue as well.

Multi-phasic

The basic problems were there in the preparatory phase, and we did expect that will be ensured in future but in real that was not done properly so the same thing happened in the year 2017. There were problems in emergency evacuation, shelter, medical, privacy and rehabilitation. So the loss of life, property and environment were enormous. Most pathetic matter

was some 100 people were missing and remain the same till now.

Multi-sectorial

With the lack in the early alarm phase, the collective operations of different offices, forces and organisations are as follows:

- For the medical operations, at first the mobile health units were deployed while evacuation and shelters.
- Local authority ensured the temporary shelter at the local schools and temples.
- The Sri Lanka Army deployed more than 1500 Army personnel for search and rescue and relief operations.
- Sri Lankan air force has deployed their helicopters for rescue operations and providing of relief aid to victims.
- The Sri Lanka Navy dispatched 81 flood relief teams.

These efforts proved the effective multi-sectional operations in the post-disaster operations.

Country	Assistance	Unit/Amount
Commonwealth Nations	Condolences by the Secretary General	
USA	Post-flood recovery operations, humanitarian assistance operations	\$1,000,000
Singapore	Relief operations	\$150,000
Pakistan	Relief and medical operations	30 Bed's hospital
Australia	Clean water and sanitation for children in shelters	AUD \$500,000
Nepal	Relief operation	\$100,000
Japan	Blankets, generators, water purifiers and water tanks	Unknown
India	Humanitarian assistances	Unknown

Source: Wikipedia, 2018

Multi-stakeholders and Multi-locality

The willingness was proper; but because of resource constrains, the authority of Sri Lanka urged international support to tackle the flood in the year 2016.

- With the collective efforts by thousands of military personnel in Sri Lanka, the post-disaster operations started in all three land, water and air regime.
- Ministry of Disaster Management immediately started the recovery programme in worse affected areas.
- Several offices and organisations started the evaluation process immediately to arrange the relief properly.
- Medicine, drinking water and sewerage system were taken into the consideration very seriously.
- During the flood of 2016, the international cooperation was like as following:

Multi-temporal

Again the preparatory phase was disappointing than the recovery operations. In this course of disaster, more than 10 countries and international organisations worked together for mitigating the problems made with this flood of 2016. But the actual time-based operation was absent there.

Recommendations

After having a clear conception about the disasters and the role of the national policy, this paper suggests the following:

- The policy must describe how the relevant agency/person will act according to the different types of hazards, i.e. natural, human-induced and technological disasters.
- It is good to know that different phases of management have addressed by the policy very well, but for disasters, prevention measures should be taken more seriously than that of the recovery and rehabilitation phase so that the amount of damage could be minimised.
- Integration of different offices amongst the government should be more transparent and responsible.
- Combining the efforts of all stakeholders is a must to make the policy successful and ensuring the effective disaster management as well.
- Disaster has no political or economic border, so international, regional and national efforts should be mobilised effectively.
- According to the perspective, multi-temporal plans and preparedness should be taken carefully.
- To ensure the real culture of safety in Sri Lanka through this National Policy on Disaster Management.

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Governmental and Non-governmental Collaborative Efforts in Disaster Management: An Experience from Uttarakhand

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ABSTRACT: The escalated vulnerability of regions and peoples thereof to disasters, especially natural disasters, due to unscrupulous development, environmental degradation and climatic instability coupled with lackadaisical approach towards disaster prevention has led the situation to an alarming level over the past few decades. This certainly has called for a concentrated, cooperative, collaborative and coordinated planned action on the part of different stakeholders. The paradigm shift invoked into the approach towards disaster management has tilted the pendulum towards the pre-emptive aspects of disaster prevention, mitigation and risk reduction, making the entire process more pragmatic. In Indian context, both the National Disaster Management Act 2005 and National Policy on Disaster Management 2009, in keeping with the International Strategy for Disaster Reduction, delineate the role of governmental and non-governmental agencies, community-based organisations (CBOs), civil society, private organisations and media in all phases of disaster management activities. It is well established that development and disaster management concerns are the two facets of the same coin, and non-governmental initiatives are known to supplement government initiatives in this respect. It is in this light that the collaborative efforts on the part of government and non-government agencies become imperative for a holistic approach towards both disaster management and sustainable development. This study attempts to analyse, through qualitative approach using document analysis method, the efforts made on the part of governmental and non-governmental agencies in the state of Uttarakhand with respect to the management of 2013 floods originating in the pilgrimage site of Kedarnath and distressing almost all the districts of the region; as also endeavours to put forth a few suggestions towards strengthening collaboration of governmental and non-governmental initiatives for the purpose of effective disaster management. Numerous national and international NGOs, voluntary organisations and community-based organisations (CBOs) contributed to the rescue and relief operations during the Uttarakhand Disaster of 2013. Besides, they also put forth their plans to contribute to the recovery and rehabilitation phase and several Memoranda of Understanding (MoUs) were also signed between these organisations and district administration to this effect. However, most NGOs and CBOs could not sustain their efforts and left the region and its people to manage on their own. The reasons were plenty including shortage of funds and material resources, lack of governmental policy to facilitate and accommodate the efforts of non-governmental agencies, geographical and climatic limitations, lack of coordination between the NGOs themselves as also between governmental and non-governmental organisations (GO-NGO). Nevertheless, the role that these non-governmental agencies played sharing the responsibility and quantum of the burden during the Uttarakhand Disaster was very substantial. Therefore, there is an urgent need to integrate the contributions of volunteers

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and non-governmental organisations in different phases of disaster management and government ought to create a facilitating environment for establishing an optimally productive GO-NGO collaboration.

KEYWORDS: GO-NGO collaboration, disaster management, Uttarakhand floods 2013

Introduction

The rapid growth of the world's population and its increased concentration often in hazardous environment has escalated both the frequency and severity of natural disasters. With the tropical climate and unstable land forms, coupled with deforestation, unplanned growth proliferation, non-engineered constructions, which make the disaster-prone areas more vulnerable, tardy communication, poor or no budgetary allocation for disaster prevention, developing countries suffer more or less chronically by natural disasters. The situation has reached alarming levels over past few decades calling for a concentrated and cooperative action worldwide with the paradigm shift in the approach towards disaster management from relief and rehabilitation to prevention and mitigation and invoked a holistic and comprehensive approach to disaster reduction, promoting new emphasis on preparedness and prevention while building up sustainable post-disaster relief capabilities. Disaster management is an applied multidisciplinary field that seeks, by systemic observation and analysis of disasters, to improve measures relating to prevention, emergency, response, recovery and mitigation. Also, it encompasses all aspects of management functions of planning and administration as well as coordination of different organisations. It progresses while incorporating planning for and responding to disasters, including both pre- and post-disaster activities. Disaster management must be beheld as an extension of development process itself in specific situations when one seeks to mitigate adverse effects translated on the society by a disaster. A comprehensive Disaster Management Cycle includes four components of Preparedness, Rescue and Relief, Rehabilitation and Reconstruction, and Prevention and Mitigation.¹

The year 2005 came as a turning point in the series of governmental efforts pertaining to disaster management in India when the National Disaster Management Act was enacted. Prior to the Act of

2005, the subject of disaster management did not find mention in any of the three lists in the seventh schedule of the Indian Constitution. The country had integrated administrative machinery for disaster management at the national, state, district and sub-district levels, but the approach to disaster management was fragmented with controls resting with individual ministries. The basic responsibility to undertake rescue, relief and rehabilitation measures in the event of a natural disaster rested with the State Governments concerned. The Central Government's role was confined to providing financial and logistic support. The inclination of the entire machinery was towards reactive and response mechanisms.² The Act has brought a paradigm shift in India's functional approach to disaster management. It provides statutory legitimacy to the required institutional mechanisms at the national, state and district levels for preparing and monitoring the implementation of disaster management plans and ensures measures by the various arms of government for disaster prevention and mitigation and for holistic, coordinated and prompt response in a disaster situation.

The Act of 2005 was followed by the release of the National Policy on Disaster Management (NPDM), 2009, on 10 January, 2010, which envisages a safe and disaster-resilient India by developing a holistic, proactive, multi-disaster-oriented and technology-driven strategy through a culture of prevention, mitigation, preparedness and response. It delineates the role of governmental and non-governmental agencies, community-based organisations, civil society and media in all phases of disaster management activities. This policy framework which centres round community-based disaster management is also in conformity with the International Strategy for Disaster Reduction, Rio Declaration, Millennium Development Goals and Hyogo Framework of Action (2005–2015).³

The state of Uttarakhand is prone to multi-hazards like earthquakes and landslides, flash floods and cloudburst, which strike the state from time to

time. On 16 June 2013, the state suffered yet another mammoth disaster, one of the worst disasters in the living remembrance, causing widespread damage and devastation, besides heavy casualties. The entire state was hit by torrential rainfall and flash floods. Though all the 13 districts of the state were hit, five districts, namely, Bageshwar, Chamoli, Pithoragarh, Rudrapur and Uttarkashi were the most nastily affected. The disaster intersected with the peak tourist and pilgrimage season, considerably enhancing the number of the casualties and adversely affecting the rescue and relief operations. The incessant rains witnessed during the monsoon of 2013 by the Himalayan belt in India played havoc and posed a grave and serious situation where the entire so-called development stood dismantled and lives shattered. Amongst other areas of the belt, the State of Uttarakhand presented the grimmest scenario in terms of socio-economic loss as well as in management and rehabilitative measures and efforts.⁴ The basic problem of the present research project is to investigate and analyse the efforts made by the government authorities and non-governmental agencies in context of the June 2013 flash floods that struck the State of Uttarakhand, and even otherwise, with special reference to Pauri Garhwal district.

Role of NGOs in Disaster Management

As regards disaster risk reduction (DRR), a multi-dimensional issue that essentially needs to be mainstreamed into development sector, especially at community level, NGOs possess a very immensely significant role. The resilience of local communities to disasters lies on their capacity to prevent, prepare for and respond to natural hazards. An inclusive approach to disaster risk reduction (DRR) necessitates an amalgamation of changes at community level with changes to national and international policies and practices. The UNISDR secretariat attaches great importance to NGOs' increased engagement in different facades of DRR and opines that active participation of NGOs is a prerequisite to building the resilience of nations and communities to disasters.⁵ The Disaster Management Act 2005 has provided legislative backing

to this endeavour and emphasises the involvement of the communities and asserts that the role of the humanitarian agencies and NGOs is to supplement the efforts of the government, thereby helping communities to cope and recover from the disaster. In the foray, it has entrusted the State Executive Committees and District Authorities with the responsibility to advice, assist and coordinate the activities of NGOs engaged in disaster management. The District Authorities are mandated to encourage the involvement of NGOs and voluntary social welfare institutions working at grassroots level in the districts for disaster management.⁶

Of late, the role of NGOs in disaster management has seen a sea-change from providing post-disaster relief to strengthening pre-disaster preparedness and mitigation through capacity building, public awareness campaigns, mock exercises, workshops and conferences and so on. NGOs collaborating with corporate entities via Public-Private Partnership (PPP) projects and Corporate Social Responsibility (CSR) initiatives are also underway in the field of disaster management at state, district and sub-district levels. Even though, the work of NGOs in the field of disaster management has been mostly intermittent, reactive, responsive and stimulated by local-level obligations in the geographic areas where they are carrying development projects, and quite often these organisations are faced with enormous challenges in coordinating with the government machinery as also amongst NGOs themselves, still the role played by the non-governmental organisations in the sphere of disaster management is irreplaceable. These non-governmental initiatives supplement government initiatives by acting as a conduit between development programmes and beneficiaries, informing and sensitising people about their rights and entitlements, mobilising people towards their own cause and helping people articulate their problems in a better way. Similarly, NGOs play an important role in disaster response and mitigation as well in different regions; and the disaster management and development concerns are the two facets of the same coin. It is in this light that GO-NGO collaboration becomes imperative for a holistic approach towards both disaster management and sustainable development.⁷

Review of Literature

Several studies on various dimensions, issues and problems of disaster management have been made, covering global, national and regional levels and addressing theoretical and applied aspects by scientists, social and otherwise. A review of some of these available studies covering various related aspects has been carried out by the researcher. It was so found that though numerous issues, aspects and parameters related to management and mitigation of disasters have been studied by researchers and academicians ranging from global to regional level, still very few studies have been conducted as regards hand-in-hand approach towards governmental and non-governmental efforts so as to extract maximum social advantage from government policies. This study, therefore, aims to fill the gap and analyse the status of efforts made on the part of governmental and non-governmental agencies in Pauri Garhwal district of Garhwal division of the State of Uttarakhand.

Objectives of the Study

The objectives, thus arrived at, in the context of this study are thus:

- To analyse the implementation of governmental legal and institutional measures with respect to the management of disasters in the region;
- To examine the initiation and participation made by non-governmental organisations functional in the area as regards management of disasters;
- To analyse the coordination and cooperation level between governmental agencies concerned and the non-governmental bodies involved in disaster management activities in the region; and
- To suggest a plan of action vis-à-vis hand-in-hand approach between governmental and non-governmental agencies for better management of natural disasters.

Taking clue from the close observation of the disaster management scenario in the country, reviewing and analysing the available literature and drawing an understanding of the Uttarakhand Disaster 2013, the

major research questions formulated for the purpose of the study are as follows:

- Is the existing governmental set-up for disaster management functional in the region in coherence with the legally provided institutional framework for the purpose.
- Is the governmental set-up concerned able to achieve its purpose of managing disasters in the region?
- Does the greater participation of people and local community in all phases of disaster management ensure better results?
- Does the incorporation of disaster management process in developmental planning reduce the society's vulnerability towards disasters?
- Does the participation of non-governmental organisations and community-based organisations have an effective role in the efficacy of government measures on disaster management?
- How can the GO-NGO collaboration in the field of disaster management be strengthened?

Research Methodology

This study has been conducted from a qualitative approach deploying document analysis method. Document analysis is a social research method, generally applied to mixed-method researches concentrating on the qualitative aspect of the research wherein both printed and electronically recorded materials are systematically reviewed and evaluated so as to elicit proper meaning, gain understanding and develop empirical knowledge.⁸ Document analysis involves scanning through documents to make superficial examination, followed by thorough examination, and hence interpretation.⁹ Documents, falling into various categories ranging from written or audio-visual, published or unpublished, public or secret, institutional or internal to current or retrospective, can help the researcher discover meaning, develop understanding and realise insights relevant to the research problem. Although document analysis has served mostly as a complement to other research methods, it has also been used as a stand-

alone method, specifically in historical and cross-cultural researches.¹⁰

The Srinagar Tehsil of the district of *Pauri Garhwal* in Garhwal division of the State of Uttarakhand was selected for the purpose of the study being amongst the most affected areas in the state by natural disasters like landslides and flash floods; quantum of damage having occurred to the region during floods of June 2013 and yet been avoided by the majority studies made on the topic as gathered from the literature primarily consulted and reviewed. Besides, it was the accessibility of the area and other essential resources at the researcher's disposal those formed the ground for the selection of the site for this study. During the catastrophic flood, most of the habitats close to the river bank of Alaknanda were hit particularly hard in Srinagar by the flash flood and the local people closely experienced heavy floods during June 2013.

The various documents consulted for the purpose of this study include India Disaster Report 2013; Annual Disaster Statistical Review 2016; Comptroller and Auditor General of India's Performance Audit Reports No.5 (2013) of Disaster Preparedness in India and Report No. 2 (2015) of Natural Disaster in Uttarakhand, June 2013 (Response, Relief and Restoration of the Damaged Infrastructure of Immediate Nature); National Institute of Disaster Management's (NIDM) various related reports and publications like Uttarakhand Disaster 2013, South Asia Network on Dams, Rivers and People (SANDRP) reports and documents; reports, guidelines and other published material on websites of Government of India (GoI), Government of Uttarakhand, National Disaster Management Authority (NDMA), Uttarakhand's Disaster Mitigation and Management Centre (DMMC) and so on; publications on websites of SlideShare, Oxfam, ReliefWeb, Centre for Research on the Epidemiology of Disasters (CRED), Indian Red Cross Society, various NGOs and so on; articles of online newspapers and magazines like *The Asian Age*, *The Wire*, *Down To Earth*, *Livemint* and so on; various newspaper reports like that of *The Hindu*, *Hindustan*, *Amar Ujala*, *Dainik Jagran*, *Indian Express* and so on; and various blogs of journalists, engineers, scientists, environmentalists and so on.

Discussion and Analysis

The Uttarakhand Disaster 2013 exposed the institutional failure with respect to the management of a major disaster in the country and was befittingly termed as an Institutional Disaster. The preparedness level, logistical support, real-time implementation of policies and guidelines and systemic coordination all were unpleasantly exposed. The Uttarakhand government seemed clueless about how to handle the situation despite different states announcing aid and assistance. Post-disaster, numerous NGOs seemed to be omnipresent in the State of Uttarakhand contributing to the rescue and relief operations and expressing their desire to be part of the reconstruction initiatives, therefore, signed hundreds of Memorandum of Understanding (MoU) with the district administration. However, over 80 per cent of these NGOs backed out and left the district without doing anything to that effect. As per the observers' account, several NGOs were less keen on distributing relief materials in far-flung areas, where flood victims were in greater need of help.¹¹ The contribution by NGOs was more about distribution of relief supplies and reconstruction initiatives were supported by only few, for example, reconstruction of the schools. The determination and endeavour of local youth, district administration and various organisations at local level in overcoming the hurdles in the way of effective and quick response have been generally lauded.¹² Their knowledge of the terrain, mountaineering skills and commitment was highly instrumental in reaching out to cut-off villages. Noticeably, there had been a swelling response with a host of volunteers, non-traditional actors and local actors involved in responding to the post-disaster situation in this case. However, it was realised that for the sake of effective and efficient results, the enthusiasm of these local players needed to be complemented with technical knowhow and skills, in addition to an understanding of Humanitarian Standards and the Code of Conduct.¹³

People in the region were agitated against the poor governmental action and quite a percentage of people in Srinagar was not satisfied with the support

extended by governmental agencies to them as they did not receive timely support, sufficient relief material and appropriate monetary assistance in terms of the compensation in proportion to the loss incurred by them, as the loss for many surpassed the monetary aid given to them. People had a predilection towards non-governmental initiatives on the pretext that whatever they contribute is done on voluntary, missionary and sheer philanthropic basis, and the responsibility primarily lies on the government not only for fulfilling the expectations but also to create ground and space for enhanced role of non-governmental agencies in any situation that demands their contribution.

Legally, at the national level, an institutional framework had been provided for by the National Disaster Management Act 2005 and subsequent release of the National Policy for Disaster Management 2009 and other relevant guidelines and regulations from time to time. Conforming to these mandates and guidelines, the State of Uttarakhand enacted its Uttarakhand Disaster Mitigation, Management and Prevention Act 2005 laying emphasis on mitigation and prevention measures. The Act of Uttarakhand had a special feature under which an autonomous body, Disaster Mitigation and Management Centre (DMMC), was established as the nodal agency for disaster management in the state, with rest other provisions being in line with the mandate of the national Act and Policy¹⁴. Accordingly, the institutions were established at different levels in the state for the purpose of disaster management. The Uttarakhand Act¹⁵, however, had an important shortcoming as it absolutely neglected the role of community and the general public in providing critical support for efficient and effective management of disasters in the state; and as apprehended, this omission compromised with the competence of the official in prevention and mitigation of disasters in the state. Further, the mere erection of edifice does not help if it is not functional, and the same happened in case of the Uttarakhand Disaster 2013. As had been noticed by several authoritative reports, especially that of CAG's Performance Report on Disaster Preparedness of 2013, the preparedness level at both the national and state levels was in a deplorable condition, and despite numerous warnings, recommendations and

instructions to set the things in order, no due action had been taken to rectify the situation. Moreover, there was no coordination between different governmental agencies and institutions, either at national or at state level or between national and state levels. There was serious lack of human resource, logistics and equipment and state-of-the-art technology with these institutions, at both the central and state levels. The various regulations like that of flood plain zoning only remained on papers and had not been properly implemented. Importantly, the Uttarakhand government had not formulated any policy or plan of action by 2013, and it was only after much criticism that it attracted in wake of the disaster that it prepared the State Disaster Management Plan of Action for the State of Uttarakhand.

Due to the lapses in the governmental set-up with respect to the entire process of management of disaster in Uttarakhand in 2013, it failed to achieve its purpose in absolute terms because of poor preparation level, discoordination, indifference towards rules and regulations and negligence at different levels. The magnitude and scale of the disaster were too high to be matched and sustained by the existing capacity of the governmental machinery, and several loopholes in the system got excavated by the occurrence of the catastrophe. The only glory was brought by the efforts of the Armed Forces and Paramilitary forces who contributed at a missionary level, though their efforts too were marred with the lack of advanced equipment and state-of-art technology, failure of communication network, hindrance by inclement weather, loss of connectivity and lack of unity of command leading to confusion and so on. A lot needs to be improved on the front of systemic restructurings, enhanced infrastructure and better implementation of policies, guidelines, rules and regulations. Thousands of stranded pilgrims and tourists were evacuated, and tons of relief supplies were distributed to the affected people in the region, but still many were left out of the benefits. The affected people clearly voiced their discontent with the quality, quantity and nature of relief works carried out by the government machinery. Moreover, disaster management is not about rescue and relief operations alone as it merely

pertains to meeting out the post-disaster exigency. Effective disaster management calls for sustainable restructuring and rehabilitation exercises as well which can reduce the risk, enhance resilience of the society and prepare it in a strengthened manner against any similar or even more hazardous future occurrence. On the other hand, the case of Uttarakhand Disaster 2013 exhibited a different scenario altogether as the state government machinery was neither foresighted nor agile in restoring normalcy in the region.

The local community is always the first responder, so it is very essential that sufficient efforts are taken to generate awareness, build capacity and ensure involvement in all phases of disaster management in functions ranging from planning to implementation. Tapping the potential of local community helps incorporate the indigenous and traditional practices into disaster management process, builds upon the local knowledge and traditional methods to develop a customised and sustainable plan for the region, reduces political apathy, ensures better accountability, facilitates better implementation and fetches far-reaching ecological benefits. Community is the ultimate stakeholder in any public service delivery and disaster management is no exception to it. In case of Uttarakhand Disaster 2013, community played a significant role serving as volunteers during the rescue and relief operations to meet out the compulsion that situation had arisen, but no initiative had been taken on part of the government set-up to carry out any mass awareness drives beforehand, no training or skill development or capacity building exercise had been conducted and no mechanism had been put in place to ensure community involvement in planning or implementation of the related laws, rules and regulations. In fact, the State Act for disaster management was myopic in the sense that it did not acknowledge the quintessence of community involvement in disaster management and altogether neglected it. Only after realising that no agency, howsoever competent it may be, can deliver without seeking community participation, did state government got inclined towards imparting some training to the local people for better conduct of rescue and relief operations. This laxity on part of policy makers translated itself into serious repercussions in terms of

mismanagement and lack of a structured approach towards community involvement for effective and efficient management of the disaster in the region.

Disaster management is a continuous process with multidisciplinary approach. However, the state government of Uttarakhand did not seem to realise this. No proper tourism policy filtering the influx of pilgrims to Char Dham had been put in place. Rampant infrastructural growth had been allowed in the upper reaches of Himalayas escalating climatic temperature and geological pressure in the region. Use of heavy explosives for the purpose of constructing roads had been done unthoughtfully. Building by-laws had been compromised for the construction of buildings, especially in the tourist areas and no robust mechanism was in place either to review or to enforce them. Flood plain zonation regulation, despite being in place, had not been strictly implemented, and in many areas, infrastructure had been erected in the risk-prone areas putting people in vulnerable position. Warnings and instructions of environmental organisations like National Green Tribunal (NGT) and Wildlife Institute of India (WII) had been ignored. Recommendations of authoritative research organisations warning and suggesting the state government to make rectifications after some serious disasters in the past had been simply brushed aside. Thus, no lessons had been learnt from the previous similar yet not so grave episodes despite the state having a long history of interface with natural disasters. A large number of hydropower projects had been in progress or in the pipeline on all major rivers and their tributaries in the region, some 70 alone on Alaknanda, forcefully changing the course of rivers and creating undue hydrological pressure in many areas. In light of the alleged role of hydropower projects in Uttarakhand flood disaster of June 2013, an Expert Body (EB) headed by Dr Ravi Chopra was appointed by the Union Ministry of Environment and Forests, which in its report "Assessment of Environmental Degradation and Impact of Hydroelectric Projects During The June 2013 Disaster in Uttarakhand" recommended dropping of at least 23 hydropower projects and that there was an urgent need to improve the environment governance of hydropower projects in the state as these projects were bound to have irreversible impacts on the biodiversity of Alaknanda and Bhagirathi river basins.

It was also strongly recommended that a detailed study of the impacts of hydropower projects in terms of deforestation/tunnelling/blasting/reservoir formation on the hydrogeology of the area should be carried out before allowing the construction of such projects. Quite ironically, the organisations like World Bank and Asian Development Bank which had been part of some major hydropower projects in the State of Uttarakhand, in cooperation with the central government, facing allegations for the disastrous consequences of and illegalities in these hydropower projects had offered help for reconstruction which principally is bound to fetch more disaster. This all reflects an unscrupulous and skewed approach to development disturbing the entire ecological equilibrium of the region. The 2013 disaster was caused as a result of natural factors having anthropogenic origin and was further aggravated by human-induced factors, therefore, having been termed as a man-made disaster by environmentalists. The disaster reiterated and re-emphasised upon the necessity of dovetailing various disaster management-related concerns and mainstreaming disaster management planning into development planning so as to bring about sustainable development and hence increase the resilience of the society against any impending disastrous situation.

Various national and international NGOs, voluntary organisations and community-based organisations (CBOs) contributed in the rescue and relief operations during the Uttarakhand Disaster of 2013. Although maximum number of NGOs and CBOs worked in the most devastated areas, but there were many whose efforts were scattered over other areas as well to provide succour to the affected people. Besides distribution of relief supplies and assisting in evacuation, they also put forth their plans to contribute to the recovery and rehabilitation phase by restoring livelihoods, providing interim shelters, carrying out capacity building through skill development for alternative livelihoods, reinstating farmers through agricultural assistance, reconstructing schools, and so on; and several Memoranda of Understanding (MoUs) were also signed between these organisations and district administration to this effect. However, most NGOs and CBOs could not sustain their efforts and left the region and its people to manage on their own. The reasons were plenty including shortage

of funds and material resources, lack of governmental policy to facilitate and accommodate the efforts of non-governmental agencies, geographical and climatic limitations, lack of coordination between the NGOs themselves as also between governmental and non-governmental organisations (GO-NGO). Although disaster management is the primary responsibility of the State Government, but due to the complexity, interdisciplinary and interdepartmental nature of the process of disaster management, it earnestly calls for a multi-stakeholder involvement with civil society being one of the most significant stakeholders. NGOs and CBOs form an integral part of civil society and, therefore, play an indispensable role in the process of disaster management not only to supplement but also to supply at times the efforts of government agencies in this context. In case of this Uttarakhand disaster as well, NGOs contributed quite overwhelmingly aiding and assisting the stranded and affected populace; at times reaching to areas and people where even government could not reach. Although they could not yield the best of results and could not meet extremely high expectations of the utterly disheartened and derelict sufferers, still they performed quite satisfactorily at the rescue and relief levels, but their role at the latter stage of recovery and rehabilitation attracted condemnation from various corners. Nonetheless, the role that these non-governmental agencies played during the Uttarakhand Disaster was very significant as they shared the responsibility and quantum of the burden that was there on the shoulders of government.

Conclusion

Here, the first hypothesis stands verified that the existing governmental set-up for disaster management functional in the State of Uttarakhand is in coherence with the legally provided institutional framework for the purpose of disaster management in the country. However, the same is not being employed adequately and not fulfilling the responsibilities assigned to it due to political apathy, lack of resources and non-mobilisation of the existing ones, and lack of coordination.

In spite of the huge monetary assistance extended to the state from different corners, the State Government

failed to utilise the same optimally and also failed to maintain proper records of the expenditure incurred on various heads. Also, discrepancies were observed in the activities shown and actual work done. This clearly indicates failure on part of the government machinery for disaster management in general in managing 2013 disaster in the region rejecting the second hypothesis.

Community involvement is almost indispensable in the conduct of hazard risk and vulnerability assessment (HRVA) exercise as any such assessment is based on local knowledge best retained by the local community. Therefore, the third hypothesis stands true that greater the participation of people and local community in all phases of disaster management better shall be the results obtained.

Thus, the fourth hypothesis stands favourably verified that the incorporation of disaster management process into developmental planning reduces the society's vulnerability towards disasters. Major challenges, however, here are to convince the development agencies to integrate disaster risk reduction measures in the development planning process and ensuring the sustainability of disaster risk reduction initiatives which requires that both capacity building and awareness-related initiatives are carried out on a regular basis. The idea is to have a green economy based on green ways of development, like using solar and wind power, with the adoption of green technology strategies and tackling climate change issues, which in turn will fetch disaster risk reduction (DRR) benefits and insurance and risk management industries.

Thus, it stands verified that the participation of non-governmental organisations and community-based organisations has an effective role in the efficacy of government measures on disaster management. Having said that, it is pertinent to add that there is an urgent need to integrate the contributions of volunteers and non-governmental organisations in disaster response at the state level and the government ought to create a facilitating environment for establishing an optimally productive GO-NGO collaboration. This integration would be best achieved at the district and local levels to impart it in a bottom-up approach for optimal efficiency and efficacy. Also, NGOs should be engaged in the disaster management planning process

so as to ensure their profitable involvement in a joint response in the wake of a disaster.

Suggestions

There is a common perspective that government and NGOs are agencies with antagonistic agenda and tendency. Instead, both are the integral offshoots of the same society and hence are bound to be complementary to each other; by the virtue of which, a close and strengthened coordination between governmental and non-governmental agencies is of immense significance for better management of disasters in the country. There exists an environment wherein NGOs view government as eager to restrict freedom of NGOs through authoritarian control, insensitive to civil society concerns, and opposed to transparency and accountability, while government views NGOs as more vocal and less active, opposed to any move to ensure transparency and accountability, donor driven, obsessed with sectoral issues, over critical of government policies and blind to macro-challenges of development. On the contrary, the fact is that both shall co-exist and need each other's support for better public service delivery in various sectors including disaster management. For the sake of efficient and effective disaster management, it is imperative that a profitable GO-NGO collaboration is established and the barriers in its way are removed to strengthen this collaboration. So far, though NGOs played an important role in abridging resource and capacity gaps in the development process, their tendency to present themselves as an alternative to government created differences between the two. Both sectors have their respective strengths and weaknesses, and any effort to hide weaknesses and overplay strengths by one sector is sure to cause mistrust and discontentment on the other side. Quite often, prolonged relief work beyond a reasonable time limit and differential aid provisions by NGOs during the post-disaster period creates confusion among NGOs and vexes the government, as it hinders and adversely affects reconstruction/rehabilitation initiatives of the government. Furthermore, NGOs feel that in case of urgent issues like that of disaster management, their collaboration with government is bound to hamper their role as the watchdog over

government. Similar misgivings prevail within the NGO fraternity as smaller NGOs distance themselves from bigger NGOs due to their domineering attitude, while bigger NGOs look down upon their smaller counterparts due to their poor institutional strength and avoid sharing a common platform with them on larger issues.

Overcoming these impediments, it is of vital significance to establish GO-NGO collaboration by creating an enabling policy environment strengthening GO-NGO partnership for disaster reduction and socio-economic development while paying due attention to the areas like institutional and legal framework, incentives, sectoral collaboration, capacity building, level and nature of collaboration, NGO role in policy-making and so on. In order to develop a set of minimum standards in core areas of humanitarian assistance, a project named as Sphere Project was launched in 1997 with the objective of developing a humanitarian charter and associated set of minimum standards in collaboration with leading NGOs, interested donor governments and UN agencies, to disseminate the results widely within the international humanitarian system and to encourage their formal adoption and practice by relief agencies and their donors. The project led to the publication of the handbook on *Humanitarian Charter and Minimum Standards in Disaster Response*. Also, the National Guidelines on Role of NGOs in Disaster Management have already taken cognizance of the matter and have issued some directives as regards such collaboration, but there has been no much headway as yet. The following steps may be taken to strengthen GO-NGO collaboration for the purpose of effective management of disasters:

- A GO-NGO Collaboration Institutional Framework should be set up in non-disaster times to align the initiatives in times of need by overcoming the differences. This framework should facilitate a continuous collaboration platform at all levels of administration ranging from grassroots or local level to central level to ensure appropriate coordination in times of exigency.
- Distinct road maps, strategies and plans should be charted out as per long-term, medium-term and short-term requirements.

- Common Minimum Standards should be established for both governmental and non-governmental organisations backed with a compliance regime so as to ensure better collaboration, transparency and accountability. There should be provision of social auditing to ascertain the performance level of such collaborative initiatives.
- Knowledge and Resource Database should be established in the context of this collaboration so as to consolidate the scattered information of skills and capacities of various NGOs and resources available with them which may be optimally utilised in case of an emergency and also to provide clarity about the same.
- NGOs should bring some fundamental changes in their governance structure in order to strengthen their representative character and enhance their credibility and institutional stature in eyes of both people and the government.
- Responsibilities should be distributed between GOs and NGOs building upon each other's strengths, thereby overcoming individual deficiencies.
- Training, mock drills and simulation exercises should be carried out under collaborative arrangement. Learning gaps should be filled by documentation and referring of good practices under such collaborative initiatives in disaster management.
- Any GO-NGO collaboration initiative would fail to yield desired results unless collaboration is not established amongst the NGOs themselves, therefore efforts should be taken in this direction as well.

Notes

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Turnaround of Disaster Management in Bihar: A Critical Appraisal

Sunil Kumar Chaudhary^a

ABSTRACT: During 1999–2000 to 2005–2006, the state income at constant prices grew at an annual rate of 5.7 per cent. After that, the economy witnessed a turnaround and grew at an annual rate of 12.0 per cent making it the nation's fastest growing state. Disaster Management is a big area, which does not only include humanitarian assistance but also refers to the whole reconstruction and recovery process that goes on until the affected country is back on its feet and able to handle future disasters on its own. The humanitarian sector is a part of Disaster Management, and we call the rest of the business the development sector. Disaster Management and development are two sides of the same coin. The case is no different for the State of Bihar. The state's turnaround to good governance and visible improvements in Disaster Management conditions, and hence given the credit to dynamic leadership for the sterling performance backed by political and administrative initiatives. The success story of Disaster Management Department (DMD) of Govt of Bihar is a matter of great interest in recent times for economists, research scholars and business practitioners around the globe who started evincing interest to know how it could be a reality for DMD of Bihar to take this sector to grow path. The Road map of Disaster Management Department of Bihar in its course of realising amazing turnaround is hard, painstaking and full of decisions both financial and organisational duly supported by the dedicated efforts of engineers and administrators who strived to provide a meaningful shape to the vision of top management.

This paper attempts a diagnosis of 'turnaround' beginning with the question as to whether it really was a turnaround. This paper then carried out an analysis of the various determinants of the 'turnaround'. This is followed by a critical assessment of the strategies and key process being the 'turnaround'. Finally, the sustainability of the 'turnaround' is explored.

KEYWORDS: turnaround, disaster, management, Bihar

Introduction

The State of Bihar, a multi-disaster-prone state, is predominantly rural in character. The geo-climatic conditions of Bihar make it vulnerable to many hazards. The lives and livelihood of millions of the people residing in Bihar gets affected by various disasters from time to time. The state witnesses various types of natural and human-induced disasters, like floods, drought, earthquake, fire, cyclone (high-speed winds), road accidents, stampede, epidemics, heat waves, cold waves and landslides. Kosi Flood of 2008 and

severe earthquake of 15 January 1934 have been worst disasters in the history of Bihar and the country. In addition to natural disasters, human-induced disasters also pose serious challenge to the people of Bihar. Environment and climate change issues have been at the centre of disasters with increased frequency of extreme weather conditions, thus requiring an eco-sensitive approach to deal with them. With a paradigm shift from post-disaster efforts to pre-disaster initiatives, better institutional arrangements and increased awareness and preparations, the state is moving towards disaster resilience and emerging

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as a leader in the field of disaster risk reduction and management and setting examples for other states to follow. The multi-disaster-prone state of Bihar requires a multidisciplinary approach to deal with these disasters requiring participation of various stakeholders. It requires a continuous and integrated process of planning, organising, coordinating and implementing measures that are necessary for risk prevention, mitigation of risk impacts, preparing to face the disaster event, response, rehabilitation and reconstruction.

Though the state is a multi-hazard-prone state, it has also been moving towards greater disaster resilience. Bihar State Disaster Management Authority (BSDMA), together with Disaster Management Department of Government of Bihar, has been taking various initiatives towards awareness generation and capacity building of various stakeholders and also the affected population. Emphasis of BSDMA has been towards structural and non-structural strengthening of the system to reduce disaster risks and mitigate their impacts. Safety Weeks (Road Safety, Earthquake Safety, Fire Safety & Flood Safety), training of stakeholders, safe school programmes, safe construction guidelines, Free Earthquake Safety Clinic & Centre, wide circulation of IEC materials and so on. are some of the important initiatives of the authority.

Literature Review

How could the Disaster Management achieved such a spectacular turnaround in such a short period of time is a question of interest, and this paper explains the various strategies adopted by the government. But before that happens, authors review the literature on public sector turnaround within which the turnaround of Disaster Management has been analysed.

Although study of turnaround has been earlier studied, it is arguably poorly understood in terms of complexity and diversity and how it affects the different castes, classes and groups of society. It is evident that in recent times virtually no study on the turnaround of Disaster Management has been conducted in Bihar. This study aims to fill some gap by providing an in-depth assessment of Disaster

Management in Bihar covered under the Govt of Bihar funded research project. It is important to understand the various issues of turnaround and various dynamics of Disaster Management to accelerate the process of improvement in Disaster Management of state. It is evident that the situation of Disaster Management is good but requires improvement, and hence, there is a compelling necessity to study its status in the current socio-economic and political set-up.

Turnaround has been defined as performance decline followed by performance improvement (Schendel et al., 1976., Robbins and Pearce, 1992). Brandes and Bregge (1993, p.92) define it as a process that takes a company from a situation of poor performance to a situation of good performance. While the literature on the factors that lead to organisational turnaround in the private sector is well developed, the one on public sector is of recent origin (Arogyaswamy, K. Barker, 1995). Beeri (2006) states that turnaround management strategies have been researched widely in the private sector as part of the organisational study area. However, only recently these strategies have been researched in the public sector (Boyne, G. 2006).

Disaster Management, while easy enough to conceptualise, is also extremely difficult to measure, as the very extensive literature on this in political science, legal studies, economics and public administration shows (Nardulli, Peyton and Bajjaleih 2011). Bihar had a particularly poor perceived record with respect to Disaster Management throughout the 1990s and later. The condition of Disaster Management in Bihar declined in 1990s.

The condition of Bihar's Disaster Management in the last 15 years has been miserable (Tripathy, R., 2007). "It was not a case of bad governance," Nitish Kumar, Present CM of Bihar, said in an interview. "Governance was completely absent from the state of Bihar."

There are several causes of the performance decline of Disaster Management (Mathew, S., 2011). These among others included the lack of accountability which was compounded by poor staff productivity. Efficiency and performing attitude slowly disappeared from the dictionary of government employee.

Political profligacy was also one of the major impediments for poor condition of Disaster Management

in Bihar. Thus, the key reason for performance decline was politicisation of the decision-making processes. This philosophy had to undergo change in order to make a turnaround in the Disaster Management in Bihar and to make Disaster Management Department a truly people-oriented corporate organisation (Ghosh, P. P., 2007).

The philosophical change began in 2005 as is evident from the statement made by the Chief Minister Mr Nitish Kumar. The condition of Bihar's Disaster Management in the last 15 years has been pathetic, Chief Minister Mr Nitish Kumar admits (CNN-IBN, 2006). "Our government has taken up the task of providing better disaster Management on priority," he says. The change in philosophy appears to have shown impressive results in the years that followed (Nagaraj, R). There is a decrease in the number of loss of lives, decrease in response time during disaster, significant increase in mitigation activities to minimise the risk of disaster and significant increase in economic progress and infrastructure development due to improved Disaster Management in Bihar. The government of Bihar is now spending a significant amount of its plan outlay on Disaster Management.

There are visible signs of turnaround where the Bihar government has been implementing wide-ranging initiatives. While pinpointing the roots of turnaround is complex, the faster growth experienced by Bihar after 2005 can be reasonably linked to improvements in the Disaster Management, more efficient and larger public expenditures and better infrastructure (Sinha, A., 2011).

Objective of the Study

- An attempt has been made to probe the status of Disaster Management in Bihar and its turnaround story with a special focus on Patna district.
- To assess the path-breaking initiative, measure the extent to which it improved Disaster Management situation and identify gaps.
- Confidence of people in the Disaster Management which has been established by present leadership has been examined.

Hypotheses

- There would be significant decrease in loss of lives and properties during disaster
- There would be significant increase in expenditure on disaster mitigation and response
- There would be significant decrease in response time during disaster
- There would be significant increase in mitigation activities to minimise the risk of disaster
- There would be significant increase in economic progress and infrastructure development due to improved disaster management in Bihar

Research Methodology

To achieve the objectives of this study, both primary and secondary data sources have been explored. The process starts with a review of available literature on turnaround in general as it obtains from the international and national experiences.

A number of secondary sources were used including research studies on turnaround in law and order of Bihar as well as data from the website of Govt of Bihar, budget documents, speeches of the Finance Minister, block and district administration and other published sources. I have also used data from Census and State election commission and other stakeholders. Information collected through interviews and group discussions was cross-checked with other reliable sources. Local dialects were used by the Field Investigators (FIs) during the interview and FGD.

The methodology adopted for the study can be summarised as follows:

- Develop research framework and identify data sources
- Review and collate existing governmental and non-governmental data to support the aforementioned indicators
- Interpret data, analyse and document information
- Report based on qualitative and quantitative analyses results

The study focussed at qualitative and quantitative research methods, which aimed at comparing and interpreting findings, rather than relying on direct, potentially conflictive questioning.

Research Technique

Since turnaround in Disaster Management of Bihar is the focus of this study, quantitative as well as qualitative techniques, focus group discussions, structured as well as unstructured interviewing and observations have been used for collecting the data. Focus group discussions were conducted with members of NGO representatives, government functionaries and village-level leaders. The methodology also includes semi-structured in-depth interviews with different sections of the society.

Focus Area of the Study

- The fieldwork covers the four blocks of four Subdivisions of Patna district. Multi-caste Panchayats were studied in each area. All were well connected.
- The target groups under the study have been selected using stratified random sampling method from those Panchayat. A sample size of 200 people from Paliganj, 150 people from Danapur, 150 people from Patna Sadar and 100 people from Fatuha was taken.

Interview Schedules

The Field Investigators collected information which will assist the policymakers and programme managers to formulate and implement strategies in the near future. Three types of questionnaires were used: the interview schedule for the rural and urban respondents, opinion leaders and the stakeholders. The overall content and format of schedules were determined through a series of discussions with the members and experts working on Disaster Management issues. The schedule/questionnaires were set up in Hindi, and FIs were instructed to make use of local dialects during the

discussion in order to extract the in-depth quantitative as well as qualitative information.

Turnaround Diagnostics

The condition of the Disaster Management in Bihar has completely changed. The Planning commission has called Bihar a good performing state. "The aim is that there will be minimum loss of lives and properties during disaster. People feel safe in Bihar, and there should be no fear," says Nitish Kumar, Chief Minister of Bihar. "Almost everybody in the state is saying about how Disaster Management in Bihar have transformed."

To diagnose the 'turnaround,' the first question would be *whether it really was a 'turnaround.'* Figures 1–5 allows an analysis of this.

The essence of the 'turnaround' was in the fact that (i) Decrease in loss of lives and properties during disaster in the state by significant percentage in the last 10 years; (ii) Decrease in response time during disaster in the state by significant percentage in the last 10 years; (iii) Significant increase in mitigation activities to minimise the risk of disaster in the last 10 years; (iv) Significant increase in economic progress and infrastructure development due to improved disaster management in the last 10 years and (v) expenditure on disaster mitigation and response continued a robust upward trend.

The next question would be the *determinants of the 'turnaround.'*

The turnaround in the Disaster Management could be attributed to (i) decrease in loss of public property by 100 per cent (Fig. 1) in last 10 years; (ii) decrease in loss of lives by 98.0 per cent (Fig. 2) in last 10 years; (iii) capacity building programme of different stakeholders resulted in training of 5300 masons, 1500 engineers and more than 6000 BDO, CO, Mukhia, Sarpanch and villagers so far; (iv) increase in Bihar per capita income by 65 per cent (Fig. 3) and ratio of Bihar PCY to All India PCY continued a robust upward trend; (v) increase in expenditure on Disaster Management by 60 per cent (Fig. 5) in last 10 years; (vi) response time has reduced to minimum due to NDRF, SDRF and Govt Machinery's promptness and (vii) excellent economic progress and infrastructure development of state in last 10 years.

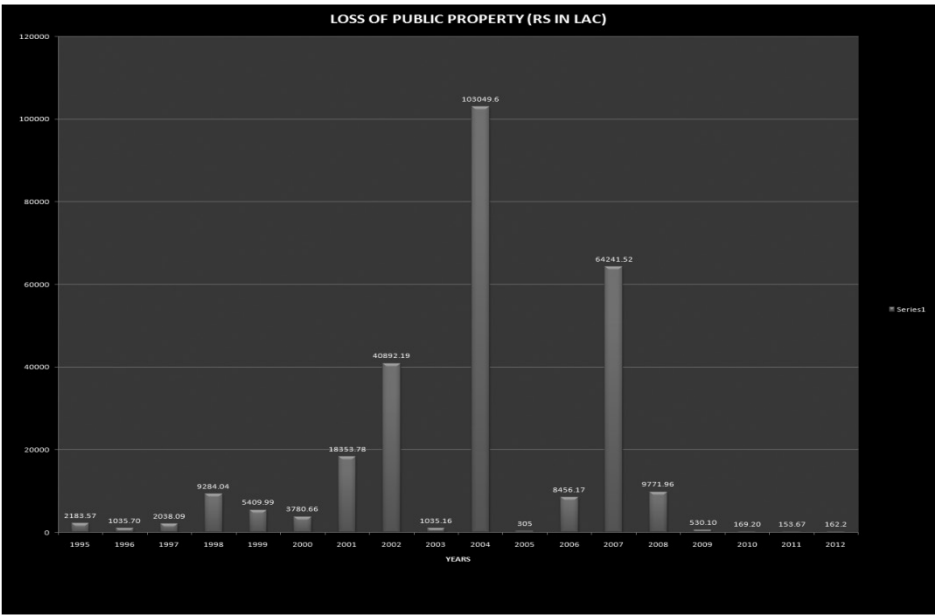


Figure 1: Loss of public property

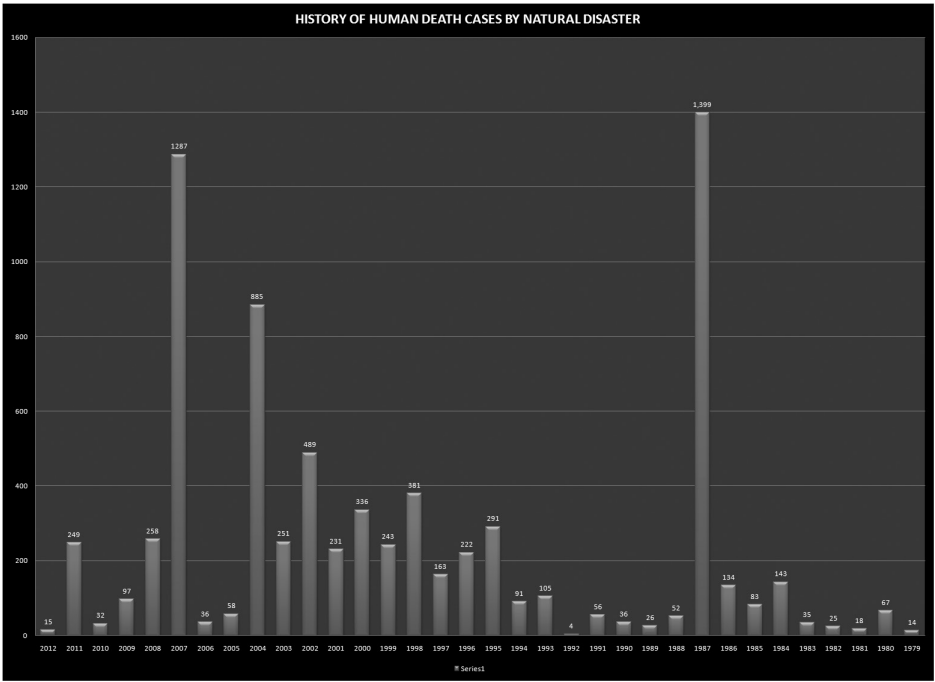


Figure 2: Human death

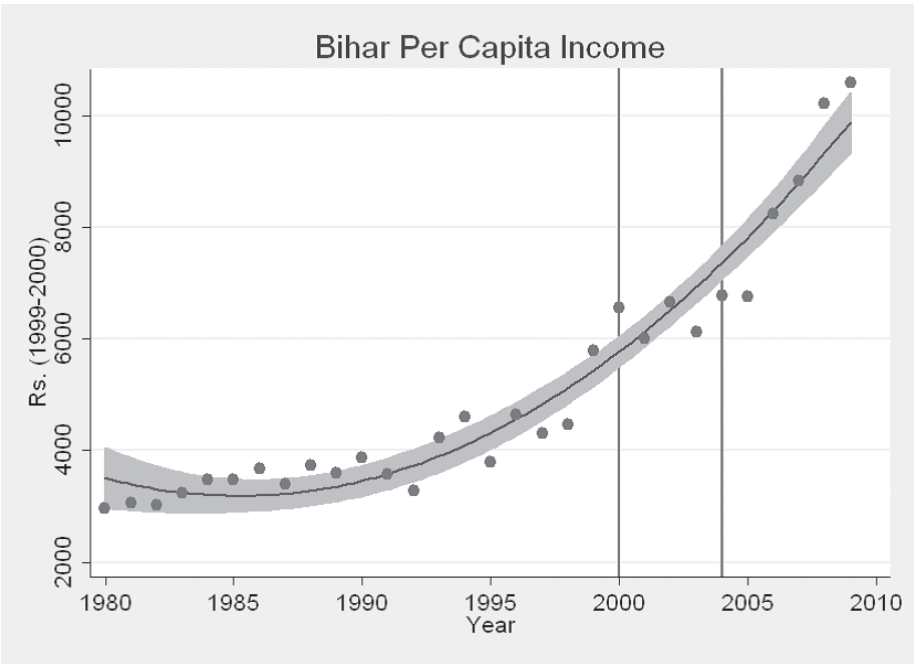


Figure 3: Bihar per capita income

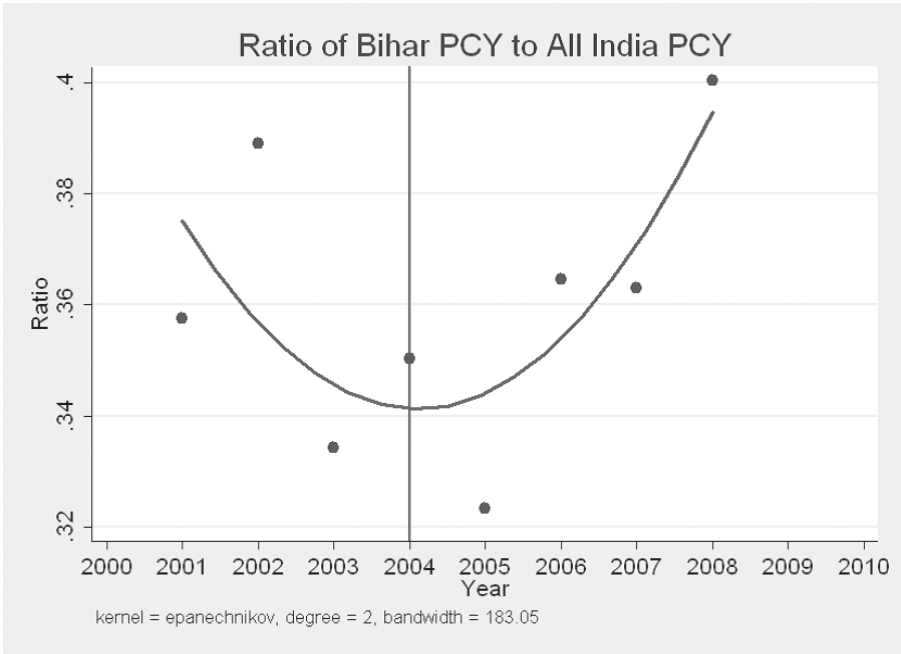


Figure 4: Ratio of Bihar PCY to All India PCY

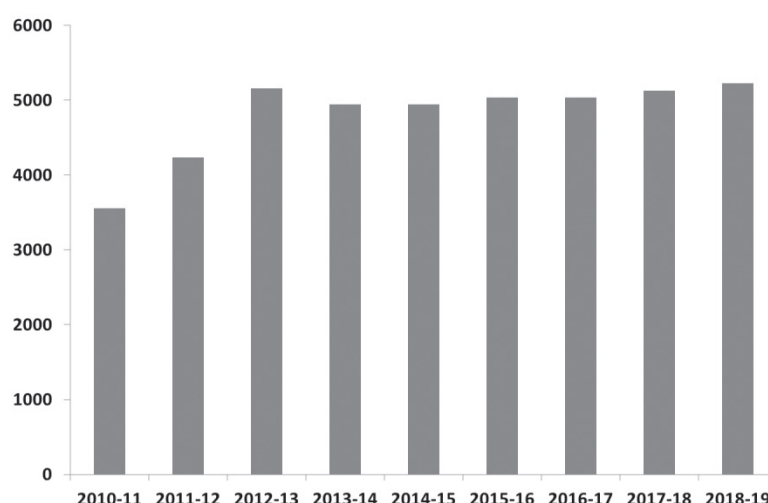


Figure 5: Budget expenditure on disaster management

Major Findings

- An overwhelming majority of 90 per cent respondents talked positively about Disaster Management in Bihar and asserted that there is decrease in response time for rescue and relief during disaster in Bihar. Only 10.0 per cent respondents spoke negatively about Disaster Management.
- But the most important thing is those who talk negative about Disaster Management are also in favour of sustainability of leadership.
- 100 per cent respondents were in favour of sustainability of leadership.
- People have started constructing house using disaster-resistant technology.
- There is a heightened awareness about the need to focus on disaster-resistant new construction and retrofitting of old building among different stakeholders of society.
- There is astonishing response among engineers, masons, local representative, political leaders, local representatives, common people, media and so on.
- Govt officials and local representatives are putting their request for more and more training.
- Finally, while condition of Disaster Management in all the four blocks of four subdivisions is good but still requires improvement.

Critical Appraisal Strategies

As we review the initiatives behind the 'turnaround,' it is clear that significant dynamism has been brought in to leverage value from a whole range of possible innovative initiatives.

The strategy of making full use of existing technical team has done well for the improvement of Disaster Management of Bihar. Strict and effective action has been a major driver for this. The focus on innovative planning process and increase in budgetary provision has been a key support for this.

The strategy of speeding up mitigation and response activities process has done well for the improvement of Disaster Management in Bihar. Capacity building of different stakeholders has been a key driver for this, and the results achieved have a salutary effect on the Disaster Management situation while restoring the faith of the common man in the Disaster Management system.

Increased use of IT has done well Disaster Management. Bulk SMS and help line has been key driver for this. Dedicated helpdesk set up at HQ and training programme for Disaster Management Professionals has been a key support for this. However, the implications of increased use of IT for improving Disaster Management need to be studied scientifically rather than just empirically.

Change in planning system has proved worthy. It was the result of good planning system and changes in organisation culture that more than 5300 masons, more than 1500 engineers and 6000 BDO, CO, Mukhiya, Sarpanch have been trained so far and the state has seen significant decrease in loss of lives and properties in last 10 years. People have started constructing disaster-resistant house using this technology. There is astonishing response among engineers, masons, local representative, political leaders, local representatives, common people, media and so on. Govt officials and local representatives are putting their request for more and more training. Uses of technology, outsourcing for infrastructure development and smart initiatives have enabled the Disaster Management Department to scale-up rapidly, improve qualitative performance and bring transparency.

An HR initiative has fetched very good results. Appointment on large scale has been a consistent thread across both Disaster Management Department and Authority. It enabled the government to do quick scale-up, offer flexibility for course correction and improve delivery.

Critical Appraisal Processes

Having attempted an appraisal of the strategies, we now critically examine some of the key processes behind them. Discussions with various people from different sections of the society by the author brought home the point that there had been a significant increase in initiatives over the past 10 years. "This has brought in a confidence and up-beat attitude right through the organisation."

All major policy initiatives require the CM's approval. Hence, the role of the CM's vis-à-vis the Disaster Management Department becomes critical.

The CM

Given the implicit power structure, the CM becomes the effective CEO of the Disaster Management Department. He is thus in a position to drive initiatives.

Based on an analysis, the key factors affecting the Disaster Management turnaround over the past 10 years have been summarised as:

- Quick decision-making with 'partnering' approach

- Sustained economic growth
- Expeditious mechanism to resolve encumbrance issues and pro-active Govt support
- Non-politicisation of decision-making process
- Real-time project monitoring

Almost all the above initiatives were moved by the Disaster Management Department and brought to finality by the CM.

The Style of the Present CM

The operationalisation of the various strategies over the past 10 years depended significantly on the leadership style of Mr Nitish Kumar. Of course, Kumar has tremendous motivation to deliver. His political career hinges on it. It was a common sense-based approach, showing an astute understanding of the market reality, the asset base of the Disaster Management Department and the expertise and capability of the Disaster Management Department professionals and systems. Consequently, he followed this up with the principles of quick decision with confidence and empowerment and delegation. With whatever has been achieved the 'turnaround', Mr Nitish Kumar has demonstrated that good economics is good politics.

Non-interference: Dealing with the Disaster Management Department

"Mr Nitish Kumar is a non-interfering, yet aware CM, who sets the goals and expects results." "This has given him a position of strength to build organisational alignment to see through fundamental initiatives." It appears that the current officials of the Disaster Management Department and Authority function as a cohesive entity due to the force of expectation on legitimate initiatives.

Direct Approach: Communication to Secretary and VC

To build alignment for execution, the CM periodically communicated to the Secretary's and VC, setting and reinforcing priorities.

Caring Attitude: Staff and Officers

Mr Nitish Kumar had a positive approach in dealing with the officials and staff. Given the financial and physical performance of the Disaster Management Department, the govt decided to award the best performing officers.

Officers and staff wanted to implement VIIth pay commission. He agreed. There were discrepancies in pay band. He appointed a committee to solve the issue without delay.

He believes in the principle of “Downsizing may make Disaster Management Department thinner, but not necessarily healthier.” On presenting the future, his pitch was, “regenerate competitiveness and leverage resources rather than restructure and downsize.” He believed in instilling hope and excitement rather than fear and anxiety.

Image Building: Media

Given his penchant for wit and one liner, Mr Nitish Kumar was sought after by the media. Whenever there was an opportunity to highlight an initiative or an achievement, advertisements were released. Bihar’s experience highlights the importance of image management for governments and Disaster Management department and Authority. A healthy institutionalised relationship with the media and a public emphasis on improving civic life were important components of the reform strategy. In recognition of his initiatives, Mr Nitish Kumar will be known as the best chief minister of Bihar.

Identifying Right People

Mr Kumar understood good governance to mean “the restoration of governance” above all. He wanted to revive the organs of the state and restore government authority. Improvements in Disaster Management were vital aspects of his quest.

Sri Vyasji (who uses only one name) was appointed to the position of Principal Secretary of Disaster Management Department, a high-level post, in 2005 who later became VC of Bihar Disaster Management Authority. He was specially chosen by the CM for this position, based on earlier performance (Mukherjee, R., 2009). It had been clarified between him and the CM that his role would be to provide the link between the CM and the Disaster Management Department to translate the CM’s vision for Disaster Management Department into action.

The first task that Sri Vyasji took upon himself was to understand the functioning of the Disaster Management Department and what has been said about the Disaster Management Department in a

studied manner. He soon realised that the Disaster Management Department had tremendous strengths in its systems that ensured robust decision-making. The Principal Secretary understood that the Disaster Management officers themselves were a source of ideas for innovation that would be in line with the CM’s thinking. He made it a point to be open to ideas from within the Disaster Management Department, so that they could be examined and appropriate action finalised and implemented quickly.

Mr Nitish Kumar believes that if leadership is productive, system delivers. He appointed Mr Anil Sinha as Vice Chairman of Bihar Disaster Management Authority. Using his leadership quality, innovative thinking and goal-oriented temperament, he scripted a spectacular turnaround story in the Bihar Disaster Management Authority. He brought a revolution in the field of mitigation approach.

No wonder, by entrusting Sri Vyasji and Mr Anil Sinha with Disaster Management Department and Authority, respectively, Nitish Kumar appears to have put the right person at the right place.

This is even more significant, given that all this has happened through the existing systems and culture of the DMD. The tactic behind the achievements was the balanced use of the CM’s support for legitimacy, and in keeping independence in the departmentally oriented and hierarchical organisation that Disaster Management Department was.

A premise that comes forth is that if all it takes is a CM’s consistency of direction and follow-up to make the organisation more dynamic, then by implication, the Disaster Management Department is well set in terms of people and a lot of systems but does not have the structure for a corporate approach to fructify policy initiatives in a timely manner independent of the political leadership, in the context of the Disaster Management requirements for the State of Bihar.

Disaster Management Department

Most of the initiatives implemented over the past 10 years have been ideas from within the Disaster Management Department. The Disaster Management Department has played a pivotal role in implementing the initiatives, leveraging the well laid out systems.

However, while many ideas had been generated within the Disaster Management Department, the structure of the Disaster Management Department with Officials being responsible for different departments often slowed down decision-making for innovations. The officials had to ensure that their decisions comply with the technical and systemic requirements of their respective departments. Resolution of this for a policy decision often took more time than would be appropriate for a changing environment in a fast-growing economy.

The strength of the systems was in the fact that the Disaster Management Department was able to function well on its own for routine and to rally around whenever routine was disrupted (like in the case of flood).

Thus, most innovations generated in the Disaster Management Department had come to fruition with the active involvement and leadership of the CM. The one notable instance of a VC driving initiatives (with the backing of the Chief Minister) was development of a system that came to be known as “Capacity building of Engineers and Masons and other stakeholders” to prepare the society to face the disaster and expedite the response activities during disaster. The turnaround in Disaster Management as one performance measure shows the impact of those initiatives.

The Principal Secretary of Disaster Management Department has had relatively short tenures. The same would be the case for the VC. Given the relationship between the political leadership and the Disaster Management Department, the implication of this reduced in significance when there is a CM who is committed to getting the best out of the organisation.

Critical Appraisal: Sustainability

The final question is *whether the strategies and processes are sustainable.*

It is important to recognise that apart from a faster growing economy, the one variable that was different in the past 10 years of the ‘turnaround’ was the political leadership. The natural corollary is that sustainability depends on the political leadership.

From the perspective of Disaster Management responding to environmental changes in a fast-growing economy, what is required is a framework for continued innovation. We shift our focus from just the current strategic initiatives to the process of continuing

such initiatives. Towards this, the strategies and processes *can be sustained* if the political leadership is well intentioned and has consistency of direction. Political leadership does not come in through a controlled process. The need is for the professional top management to be able to respond as a commercially oriented organisation with a corporate culture.

Strategies and processes have to be people and user centric. The current structure of the organisation lends itself primarily to supply-driven strategies, where at best the initiatives are what the Disaster Management Department thinks is good for the people and user and not necessarily driven from the people’s and user’s perspective.

An important strategic tool to evolve customer-centric strategies is *market segmentation*. Market segmentation based on the nature of the origin/destination for disaster may be considered. This can have implications on planning process. There could be other dimensions of segmentation like size of disaster, time value of disaster, geographic origin/destination, monetary value of the disaster and so on.

Every District Magistrate (the division being the operational interface with the client systems) should be asked to periodically evolve a strategy paper with a two-year time frame, which can then be consolidated at a circle level. Periodic workshops and disaster study should be held where in key issues should be discussed with the top management listening. Periodic disaster research should be conducted and assimilated to understand the Disaster Management’s needs.

Strategies and processes have to be scientifically based. This needs a paradigm shift on research, development and training to evolve and sustain faster and quality management of disaster with proper utilisation of law, technologies and systems that are innovative and people friendly.

To sustain the above, Disaster Management department needs to focus on *organisational restructuring*. Top-down restructuring with a focus on performance, better promotion and other facilities and merging of cadres, beyond the mid-way career, are imperatives for the Disaster Management Department.

The ‘turnaround’ over the past 10 years has demonstrated that Disaster Management of Bihar is indeed sunrise sector. With the right moves, nothing can hold it back from being best in the country.

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Capacity Building for Earthquake-, Cyclone- and Flood-Resistant Constructions: A Revolutionary Mitigation Approach

Sunil Kumar Chaudhary^a

ABSTRACT: As Bihar is vulnerable to different kinds of disasters due to its geographical and topographical location, it is prone to earthquakes, cyclones and floods. According to seismic zoning, some parts of the state are in zones IV and V, which can cause devastation as bad as what had occurred in Bhuj (Gujarat) and Latur (Maharashtra). While natural calamities cannot be predicted and prevented, a state of preparedness and ability to respond to a natural calamity can considerably mitigate loss of life and property and human suffering. Capacity building for earthquake, cyclone and flood resistant construction has emerged as a revolutionary mitigation approach in Bihar. The revolutionary approach of capacity building of different stakeholders and visible improvements in mitigation approach in society, and hence given the credit to dynamic leadership backed by political and administrative initiatives. The success story of capacity building for earthquake, cyclone and flood resistant construction in Bihar is a matter of great interest in recent times. The road map of Bihar State Disaster Management Authority in its course of the realising amazing result was hard, painstaking and full of decisions both financial and organisational duly supported by the dedicated efforts of engineers and administrators who strived to provide a meaningful shape to the vision of the top management.

This paper attempts a diagnosis of the 'Revolutionary mitigation approach' beginning with the question as to whether it really was a revolution. This paper then carries out an analysis of the various determinants of the 'Revolution'. This is followed by a critical assessment of the strategies and key process of the 'Revolution'. Finally the sustainability of the 'Revolution' is explored.

KEYWORDS: disaster, revolution, mitigation, earthquake, cyclone, flood

Introduction

Bihar is one of the most disaster-prone states in the country and is susceptible to multiple hazards. The geographical and topographical situation makes the state highly prone to severe and moderate earthquake risks. Out of the 38 districts of the state a total number of 09 districts fall under the highest earthquake seismic zone V. Again 20 districts of the state fall under seismic zone IV and the rest are under zone III. Besides earthquake, North Bihar is also prone to severe floods

every year, affecting almost 22 districts. Other parts of the state are prone to drought. Besides this the state has recurrent village fires during summer, which cause loss of lives and livelihoods. Since the state is highly prone to various disasters, its development is adversely affected by these natural and manmade disasters.

Mitigation means to lessen the effects or plan and take action so that the impact of any future disasters will be ameliorated or eliminated. It is a long-term, pre-disaster planning that involves sustained expenditures on structural and non-structural efforts to reduce or

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eliminate future risks. Mitigation plans and activities are, in practice, usually medium to long-term. It is the cornerstone of emergency management, since it is an example where thinking ahead pays off in the long run. Though the state is a multi-hazard prone state, it has also been moving towards greater disaster resilience. Bihar State Disaster Management Authority (BSDMA), together with Disaster Management Department of Government of Bihar, has been taking various initiatives towards awareness generation and capacity building of various stakeholders and also the affected population. Emphasis of BSDMA has been towards structural and non-structural strengthening of the system to reduce disaster risks and mitigate their impacts. Capacity building for earthquake, cyclone and flood resistant construction of different stakeholders preparing to face the disaster presents a unique, amazing and revolutionary approach.

Disasters: National and State Scenario

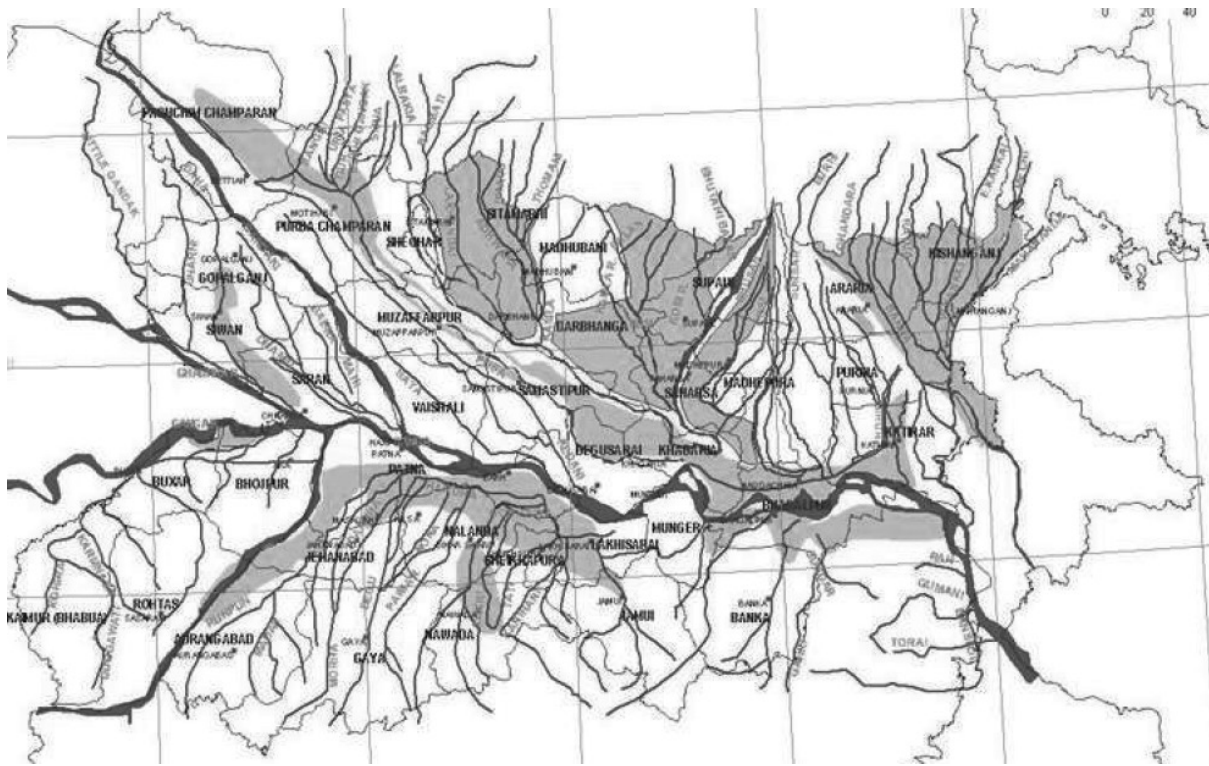
- India supports 1/6th of the world's population on 2 per cent of world's landmass
- 59 per cent of land vulnerable to earthquakes
- 28 per cent of land vulnerable to droughts
- 40 million hectares (12 per cent) of land vulnerable to floods and 80 per cent of the coast is vulnerable to cyclones
- Different types of manmade hazards

- One-million houses damaged annually, and human, economic, social and other losses
- Bihar supports 8.60 per cent of India's population on 2.86 per cent of India's landmass
- 100 per cent of land vulnerable to earthquakes
- 48 per cent of land vulnerable to drought
- 73 per cent of land vulnerable to floods
- 27 per cent of land vulnerable to cyclones

Some of the prominent disasters and their impacts are as follows:

Earthquake: Bihar is located in the high seismic zone that falls on the boundary of the tectonic plate joining the Himalayan tectonic plate near the Bihar–Nepal border and has six sub-surface fault lines moving towards the Gangetic plains in four directions. Major parts of the state are classified under seismic zones IV and V by the Vulnerability Atlas of India, that is as having high earthquake vulnerability with the potential to cause very high degree of devastation. In all, 15.2 per cent of the total area of Bihar is classified under zone V and 63.7 per cent of the total area of Bihar falls in zone IV. Of the 38 districts, 9 districts fall in seismic zone V while 20 districts fall in seismic zone IV and 9 districts in seismic zone III, with most districts falling under multiple seismic zones (i.e. either seismic zones V and IV or seismic zones IV and III). The state has in the past experienced major earthquakes; the worst was the 1934 earthquake in which more than 10,000 people lost their lives, followed by the 1988 earthquake.





Flood: Bihar's topography is marked by a number of perennial and non-perennial rivers, of which those originating from Nepal are known to carry high sediment loads that are then deposited on the plains of Bihar. A majority of the rainfall in this region is concentrated in the three months of monsoon during which the flow of rivers increases up to 50 times causing floods in Bihar. Around 68,800 sq km out of a total area of 94,160 sq km, an estimated 73 per cent per cent of the total land area in Bihar, is vulnerable to flood. Annual flooding in Bihar accounts for about 30–40 per cent of the flood damages in India; 22.1 per cent of the total flood-affected population in India is reported to be located within the state of Bihar. About 28 districts of Bihar fall under the most flood-prone and flood-prone districts.

Drought: Though the climate of Bihar is favourable for production of various crops, the agriculture of the state is dependent on the behaviour of monsoon and distribution of rainfall. Although the average rainfall in the state is 1120 mm, considerable variations occur between the different parts of the state. Large part of the state is now increasingly vulnerable to drought due to climate change. In the absence of adequate rainfall,

most parts of Bihar, including North Bihar which is prone to floods, face drought situations. South and South-west Bihar are more vulnerable and often experience severe drought situations.

Other Hazards: Apart from the above hazards, the state is also prone to cold and heat waves, cyclonic storms (high-speed winds) and other human-induced hazards like fire, epidemics, road/boat accidents, stampedes and so on. Incidences of fire are mainly local in nature but have a severe impact on villages. Since a majority of *Kucha* houses have thatch roofs and wooden structures, in the summer months when winds are high, fires from the traditional stoves spread to damage entire villages.

Literature Review

How could the capacity building turn into a revolutionary mitigation approach in such a short period of time is a question of interest and this paper explains the various strategies adopted by the government. But before that happens, the author reviews the literature on revolution within which the capacity building of different stakeholders in Bihar has been analysed.

Although the concept of revolution has been studied earlier, it is arguably poorly understood in terms of complexity and diversity and how it affects the different castes, classes and groups of society. It is evident that in recent times virtually no study on the capacity building for earthquake, cyclone and flood resistant construction as a revolutionary mitigation approach has been conducted in Bihar. This study aims to fill some gap by providing an in-depth assessment of capacity building for earthquake, cyclone and flood resistant construction in Bihar covered under the Government of Bihar-funded campaign to make Bihar safe during disaster. It is important to understand the various issues of revolution and various dynamics of capacity building and mitigation approach to accelerate the process of capacity building. It is evident that the situation of capacity building for earthquake, flood and cyclone resistant construction in Bihar is good but requires improvement and hence there is a compelling necessity to study its status in the current socio-economic and political set-up.

A revolution (from the Latin word *revolutio*, “a turnaround”) is a fundamental change in society or organisational structures that takes place in a relatively short period of time. Revolution has also been defined as a pervasive change in society and the social structure, especially one made suddenly radical. While the literature on the factors that lead to organisational revolution in the private sector is well developed, the one on public sector is of recent origin (Arogyaswamy, K. Barker, 1995). Beer (2006) states that revolutionary strategies have been researched widely in the private sector as part of the organisational study area. However, only recently these strategies have been researched in the public sector (Boyne, G. 2006).

Capacity building as a revolutionary mitigation approach, while easy enough to conceptualise, is also extremely difficult to measure, as the very extensive literature on this in political science, legal studies, economics and public administration shows (Nardulli, Peyton and Bajjaleih 2011). Bihar had a particularly poor perceived record with respect to capacity building for disaster resistant construction throughout the 1990s and later.

There are several causes for the performance decline of capacity building for disaster resistant

construction in Bihar (Mathew, S., 2011). These, among others, included the lack of accountability which was compounded by poor staff productivity. Efficiency and performing attitude slowly disappeared from the dictionary of government employees.

Political profligacy was also one of the major impediments for poor condition of capacity building for disaster resistant construction in Bihar. Thus the key reason was politicisation of the decision-making processes. This philosophy had to undergo change in order to make capacity building for disaster resistant construction in Bihar a revolution (Ghosh, P. P., 2007).

The change in philosophy appears to have shown impressive results in the years that followed (Nagaraj, R). There was a decrease in the number of lives lost, decrease in response time during disaster, significant increase in mitigation activities to minimise the risk of disaster and significant increase in economic progress and infrastructure development due to improved Disaster Management in Bihar. The Government of Bihar is now spending a significant amount of its plan outlay on Disaster Management.

There are visible signs of capacity building as revolution in Bihar. While pinpointing the roots of capacity building as revolutionary mitigation approach is complex, the faster growth in mitigation activities through capacity building for disaster resistant construction and rehabilitation experienced by Bihar in the last nine months can be reasonably termed as revolution for making the society safe during a disaster.

Capacity Building: Need of the Hour

Capacity building often refers to strengthening the skills, competencies and abilities of people and communities needed to achieve their goals and potentially overcome the obstacles and suffering. Capacity building is a conceptual approach to social, behavioural change and leads to infrastructure development. It simultaneously focuses on understanding the obstacles that inhibit people, governments, national organisations and non-governmental organisations (NGOs) from realising their development goals and enhancing their abilities that will allow them to achieve measurable and sustainable results.

People do not die due to earthquakes; rather they die due to collapse of structures. Around 29 districts of our state fall into earthquake zones IV and V. About 99 per cent of buildings in our state are load-bearing structures which may be seriously affected during an earthquake. People construct their houses by imitating others through conventional method. Masons do not have knowledge of earthquake-resistant, flood-resistant and cyclone-resistant construction. Most of the load-bearing structures are not earthquake resistant. There is a burning problem of unemployment in a large section of the society. Capacity building for earthquake, cyclone and flood resistant building construction has potential to eradicate unemployment to a great extent.

Structure of Capacity Building

- Four days of class-room trainings are arranged for engineers in the district headquarter to impart in-depth knowledge to have better control during construction and retrofitting.
- Two days of class-room trainings to BDO and COs, Mukhiya and Sarpanch to sensitise them.
- Seven days of masons training is arranged in each block where theoretical and practical knowledge of earthquake-resistant, cyclone-resistant and flood-resistant building construction is given. At the same time theoretical and practical knowledge for making the old buildings earthquake resistant is also given. As a result of practice work of various technologies involved in earthquake-resistant, cyclone-resistant and flood-resistant building construction and retrofitting exercised by masons, a model is created in each block which may guide, sensitise and motivate local people.

In the 7-day programme, theoretical and practical approaches for following important activities are imparted:

- Preparation of cover block
- Precaution in storing materials
- Soaking of bricks for 4–6 hours before use
- Layout and control pillar
- Testing of materials
- Ratio of cement and sand in mortar as per earthquake zone

- Ensuring the quality of concrete
- Isolated footing
- Excavation of foundation by multi-technique model
- Two-room earthquake resistant building layout
- Stirrups in beam and column and at the beam–column joint
- Slab reinforcement
- Retrofitting of old buildings using different techniques

Achievement

- More than 5300 Masons have been trained so far.
- More than 1500 engineers have been trained so far.
- More than 6000 BDO, CO, Mukhiya and Sarpanch have been trained so far.
- People have started constructing houses using this technology.
- There is astonishing response among engineers, masons, local representatives, political leaders, common people, media and so on.
- Government officials and local representatives are putting their request for more and more training.

Revolution Diagnostics

The condition of the mitigation approach in Bihar has completely changed. The media has called it a revolution. “The aim is that to build Capacity of different Stakeholders so that there will be minimum loss of lives and properties during disaster. People feel safe in Bihar, and there should be no fear from Disaster”, says Nitish Kumar, Chief Minister (CM) of Bihar. “Almost everybody in the state is saying about how Disaster Management through Capacity Building in Bihar have transformed”.

To diagnose the ‘Revolutionary mitigation approach,’ the first question would be *whether it really was a ‘Revolution’*. Achievement in the past nine months allows an analysis of this, which is unique, amazing and first time in the country.

The essence of the ‘Revolution’ was in the fact that there was (i) significant increase in mitigation activities to minimise the risk of disaster in the last nine months, (ii) decrease in loss of lives and properties during disaster in the state, (iii) decrease in response time

during disaster in the state, (iv) significant increase in economic progress and infrastructure development due to improved Disaster Management and (v) a robust upward trend in the expenditure on capacity building.

The next question would be the *determinants of the 'Revolution'*.

The revolution in the capacity building could be attributed to the following: (i) capacity building programme of different stakeholders resulted in training of 5300 masons, 1500 engineers and more than 6000 BDO, CO, Mukhiya, Sarpanch and villagers so far; (ii) people have started constructing houses using this technology; (iii) there is astonishing response among engineers, masons, local representatives, political leaders, common people, media and so on; (iv) government officials and local representatives are putting their request for more and more training; (v) increase in expenditure on capacity building continuously in the last nine months; (vi) response time has reduced to minimum due to NDRF, SDRF and government machinery's promptness and (vii) excellent economic progress and infrastructure development of the state.

Strategy

- Making full use of the existing technical team
- Innovating the planning process
- Increasing the use of IT
- Maximising the participants qualitatively and quantitatively
- Improving the quality of training continuously
- Percolating the mission of BSDMA up to grass-root level of society through all stakeholders including media
- Speeding up organising the training

The Road Ahead

- Improve linkages between community-based organisations, panchayats, wards, police officials and administration.
- An on-line/off-line app for the use of 'Raj-Mistries' with visuals and voice overlays.

- Opening of earthquake safety clinics throughout the state in all technical institutions.
- Creating a helpline by BSDMA for 'Raj-Mistries' of Bihar. Finding respectable openings within and outside the state by creating a national network.
- A career-progression graph for the 'Raj-Mistries' to promote them eventually as 'Master trainers'. A cashless health card for self and the family.

Critical Appraisal Strategies

The strategy of making full use of existing technical team has done well for the improvement of Disaster Management of Bihar. Strict and effective action has been a major driver for this. The focus on innovative planning process and increase in budgetary provision has been a key support for this.

The strategy of speeding up capacity building of different stakeholders has proved the revolutionary mitigation approach in Bihar. Maximising the participants qualitatively and quantitatively, improving the quality of training continuously and percolating the mission of BSDMA up to grass-root level of society through all stakeholders including media have been key drivers for this and the results achieved have a salutary effect on the Disaster Management situation while restoring the faith of the common man in the Disaster Management system. Underlying all this is the strategy of good governance.

Increased use of IT has done well for Disaster Management. Bulk SMS and helpline have been key drivers for this. Dedicated helpdesk set up at HQ and training programme for Disaster Management professionals have been a key support for this. However, the implications of increased use of IT for improving Disaster Management need to be studied scientifically rather than just empirically.

Change in planning system has proved worthy. It was the result of good planning system and changes in organisation culture that more than 5300 masons, more than 1500 engineers and 6000 BDO, CO, Mukhiya and Sarpanch have been trained so far and the state has seen significant decrease in loss of lives and properties in last 10 years. People have started

constructing houses using this technology. There is astonishing response among engineers, masons, local representatives, political leaders, common people, media and so on. Government officials and local representatives are putting their request for more and more training. Uses of technology, outsourcing for infrastructure development and smart initiatives have enabled the Disaster Management department to scale up rapidly, improve qualitative performance and bring transparency.

An HR initiative has fetched very good results. Appointment on large scale has been a consistent thread across both Disaster Management department and authority. It enabled the government to do quick scale-up, offer flexibility for course correction and improve delivery.

Critical Appraisal: Processes

Having attempted an appraisal of the strategies, I now critically examine some of the key processes behind them. Discussions with various people from different sections of the society by the author brought home the point that there had been a significant increase in initiatives over the past 10 years.

All major policy initiatives require the CM's approval. Hence the role of the CM's vis-à-vis the Disaster Management department becomes critical.

The CM

Given the implicit power structure, the CM becomes the effective CEO of the Disaster Management department. He is thus in a position to drive initiatives.

Based on an analysis the key factors making the capacity building revolutionary mitigation approach over the past nine months have been summarised:

- Quick decision-making with 'partnering' approach of
- sustained economic growth
- Expeditious mechanism to resolve encumbrance issues and pro-active government support
- Non-politicisation of decision-making process
- Real-time project monitoring

Almost all the above initiatives were moved by the Disaster Management Authority and brought to finality by the CM.

The Style of the Present CM

The operationalisation of the various strategies over the past nine months depended significantly on the leadership style of Mr Nitish Kumar. Of course, Kumar has tremendous motivation to deliver. His political career hinges on it. It was a common sense-based approach, showing an astute understanding of the market reality, the asset base of the Disaster Management Authority and the expertise and capability of the Disaster Management professionals and systems. Consequently, he followed this up with the principles of quick decision with confidence and empowerment and delegation.

Direct Approach: Communication to Secretary and VC

To build alignment for execution, the CM periodically communicated to the Secretary' and VC, setting and reinforcing priorities.

Caring Attitude: Staff and Officers

Mr Nitish Kumar had a positive approach in dealing with the officials and staff. Given the financial and physical performance of the Disaster Management department, the government decided to award the best performing officers. Officers and staff wanted to implement seventh pay commission, to which he agreed. There were discrepancies in pay band. He appointed a committee to solve the issue without delay.

He believes in the principle of "Downsizing may make Disaster Management department thinner, but not necessarily healthier". On presenting the future, his pitch was, "regenerate competitiveness and leverage resources rather than restructure and downsize". He believed in instilling hope and excitement rather than fear and anxiety.

The Style of the Present VC

Non-interference: Dealing with the Advisor

"Sri Vyasji is a non-interfering, yet aware VC, who sets the goals and expects results." "This has given him a position of strength to build organisational alignment

to see through fundamental initiatives.” “It appears that the current officials of the Disaster Management Authority function as a cohesive entity due to the force of expectation on legitimate initiatives.”

A premise that comes forth is that if all it takes is a VC’s consistency of direction and follow-up to make the organisation more dynamic, then by implication, the Disaster Management Authority is well set in terms of people and a lot of systems, but does not have the structure for a corporate approach to fructify policy initiatives in a timely manner independent of the political leadership.

Identifying Right People

Sri Vyasji understood good governance to mean “the restoration of governance” above all. He wanted to revive the organs of the authority and restore government authority. Improvements in Disaster Management were vital aspects of his quest.

Dr Sunil Kumar Chaudhary was appointed to the position of Advisor (Technical) of Disaster Management Authority. He was specially chosen by the VC for this position, based on earlier performance and qualification. It had been clarified between him and the VC that his role would be to provide the link between the VC and the field officials to translate the CM’s vision for making the society safe during disaster and prepare different stakeholders to face the disaster through capacity building.

The first task that Dr Sunil Kumar Chaudhary took upon himself was to understand the functioning of the Disaster Management Authority and what has been said about the Disaster Management Authority in a studied manner. He soon realised that the Disaster Management Authority had tremendous strengths in its systems that ensured robust decision-making. The VC understood that the Advisor (Technical) himself was a source of ideas for innovation that would be in line with the CM’s thinking. The notable instance of a VC driving initiatives (with the backing of the Chief Minister) was development of a system that came to be known as “Capacity building of Engineers and Masons and other stakeholders” to prepare the society to face the disaster and expedite the response activities during disaster has taken the shape of revolution in

Bihar which need to be implanted in country to make the society safe during disaster.

Using his leadership quality, innovative thinking and goal-oriented temperament, Advisor (Technical) scripted a spectacular turnaround story in the Bihar Disaster Management Authority. He brought a revolution in the field of mitigation approach.

No wonder, by entrusting Dr Sunil Kumar Chaudhary with Disaster Management Authority, VC appears to have put the right person at the right place.

This is even more significant, given that all this has happened through the existing systems and culture of the authority. The tactic behind the achievements was the balanced use of the VC’s support for legitimacy, and in keeping independence in the departmentally oriented and hierarchical organisation that Disaster Management Authority was.

Image Building: Media

Given his penchant for wit and one liner, Dr Chaudhary was sought after by the media. Whenever there was an opportunity to highlight an initiative or an achievement, he communicated it to the media in an effective and efficient way. A healthy relationship with the media and a public emphasis on improving civic life were important components of the reform strategy. In recognition of his initiatives, Dr Chaudhary will be known as the Chief Architect for converting capacity building for earthquake, flood and cyclone resistant construction in Bihar as a revolution to make the society safe during disaster.

Critical Appraisal: Sustainability

The final question is *whether the strategies and processes are sustainable*.

It is important to recognise that apart from a faster growing economy, the one variable that was different in the past nine months of the ‘Revolution’ was the political leadership. The natural corollary is that sustainability depends on the political leadership.

From the perspective of Disaster Management responding to environmental changes in a fast-growing economy, what is required is a framework for continued innovation. We shift our focus from just the

current strategic initiatives to the process of continuing such initiatives. Towards this, the strategies and processes *can be sustained* if the political leadership is well intentioned and has consistency of direction. Political leadership does not come in through a controlled process. The need is for the professional top management to be able to respond as a commercially oriented organisation with a corporate culture.

Strategies and processes have to be people and user centric. The current structure of the organisation lends itself primarily to supply driven strategies, where at best the initiatives are what the Disaster Management Authority thinks is good for the people and user and not necessarily driven from the people's and user's perspective.

Every District Magistrate (the division being the operational interface with the client systems) should be asked to periodically evolve a strategy paper with a two-year time frame, which can then be consolidated at a circle level. Periodic workshops and disaster study should be held wherein key issues should be discussed with the top management. Periodic capacity building research should be conducted and assimilated to understand the Disaster Management's needs.

Strategies and processes have to be scientifically based. This needs a paradigm shift on research, development and training to evolve and sustain faster and quality management of disaster with proper *utilisation of law, technologies* and systems that are innovative and people friendly.

To sustain the above Disaster Management Authority needs to focus on *organisational restructuring*. Top-down restructuring with a focus on performance, better promotion and other facilities and merging of cadres, beyond the mid-way career, are imperatives for the Disaster Management Authority. Technical team should be given exposure to understand national and international practices in the field of capacity building and disaster resistant construction, RVS and retrofitting.

The 'Campaign to make the society safe through Capacity building' over the past nine months has demonstrated that capacity building for earthquake, flood and cyclone resistant construction in Bihar is indeed a revolutionary mitigation approach. With the right moves, it has the potential to make our country safe during disaster.

Conclusion

- BSDMA is a textbook case of how leadership brings revolution in the mitigation approach.
- Capacity building for earthquake-resistant building has potential to realise the dream "Safe Bihar: Developing Bihar" of our honourable CM.
- It goes to the credit of Mr Nitish Kumar that he not only gave free hand to our VC to frame the policies but importantly ensured that they produced results.
- To protect the people of Bihar during earthquake, cyclone and flood, we adopted a three-pronged strategy.
- Capacity building for disaster-resistant building has demonstrated that it is indeed a revolution. With the right moves, nothing can hold it back from making Bihar disaster-resilient.

Recommendation

- Sustainability of leadership is required for better disaster mitigation.
- BSDMA should have the structure for a corporate approach to fructify policy initiatives in a timely manner.
- Active participation of print and electronic media should be made to sensitise the public about different initiatives of BSDMA.
- National and international exposure to technical team is the need of hour.
- Non-politicisation of decision-making process should continue.
- Improve linkages between community-based organisations, panchayats, wards, police officials and administration.

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Commencement of Change

Prasad Sankpal^a

ABSTRACT: Natural disaster can be one of the greatest obstacles to sustainable development and social security. There are certain regions and localities, which are recurrently exposed to hazards like floods or earthquakes. In this context, mainstreaming disaster risk mitigation programme is an important task as it will help in protecting the development gains. The case study, “Commencement of Change” highlights how Kolhapur, which is exposed to recurrent events of flash floods, has institutionalised mechanisms through planned interventions by introducing structural and non-structural changes to improve response coordination during disasters and create a new culture of disaster preparedness and mitigation amongst the communities. It was due to this effort, the district could avert a major catastrophe in 2018. It depicts how most of the Disaster Risk Management (DRM) related tasks require appropriate decentralisation of functions, devolution of authority and community participation to complement the centralised system. A strong case is sought to be made out for the need to strengthen capacities of the District Administration as well as local communities to develop sustainability of the DRM programme in the region by ensuring deployment of adequate financial, technical and manpower resources.

KEYWORDS: DRM – disaster risk management, community-based disaster management (CBDRM), emergency operation centre (EOC), search and rescue (SAR)

Situation in District in Previous Floods

Kolhapur, an affluent district of Maharashtra, which has always been at the forefront because of its advancement in agriculture, industries, art and cooperative movement, was worst affected by unprecedented floods in the years 2005, 2006, 2007, 2008 and 2016. The rains, accompanied by the sudden release of dam water as well as the accumulated backwater effect from dams, barrages and weirs, resulted in the flooding of vast areas. Approximately 30,080 families in 992 villages and 6 cities of Kolhapur were gravely affected by this disaster. People fled to safety in order to save their lives. Transport and communication were severely disrupted and Kolhapur was disconnected from other districts, thereby creating further impediments in rescue and relief operations. On 30 July, flooding from 11 dams of Kolhapur worsened the situation. There was a colossal loss of human life, livestock, property and revenue in the year 2005.

Response of the District Administration

Lack of preparedness on the part of the District Administration as well as the local communities was the key reason for the huge loss and damage that had occurred. Subsequently, the District Administration geared up and decided to take proactive steps to handle future catastrophes that may strike Kolhapur. It further reviewed the situation to map immediate priorities by organising consultative meetings of government functionaries, non-governmental organisations (NGOs) and local communities at the district, taluka and village levels.

Implementation of the Seven-Point Disaster Risk Management Programme

In order to effectively handle the crisis situation evolving through disasters, the District Administration,

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Kolhapur, developed a seven point agenda under the Maharashtra Disaster Risk Management (MDRM) Programme. The entire thrust of the programme was on introducing non-structural changes for developing (A) capacity, (B) communication and (C) coordination of the local communities as well as the administration through the strategies mentioned in Fig. 1.1. A detailed discussion of the same is given in the following paragraphs.

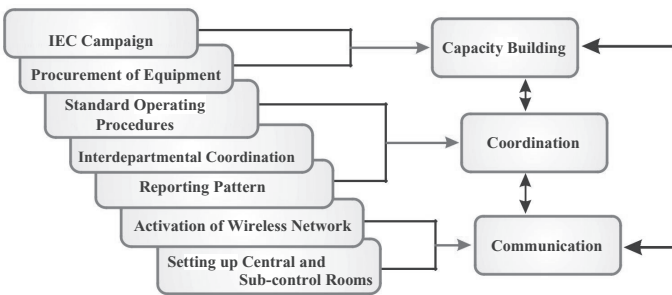


Figure 1: Seven point DRM programme

Source: Based on the interview with Mr Avinash Subhedar, District Collector, Kolhapur

Dissemination of Information

Special emphasis was given on the information, education and communication (IEC) campaign to educate people about the DRM Programme and the do's and don'ts during disasters (see Exhibit 1.1).

Exhibit 1.1 **IEC Campaign on DRM**

1. Awareness generation through electronic and print media.
2. Picture slide presentation of do's and don'ts at local cinema halls.
3. Street play presentation at block and village level on DRM.
4. Display of hoarding of do's and don'ts at village level.
5. Broadcast of educational talk shows on types of disasters and community-based methods of tackling it.

Source: Interview with Mr. Sanjay Shinde, RDC Kolhapur.

Decentralisation of Disaster Management System

In order to ensure a synchronised effort towards handling disasters within the district, the District Administration developed a three-tiered coordination mechanism (see Fig. 1.2). A Disaster Management Committee (DMC) was set up at the district level and 12 committees at the taluka level were constituted. Similarly DMCs were constituted at municipal council level and village level.

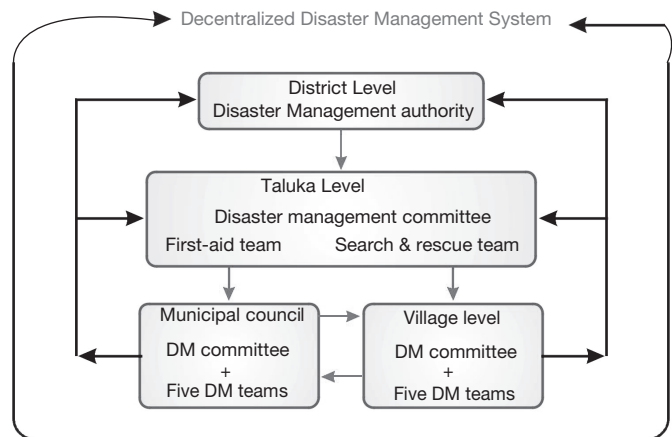


Figure 2: Decentralised disaster management system

Source: Based on the interview with Mr Sanjay Shinde, RDC Kolhapur

- The District Disaster Management Committee comprised the District Collector (DC), the Resident District Collector (RDC) and Additional District Collector, besides the Municipal Commissioner, the Superintendent of Police (SP) and Chief Executive Officer (CEO) of the Zilla Parishad. Heads of the line departments of Irrigation, Public Works (PWD), Health, Agriculture, Animal Husbandry and Power, and representatives of NGOs were the other members of the committee.
- At the taluka level, the Taluka DMC comprised Tehsildar, Block Development Officer, officials of other line departments such as Police, Health, Irrigation, Agriculture, PWD, Animal Husbandry, Water Supply, corporate agencies, trained NGO volunteers and first aid, and search and rescue teams.

- At the municipal council level, the DMC consisted of the President, Chief Officer, officials of line departments such as Health, Police, Education, Women and Child Development, corporate agencies, trained NGO volunteers and five teams: early warning, first aid, search and rescue, food and shelter management. and water and sanitation teams.
- The village level DMC has Sarpanch, Talathi, Gram Sevak, Agricultural Assistant, Police Patil, Headmaster of village school, Medical Officer, SHG President and Aanganwadi Teacher.

According to Mr Sanjay Shinde, RDC Kolhapur, effective coordination between these three tiers resulted in detailed planning and speedy execution of relief and rescue operations before and during the 2018 flood. For instance, the village DMC undertook the task of microplanning for each and every village in the pre-monsoon months. Resource mapping was done by the village DMC and an inventory of resources comprising of alternative temporary shelter for affected people and cattle, along with adequate food, water, milk, medication and fodder, was developed and maintained by the disaster management teams in the village. The detailed planning also involved distribution of mosquito nets and coils for every family in the temporary shelters.

During the 2018 flood, the village functionaries like Talathi, Police Patil, Medical Officer and other key persons stayed put in the affected villages during disaster and in collaboration with the five disaster management teams, arranged for prompt relief and rescue operations. To ensure provision of prompt relief and dissemination of accurate information regarding emergency situation to the aggrieved villagers, the village DMC, as per its Standard Operating Procedures (SOPs), coordinated extensively with other line departments at taluka and district DMCs such as Police, Irrigation, Agriculture, Health, Animal Husbandry, Water Supply and NGOs such as 'Jeevan Mukti Sanstha' Jivan Jyoti Seva sanstha, Adhaar Rescue force, Pass Rescue force and Wajir Rescue force. The District Collector, Superintendent of Police and Chief Executive Officer of District Administration regularly inspected

the flood-affected villages, supervised the relief and rescue operation and ensured provision and distribution of all requisite supports to the flood-affected villagers. These initiatives not only arrested the magnanimous impact of disasters but also strengthened the trust of distraught villagers, who witnessed these functionaries' active and extended involvement in relief and rescue operations.

Preparation of Standard Operating Procedures

In order to ensure effective, interdepartmental vertical and horizontal coordination SOPs were prepared before the onset of the 2018 monsoon. All the line departments like Police, PWD, Fire, Irrigation, Agriculture, Animal Husbandry, Women and Child Development and Health were instructed to prepare their own SOPs, which described the roles and responsibilities of each department during disasters. Periodic training programmes were also conducted to facilitate the implementation of SOP. This initiative of the District Administration provided the much-required clarity for the departments regarding execution of their duties during disasters and facilitated establishment of accountability within the administration.

Preparation of Village Development Plan

The DRM office at Kolhapur undertook on a war footing the IEC Campaign throughout the district. In January 2018, participatory risk appraisal process was conducted in 1226 villages for eliciting active involvement and participation of the people to design 'Village Disaster Management Plan'. In each village, as part of the Disaster Management Committee, early warning, first aid, search and rescue, food and shelter management, and water and sanitation teams were formed. Each team consisted of at least six members. Members were selected on the basis of their suitability in terms of age, knowledge and capability.

Provision of Training

In the subsequent months the District Administration of Kolhapur sought to coordinate activities of the newly

formed teams with the Talathis of the villages and the line departments like PWD, Irrigation, Agriculture and Police. This enabled identification of roles and responsibilities, as well as areas for capacity building to cope with future disasters. Accordingly, theoretical and practical training in the areas of first aid and search and rescue operations were provided to the teams.

Procurement of Equipment

In order to equip the district with first aid, search and rescue operations, the State Government provided five inflatable motor boats. The District Administration also procured rescue equipment like six inflatable motor boats, life jackets, life buoys and so on. from MDRM programme funds. These equipment were kept at the disposal of the Administration and provided to the affected villages during rescue and relief operations.

Ameliorating Communication Channels

Poor communication was one of the major lacunae in the flood management of previous floods. In order to rectify this, the District Administration paid specific attention to the telecommunication channels and took following measures to facilitate their smooth operations:

1. Activation of Wireless Network

During the previous floods of Kolhapur district, due to disruption by the turbulent winds and rains, the telecommunication network was not functional. To rectify this and maintain interdepartmental communication and coordination, wireless network of the Revenue Department at district, sub-division and block levels was activated. In 2018, the network was upgraded using resources from Natural Calamity Fund. Today, it is active in the district, sub-divisions of Ichalkaranji, Karveer, Gadhinglaj and Radhanagari and the 12 blocks of Kolhapur.

2. Alternative Communication System

Alternative communication system was simultaneously developed. For instance, the District

Administration activated the 'Ham Radio' team available in the district and make effective use of four dedicated telephone lines in EOC at district level. With the help of 'Tarang Seva' network in collaboration with Bharat Sanchar Nigam Limited (BSNL), during disruption of the regular telecommunication service, Gram Panchayats of the affected villages could communicate with the taluka office and villages in the vicinity. Based on such information, vital decisions like deployment of army or relief and rescue teams were taken. During contingencies, this system facilitated the District Administration in staying connected and procuring relevant information from talukas and villages.

3. Setting Up of Central and Sub-control Rooms

Control rooms were set up at the district and taluka levels to ensure timely dissemination of accurate information regarding water level of rivers, release of excess water from the dams, status and reach of the relief services and other related aspects. The Resident District Collector was in charge of the District Control Room, which was fully equipped with computers, internet, cable television, four telephone lines and wireless set. A toll free number of '1077' was provided as an emergency helpline for the public. The control rooms were active 24 X 7. Officers from the line departments of Revenue, Police, Irrigation, PWD, Health, Agriculture and Electricity were functioned in three shifts in order to ensure effective coordination and dissemination of information to media and public in flooded areas. Relevant flood-related information was released every two hours. The District Collector, Deputy Superintendent of Police and the CEO personally inspected the flood-affected villages.

4. Disaster Management Telephone Directory

In order to ensure access to updated information related to the emergency situation, a telephone directory was created by the District Disaster Management System. The directory consisted of the contact numbers of the Flood Situation Control Room and 34 committees (see Exhibit 1. 2).

Exhibit 1.2**List of Committees Formed for Disaster Management**

1. District Disaster Management Mapping and Development of Standard Operating Procedures
2. District Control Room
3. Coordination with NGOs
4. Protocol regarding Very Important Persons (VIPs)
5. Medical Aid
6. Official Correspondence and Documentation
7. Arrangement of Temporary Shelter
8. Fodder and Shelter for Cattle
9. Transportation Arrangement at the Site of Disaster
10. Inventory Management of Life-saving Equipment and Fuel for Boats and Helicopters
11. Arrangement for Boats
12. Arrangement for Helicopter and Plane
13. Arrangement for State Transport Buses
14. Coordination with Army
15. Dissemination of Information to Police, Homeguard and National Cadet Corpse (NCC) Volunteers
16. Public Relation and Media
17. Preparation and Updation of
18. Electric Supply
19. Water Supply
20. Road Repair and Maintenance
21. Dead Body Disposal
22. Mapping of Helipad
23. Preparation of Panchnama
24. Temporary Shelter Homes
25. Identity Card Distribution to Government Staff and NGO Volunteers engaged in Rescue and Relief Services
26. Maintenance of Telecommunication System
27. Arrangement of Schools/Public Buildings for Temporary Shelter
28. Provision of Financial Assistance to Affected Population

29. Agricultural Activities
30. Milk Supply Receiving Centre for Public Donation and Assistance
31. Coordination to Provide Assistance to Women Victims
33. Receiving, Distributing and Controlling Assistance to People
34. District Liaison Officer

Multi-level Coordination

According to Mr. Avinash Subhedar, District Collector, Kolhapur, effective flood management in 2018 was the result of efficient coordination, which was achieved through the following techniques:

Inter-state Coordination

The District Administration of Belgaon and Bagalkot of the State of Karnataka took into consideration the report of the District Administration of Kolhapur while releasing the excess water from Almatti Dam. This arrested the destructive 'backwater effect' and eventual flooding in Shirol Taluka, which lies on the border of the two states.

1. Alertness through Mock Drills

In order to assess the preparedness and interdepartmental coordination at the time of emergency, the District Administration organised mock drills (see Exhibits 1.3 and 1.4).

Exhibit 1.3**District-Level Mock Drill**

On October 12, 2018, a district-level mock drill was organised at Kolhapur. At 12.30 p.m. the District Collector's office sent an alert to all departments that an accident had occurred at the entrance of the city at Shirol toll naka, where 4 casualties are present. The departments were instructed to rush to the site of disaster and report back. The response time of each department was checked by the administration. It was observed that within 15 minutes, all the departments as well as the media reached the site.

Exhibit 1.4**Taluka-Level Mock Drills**

In May 2018, taluka-level mock drills were arranged by the MDRM office in all flood-prone talukas. A false alarm was raised and all departments were alerted that a drown case has happened at the river basin. The Tehsildar called the Police Inspector of the local police station, the Block Development Officer and the Health department. On checking the response time it was observed that all the officials from the concerned departments rushed to the spot within 15 minutes.

Source: Based on the interview with Mr Sanjay Shinde, RDC Kolhapur.

2. Reporting Pattern

To update the State Government about the flood situation as well as the response provided by the District Administration, a detailed reporting pattern was developed by the District Disaster Management Committee, Kolhapur. This report was dispatched to the State Departments of Relief and Rehabilitation, Department of Planning and the Divisional Commissioner, Pune, at 10.00 a.m. every day and the report was updated every two hours. This detailed reporting pattern was appreciated by State Planning Department.

Impact of the MDRM Programme

Though Kolhapur was struck by floods in past many years as well, there is no doubt in the fact that the unfortunate tragedy of past floods was prevented from being repeated. This could most certainly be attributed to the high level of precision in planning and proficiency in execution through excellent teamwork. The structural and the non-structural changes resulted in strengthening competencies and capacities to handle crisis situations and improved the coordination mechanisms for response. Owing to increase in awareness about disaster preparedness the villagers too were on alert. On receipt of alert they

immediately shifted to preplanned places of safety. The decentralisation of disaster management machinery helped in providing immediate assistance to villagers. MDRM task teams accomplished all measures right from early warning to search and rescue, provision of food and medicare and rehabilitation of the flood-affected villagers. Availability of well-trained volunteers and life-saving equipment made a big difference in rescuing people to safety. Regular communication with people through radio and phone-ins kept people continuously informed and updated. People in the marooned villages could send SOS messages, receive instructions and get rescued due to the sound and well-executed communication system, relief operation and adequate machinery available at the DRM programme's disposal. The flood situation in several villages was combated successfully.

Sustainability of the MDRM Programme

Disaster management systems that focus on response and relief are inadequate insofar as, while response systems must be improved, greater focus on prevention and mitigation is essential. However, building a culture of prevention is not easy and resources for prevention and mitigation are often lacking. Expressing his concern Mr. Avinash Subhedar, the District Collector, Kolhapur, said, "Sustainability of the MDRM Programme is largely dependent on the willingness, *determination and ability of the District Administration*".

In the context of the Government of Maharashtra DRM programme phasing out in March 2019, the major challenge on part of the District Administration is to handle the management of MDRM programme. In this regard Mr Sanjay Shinde, the Resident District Collector, shared his concern, "*As the administrative head, the District Collector has a lot of responsibilities and pressing matters of concern. Hence, it is not always possible for him to pay undivided attention to the Disaster Management Programme and carry out the activities. Therefore, after the GOM Programme phases out, it is absolutely imperative to have a permanent Disaster Management Cell and permanent post of a District*

Disaster Management Officer. This structure, if equipped with adequate financial, human and infrastructural resource, can then plan, organise and carry out the disaster management activities at a district level, in coordination with the District Administration. Otherwise, this initiative is very difficult, if not impossible to sustain on an ad-hoc basis.”

Sustainability demands appropriate collaborative decisions be made at each stage of planning and execution, and hence for sustaining the DRM programme, several aspects need to be considered which include commitment, knowledge and skills of administrators, level of teamwork, vertical and horizontal interdepartmental communication and relationships with community partners. The major administrative tasks in sustaining MDRM programme will have to include resource development, promoting programme modifications and developing capabilities and competencies of the staff.

Final Word

The MDRM programme of Kolhapur has been instrumental in demonstrating the strength of decentralised planning and implementation through people’s active participation in creating a culture of disaster preparedness. The excellent work done by MDRM office of Kolhapur is highlighted as a model for the DRM machinery in the other districts of Maharashtra where the programme is operational. The seven point DRM programme of Kolhapur has facilitated a paradigm shift in disaster management from mere relief and rehabilitation to disaster mitigation and preparedness. Development of resilient communities is an obvious consequence of this paradigm shift. For sustaining this effort and replicating the same in other areas, there is a need to have the political will to deploy adequate and appropriate technical, managerial and financial resources.

Budgetary Insu-Resilience: A Sustainable and Disaster Resilience for All GDP Losses Countries

Gajadhar Choudhary^a

ABSTRACT: The Sendai Framework Target (C) seeks to reduce direct disaster economic loss in relation to global gross domestic product (GDP) by 2030. The economic losses suffered by low- and lower middle-income countries have crippling consequences for their future development and undermine the efforts to achieve the 17 SDGs, in particular eradication of poverty.

In 2017, 335 natural disasters affected over 95.6 million people, killing 9697 and costing a total of US\$335 billion. In 1998–2017 direct economic losses to countries valued at US \$ 2908 billion, of which climate-related disasters caused US \$ 2245 billion or 77 per cent of total. This is up from 68 per cent (US \$ 895 billion) of losses (US \$ 1313 billion) reported between 1978 and 1997. Overall, disaster losses from extreme weather events rose by 25 per cent between these two 20 years' periods.

In absolute, monetary terms, over the last 20 years, the US recorded the biggest losses (US \$ 945 billion), China by comparison US \$ 492 billion. The World Bank has calculated the real loss to the global economy is a staggering US \$ 520 billion per annum, with disaster pushing 26 million people into poverty every year.

The top 10 countries in terms of absolute losses are US \$ 9448 billion, China US \$ 492 billion, Japan US \$ 376.3 billion, India US \$ 79.5 billion, Puerto Rico US \$ 71.7 billion, Germany US \$ 57.9 billion, Italy US \$ 56.6 billion, Thailand US \$ 52.4 billion, Mexico US \$ 46.5 billion and France US \$ 43.3 billion.

The average annual percentage of losses to GDP by India was 1 per cent, Bangladesh 1.8 per cent, Nepal 2 per cent, Myanmar 3 per cent, Pakistan 5 per cent, Afghanistan 0.97 per cent, Sri Lanka 0.2 per cent, Philippines 6.5 per cent, Haiti 17.5 per cent, Puerto Rico 12.2 per cent (higher income), Cuba 4.6 per cent (upper middle income), El Salvador 4.2 per cent, Georgia 3.5 per cent, Nicaragua 3.6 per cent, Honduras 7.0 per cent, Mongolia 2.8 per cent (lower middle income), Korea DPR 7.4 per cent and Tajikistan 2.7 per cent (low-income countries).

Table 1: Countries' Losses to Disasters and GDP for Last Three Years

Serial	Name of Country	Average Annual Losses to Disasters (US \$)	Average Annual Losses to GDP
1	India	10,000 million	1 per cent
2	Nepal	2100 million	2 per cent
3	Bangladesh	372 million	1.8 per cent
4	Myanmar	4000 million	3 per cent

(Continued)

^a Trinity World University, Kolkata, India

Table 1: (Continued)

Serial	Name of Country	Average Annual Losses to Disasters (US \$)	Average Annual Losses to GDP
5	Pakistan	1,400 million	5 per cent
6	Afghanistan	1600 million	0.97 per cent
7	Sri Lanka	6982 million	0.2 per cent
8	Indonesia	11530 million	3 per cent
9	Philippines	16,343 million	6.5 per cent
10	Haiti	830 million	17.5 per cent
11	Honduras	812 million	7.0 per cent
12	Puerto Rico	4723 million	12.2 per cent
13	El Salvador	263 million	4.2 per cent
14	Nicaragua	111 million	3.6 per cent
15	Cuba	334 million	4.6 per cent
16	Georgia	212 million	3.5 per cent
17	Mongolia	43 million	2.8 per cent
18	Tajikistan	113 million	2.7 per cent
19	Korea DPR	9985 million	7.4 per cent

The recorded climate-related disaster losses by high-income countries were US \$ 1432 billion, upper middle income US \$ 5676 billion, lower middle income US \$ 194 billion and low-income countries US \$ 21 billion. Asia is facing 39 per cent occurrence with 53 per cent death, 86 per cent affected and 32 per cent economic losses.

The economic cost of natural catastrophes has increased dramatically in the last few decades – from around US \$ 25 billion per year in the 1980s to US \$ 335 billion in 2017. In parallel, risk transfer has risen in prominence as a means for helping governments and other national-level entities to reduce their exposure and to mitigate the impact of disasters upon socio-economic development.

Public Finance and Economic Growth

Natural disasters can place significant pressure upon public finances, with major fiscal implications in the short-term and wider long-term implications for development. Risk transfer offers the possibility of not only easing the immediate fiscal burden but also reducing or even avoiding long-term costs to public financial stability, economic growth and human development. Premium payments contribute to budget planning certainty, compared to highly volatile post-disaster expenses.

Insured losses can not only help to avoid harm to economic growth but can actually have positive effects for GDP growth in the medium term by deploying long-term capital into the real economy (Von Peter et al. 2012). In general, the presence of an insurance industry can facilitate economic development by reducing interest rates (by lowering default probabilities and investing with long-term horizons) and modifying the level

and allocation of individual and aggregate savings leading to a more optimal allocation of capital (ILO 2016). However, it should be noted that economic growth does not necessarily correlate with reduced exposure to disasters. Indeed, disaster losses represent an increasing burden on economies and public finances in both developed and developing countries. At the global level there is a trend towards more risk-taking: between 1970 and 2010 the global population grew by 87 per cent but the population living in cyclone-prone coastlines grew by 192 per cent. Exposure of GDP to tropical cyclones increased from 3.6 per cent to 4.3 per cent over the same period (Benson and Clay 2004; Hallegatte 2013).

Analysis shows that while higher incomes mean greater ability to cut annual insurance premium from annual budget allocation of 0.1 per cent, investment in insurance measures to prepare for and safeguard against disasters.

Good Governance

There is evidence to suggest that budget-allocated Insu-Resilience can transform our world better in the way that countries manage post-disaster development and further healthy mitigation policy can be implemented. This can occur by encouraging risk reduction, catalysing risk assessment and driving a more structured decision-making process around the management of ex-ante risk, and potentially improving the quality and efficiency of disaster-risk governance.

Insurance solutions can make disaster and climate risk more transparent (UNISDR 2015), as rules and transparency compel the government to behave in a certain way or be punished by voters. More generally, they can provide a way for governments to commit to systems and rules for spending money, take measures against fraud and leakage and consolidate public for GDP growth measures flows (investment for reconstruction) not stocks (destruction of physical capital). GDP growth is not intended to be an indicator for wellbeing – the research recognises that disasters invariably diminish wellbeing of affected population even if growth rebounds (Von Peter et al. 2012). Insurance offers important opportunity to provide pay-outs linked to losses from a natural hazard, helping nations to avoid harmful coping strategies and thus to reduce further negative, long-term impacts.

Table 2: List of Disaster-Prone Countries by Their Government Budget 2017

SL	Country	Revenue	Expenditure	Surplus (or Deficit)	Surplus per cent of DGP 2017
1	India	544,422	725,052	-180,630	6.9
2	Bangladesh	27,080	39,310	-12,230	4.9
3	Nepal	5954	5974	-20	0.1
4	Sri Lanka	12,640	16,6660	-4020	4.8
5	Pakistan	45,640	59,280	-13,640	4.5
6	Afghanistan	1992	6636	-4644	22.1
7	Philippines	44,740	53,5550	-8810	2.7
8	Myanmar	9211	11,450	-2239	3.3

(Continued)

Table 2: (Continued)

SL	Country	Revenue	Expenditure	Surplus (or Deficit)	Surplus per cent of DGP-2017
9	Indonesia	130,600	154,800	-24,200	2.4
10	Mongolia	2623	3711	-1088	10.0
11	Tajikistan	2214	2316	-102	1.4
12	Fiji	1446	1687	-241	4.8
13	Honduras	4376	5086	-710	3.1
14	El Salvador	5756	6751	-995	3.6
15	Zambia	4895	7050	-2153	8.4
16	Cameroon	5154	6964	-1810	5.9
17	Puerto Rico	9268	9974	-706	0.7
18	Congo DR	3238	3364	-128	0.3
19	Guinea	3186	3431	-245	2.4
20	Eritrea	2029	2601	-585	9.5
21	Haiti	1580	2251	-671	8.0
22	Chad	1178	1522	-344	3.5
23	Cuba	52,360	60,570	-8210	10.1
24	Georgia	4260	4852	-592	3.9
25	Nicaragua	3800	4074	-274	2.0
26	Mexico	292,800	314,900	-22,100	1.9
27	Dominican Republic	11,180	12,770	-1590	2.1

Insurance Financial Incentives to Reduce Risk

A widely acknowledged feature of insurance is that by pricing risk, and translating that price into premiums charged to country or policyholders, it provides an important price signal that can incentivise risk-reducing behaviour. Some insurance schemes offer reduced premiums on the basis of risk-reduction efforts – such as India's Weather-Based Crop Insurance Scheme, which offers lower premium rates for farmers who undertake soil and water conservation measures (on the assumption that these measures help to decrease their vulnerability to flooding and drought) (Hess and Hazell 2016).

Evidence suggests that insurance can contribute to greater financial stability, risk-informed development opportunity and coping capacity for vulnerable country, individuals and households.

Table 3: Allocation of Govt. Budget for Insurance-Resilience

Country	Avg. Disaster Losses Annually US\$ (Million)	Annual Budget US\$ (Million)	0.1 per cent of Budget US\$ (Million)	Amount of Insurance US\$ (Million)
India	100,00	544,422	544	27,200 (M)
Nepal	2100	5954	5.95	297.7
Bangladesh	372	27,080	27.08	1354
Myanmar	4000	9211	9.2	460
Pakistan	1400	45,600	45.6	2280
Afghanistan	1600	1992	1.99	99.5
Sri Lanka	6912	12,640	12	600
Indonesia	11,530	1,30,600	130.6	6530
Philippines	16,343	44,740	44.7	2235
Central Africa(S)	11	231	0.231	16
Chad	1000	1178	1.17	58.5
Colombia	1261	85,140	85	4250
Congo	700	2516	2.5	125
Congo DR	25	3238	3.2	160
Djibouti	7	700	0.7	35
Eritrea	26	2029	2.029	101
Ethiopia	83	12,110	12.1	605
Guatemala	187	8335	8.3	415
Guinea	36	1559	1.6	80
Guinea-Bissau	2	226	0.226	11
Haiti	830	1580	1.58	79
Iran	1542	77,220	7.7	385
Iraq	130	63,970	64	3200
Kenya	73	15,370	15.4	770
Kenya DPR	70	3,51,600	352	17,600
Liberia	6	636	0.636	32
Libya	49	16,330	16.3	815
Madagascar	845	1292	1.3	65
Mali	60	1298	1.3	65

(Continued)

Table 3: (Continued)

Country	Avg. Disaster Losses Annually US\$ (Million)	Annual Budget US\$ (Million)	0.1 per cent of Budget US\$ (Million)	Amount of Insurance US\$ (Million)
Mauritania	38	1248	1.2	60
Mozambique	472	2758	2.8	140
Niger	175	1680	1.7	85
Nigeria	1127	13,970	14	700
Rwanda	60	1874	1.8	90
Sierra Leone	6	684	0.684	34
Somalia	57	145	0.145	7
South Sudan	42	437	0.437	22
Sudan	146	8198	8.2	410
Syria	35	1033	1.033	52
Tanzania	128	7872	7.9	395
Turkey	5000	1,73,900	174	8700

The UN has defined “acceptable risk” as “the extent to which a disaster risk is deemed acceptable or tolerable depends on existing social, economic, political, cultural, technical and environmental conditions” (UN GA 2016). Residual risk relates closely to the terminology of loss and damage adopted by the UN Framework Convention on Climate Change. For example, UNISDR (2015) refers to prospective risk management, corrective risk management and compensatory risk management. Insu-Resilience a prospective risk-management framework based on budget-allocated annual risk premium to make resilience for all developing countries.

The methodology used for this paper was a desk review of special session on ‘Risk Transfer and Insurance’ held at the fifth GPDRR at Mexico in May 2017. This paper encouraged to answer “What we have learned from Insurance approaches “that today provide lessons learned and good practices”. The paper describes the key relevant concepts of budget-allocated InsuResilience on how risk transfer contributes to Disaster Risk Management (DRM) at national level and high political level with ability of insurance to contribute to risk management and risk reduction, risk layering, policy trade-offs and the need to consider the drivers of risk as climate change in parallel to the management of risk.

KEYWORDS: disaster economic losses, GDP losses, poverty, budget allocation, insu-resilience

Introduction

The report titled ‘Economic Losses, Poverty and Disasters 1998–2017’ was compiled by the UN Office for Disaster Risk Reduction. It states that the years between 1998 and 2017 have seen a dramatic rise of 151 per cent in direct economic losses from climate-related disasters. In terms of the impact of

disasters on the global economy between 1998 and 2017, affected countries reported direct losses of US \$ 2.908 trillion, more than twice of what was lost in the previous two decades. Illustrating the growing threat from climate change, extreme weather events now account for 77 per cent of total economic losses of US \$ 2.245 trillion. This represents a “dramatic rise” of 151 per cent compared with losses reported

between 1978 and 1997, which amounted to US \$ 895 billion.

The greatest economic losses have been experienced by the US at US \$ 944.8 billion, followed by China at US \$ 492.2 billion, Japan at US \$ 376.3 billion, India at US \$ 79.5 billion and Puerto Rico at US \$ 71.7 billion. Storms, floods and earthquakes place three European countries in the top 10 nations for economic losses: France (US \$ 48.3 billion), Germany (US \$ 57.9 billion) and Italy (US \$ 56.6 billion). Thailand with US \$ 52.4 billion and Mexico at US \$ 46.5 billion complete the list. In terms of occurrences, climate-related disasters also dominate the picture, accounting for 91 per cent of all 7255 major recorded events between 1998 and 2017. Floods (43.4 per cent) and storms (28.2 per cent) are the two most frequently occurring disasters. During this period, 1.3 million people lost their lives and 4.4 billion people were injured, rendered homeless, displaced or in need of emergency assistance. Around 563 earthquakes, including related tsunamis, accounted for 56 per cent of the total deaths or 747,234 lives lost, the report said.

On International Day for Disaster Reduction on October 13, 2018, UN Secretary-General António Guterres said in the wake of the devastating earthquake and tsunami in Indonesia, it was clear that disasters have a steep human cost as millions of people are displaced every year, losing their homes and jobs because of extreme weather events and earthquakes.

“A better understanding of the economic losses from extreme weather events can help to generate greater action on climate change and increased ambition on reducing greenhouse-gas emissions. Measuring economic losses can also motivate Governments to do more to achieve the targets of the Sendai Framework for Disaster Risk Reduction, which seeks a substantial reduction in disaster losses by 2030.” Reducing the economic losses from disasters has the power to transform lives and contribute greatly to the eradication of poverty. A key target of the global plan to reduce disaster losses, the Sendai Framework for Disaster Risk Reduction, is to reduce economic losses from disasters and the report highlights the fact that 63 per cent of disaster reports contain no economic data. Another key highlight is the disproportionate

impact of disaster events on low- and middle-income countries even if high-income countries bear the brunt of absolute economic losses. Only one high-income territory ranked among the “top ten” in terms of annual average percentage losses relative to GDP – Puerto Rico with 12.2 per cent.

The report concludes that climate change is increasing the frequency and severity of extreme weather events. It said disasters will continue to be major impediments to sustainable development so long as the economic incentives to build and develop hazard-prone locations outweigh the perceived disaster risks. “Integrating economic disaster losses into insurance investment decisions is the most cost-effective way to reduce these risks; investing in disaster risk reduction is therefore a pre-condition for developing sustainable in a changing climate.”

Asia has enjoyed fast economic growth over recent decades. This has contributed to the progress in achieving the Millennium Development Goals (MDGs). In the next 15 years, many countries in the region aim to continue this progress and generate higher national income on the way to achieving sustainable and equitable development. Asia is exposed and vulnerable to a wide range of natural and manmade hazards. In many respects it is the global epicentre for disasters. In 2015, the Nepal earthquake killed more people than any other disaster (8831). The drought in the Democratic People’s Republic of Korea affected the food security of more than 18 million. Four of the top five most disaster-hit countries were in Asia: China (26 disasters); India (19), Philippines (15) and Indonesia (11). In terms of economic losses, China, India and Nepal were among the five worst-hit countries in the world. These figures are consistent with longer-term trends over recent decades.

Material

Top 10 countries USA, France, Germany, Italy, China, Japan, Mexico, Puerto Rico, India and Thailand’s average annual percentage losses to GDP by their disasters namely Earthquake, Storm, Tsunami, Flood, Extreme Weather and Drought.

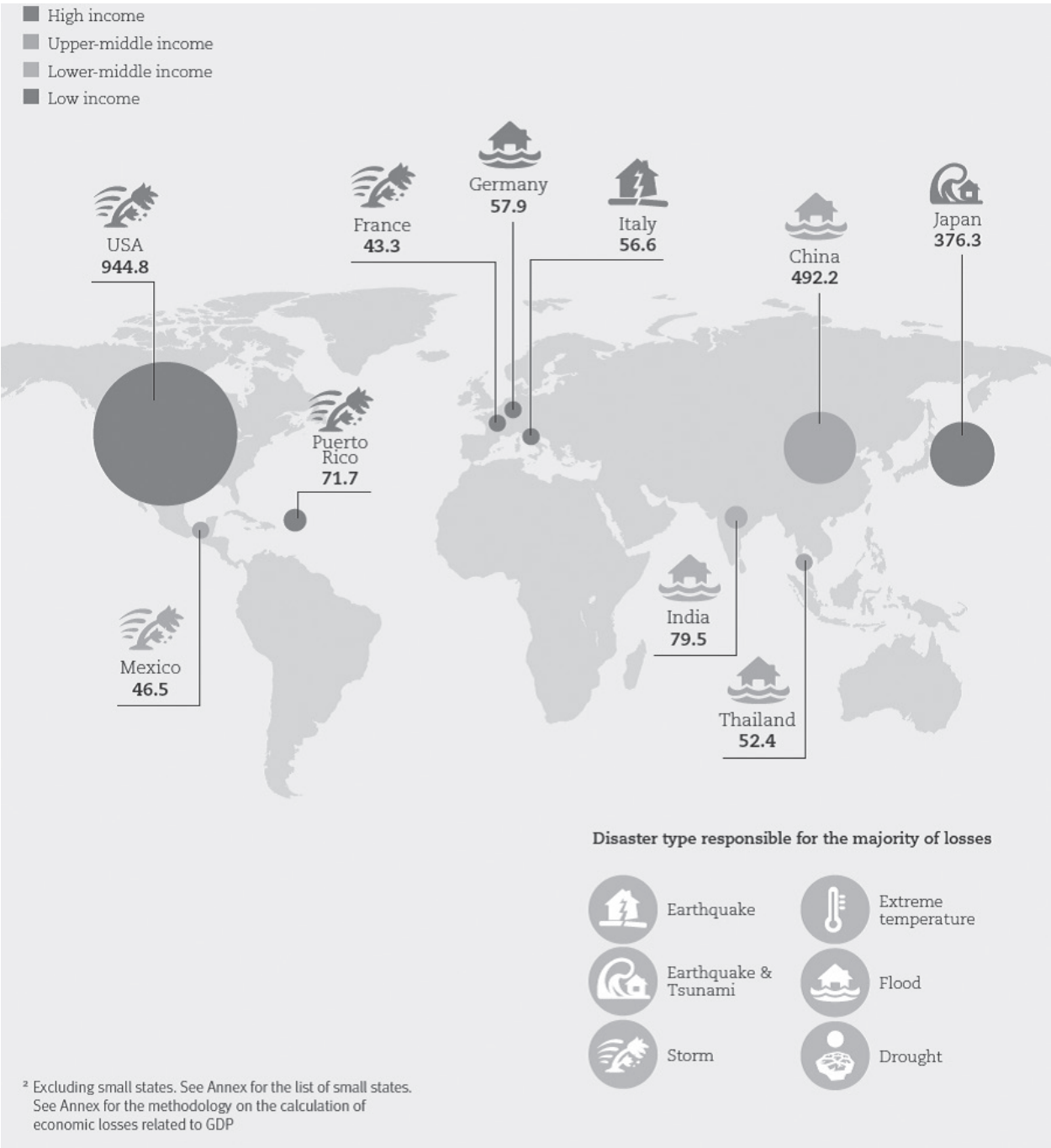


Figure 1: Top 10 countries in terms of absolute losses (billion US\$) 1998–2017

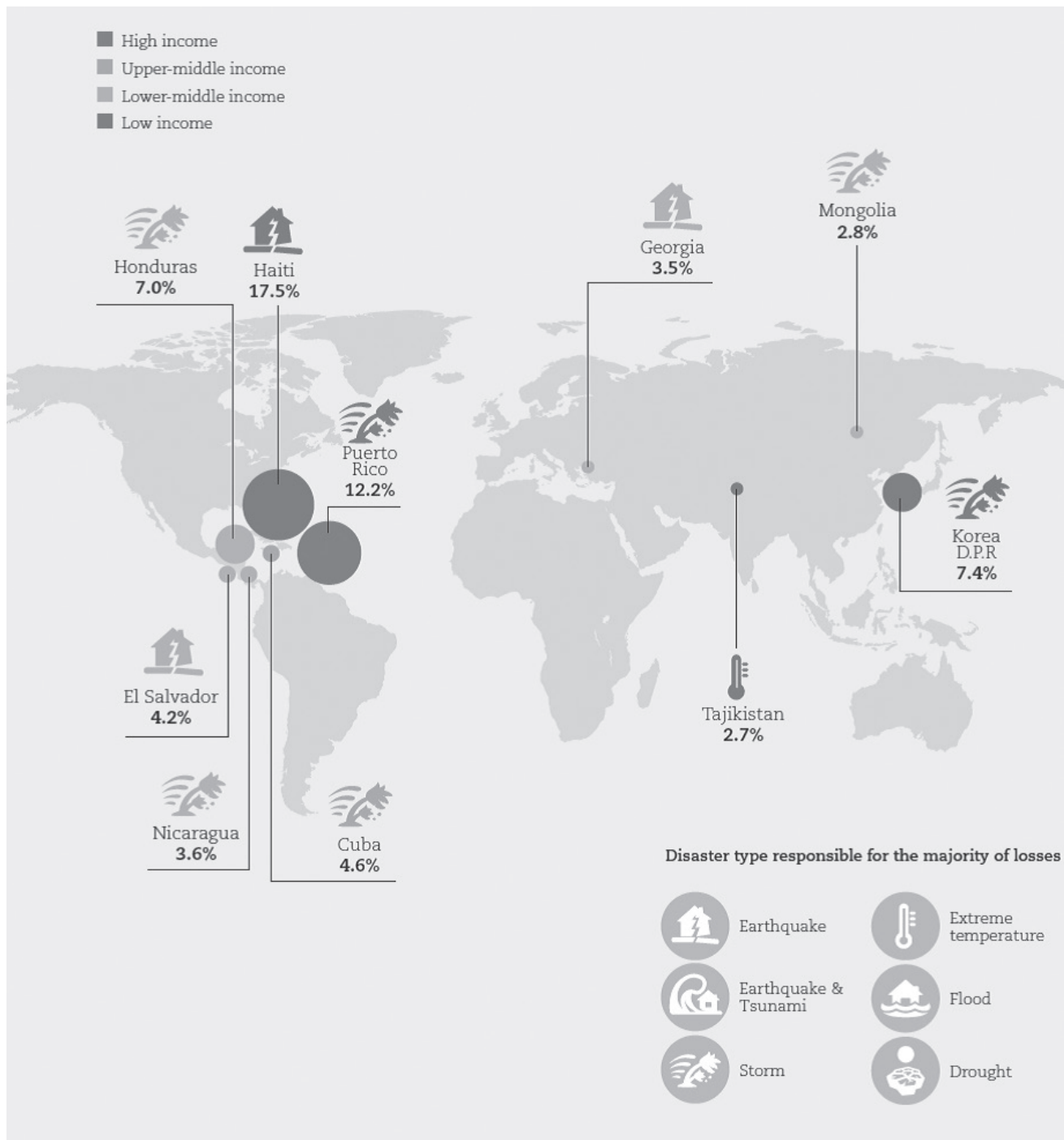


Figure 2: : Top 10 countries in terms of average annual percentage losses to GDP

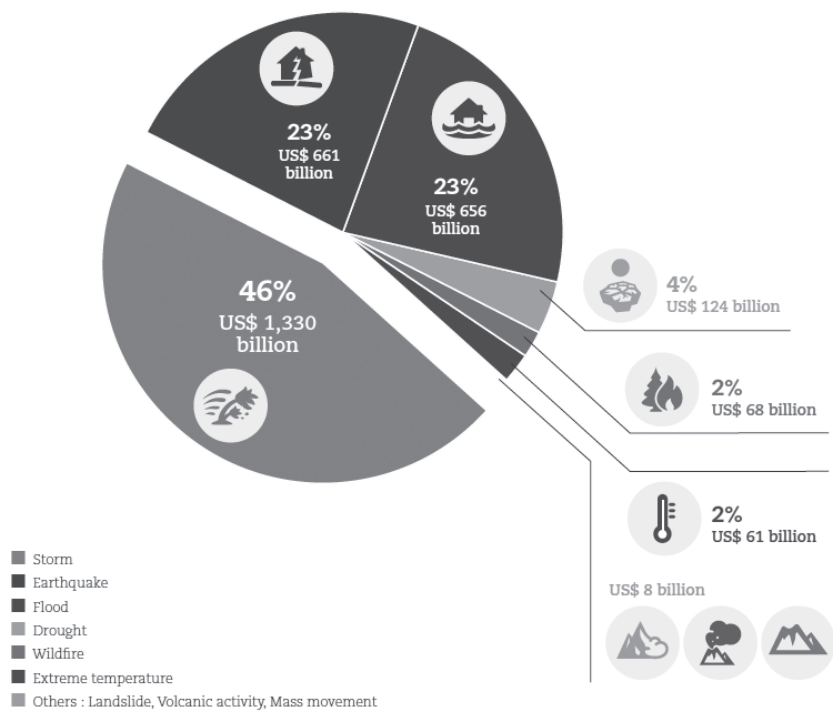


Figure 3: Recorded economic losses (US\$) per disaster type: economic losses, disasters and poverty, 1998–2017

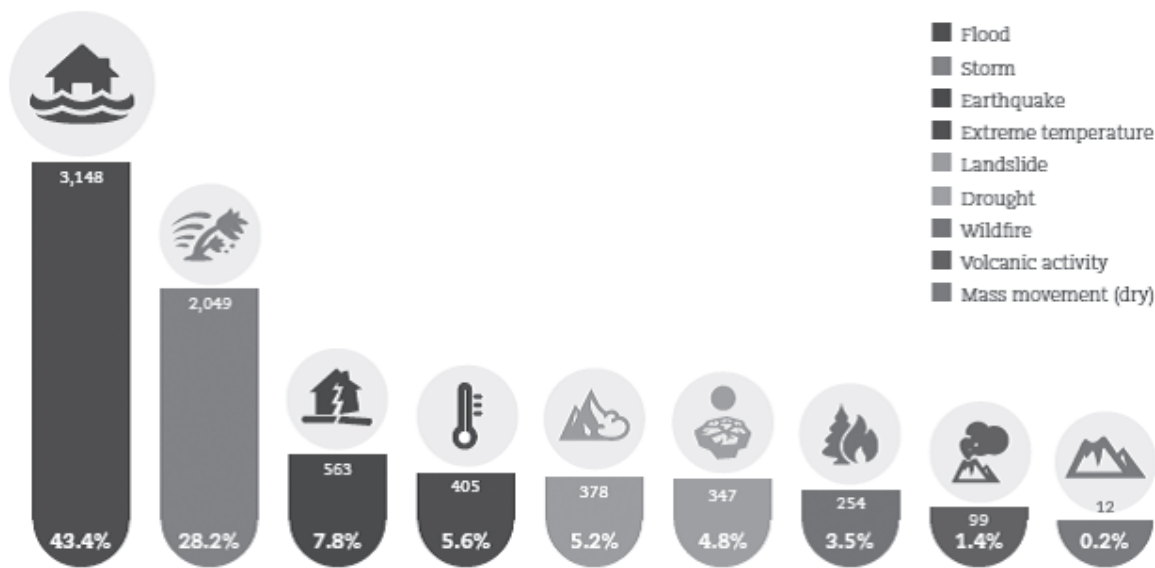


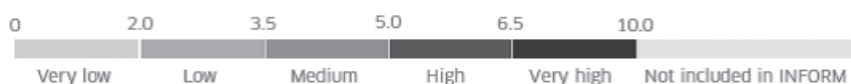
Figure 4 Numbers of disasters per type 1998–2017

In terms of occurrences, climate-related disasters dominate the picture over the past 20 years, accounting for 91 per cent of all 7255 recorded events between 1998 and 2017. Within this total, floods were the most frequent type of disaster, 43 per cent of all recorded events.

Table 4: The Risk of Humanitarian Crises and Disasters in 191 Countries

COUNTRY	RISK	3 YR TREND	COUNTRY	RISK	3 YR TREND	COUNTRY	RISK	3 YR TREND
● Afghanistan	7.7	→	● Congo	5.2	↗	● India	5.4	→
● Albania	2.7	→	● Congo DR	7.1	↗	● Indonesia	4.4	→
● Algeria	4.2	↘	● Costa Rica	2.9	→	● Iran	5.0	→
● Angola	5.2	→	● Côte d'Ivoire	5.4	→	● Iraq	6.8	↘
● Antigua and Barbuda	2.1	→	● Croatia	2.2	→	● Ireland	1.3	→
● Argentina	2.3	→	● Cuba	2.6	→	● Israel	2.6	→
● Armenia	3.6	→	● Cyprus	2.8	→	● Italy	2.7	→
● Australia	2.3	→	● Czech Republic	1.4	→	● Jamaica	2.5	→
● Austria	1.0	↘	● Denmark	1.1	→	● Japan	1.9	→
● Azerbaijan	4.7	→	● Djibouti	5.2	→	● Jordan	4.2	→
● Bahamas	2.2	→	● Dominica	2.9	→	● Kazakhstan	2.2	→
● Bahrain	0.9	→	● Dominican Republic	3.9	↗	● Kenya	5.9	→
● Bangladesh	5.8	→	● Ecuador	4.2	→	● Kiribati	3.6	→
● Barbados	1.6	→	● Egypt	4.5	→	● Korea DPR	5.1	→
● Belarus	1.9	→	● El Salvador	4.1	→	● Korea Republic of	1.6	→
● Belgium	2.1	→	● Equatorial Guinea	3.9	→	● Kuwait	2.0	→
● Belize	3.2	↘	● Eritrea	5.5	→	● Kyrgyzstan	3.5	→
● Benin	4.1	→	● Estonia	1.0	→	● Lao PDR	4.0	→
● Bhutan	2.9	→	● Ethiopia	6.3	→	● Latvia	1.6	→
● Bolivia	3.9	→	● Fiji	3.1	↗	● Lebanon	4.9	→
● Bosnia and Herzegovina	3.7	↘	● Finland	0.6	→	● Lesotho	4.5	→
● Botswana	3.0	→	● France	2.6	→	● Liberia	5.1	↘
● Brazil	3.5	→	● Gabon	4.1	→	● Libya	6.0	→
● Brunei Darussalam	2.0	→	● Gambia	4.2	↗	● Liechtenstein	1.0	→
● Bulgaria	2.6	→	● Georgia	3.8	→	● Lithuania	1.4	→
● Burkina Faso	5.3	→	● Germany	2.0	↗	● Luxembourg	0.7	→
● Burundi	5.8	→	● Ghana	3.7	→	● Madagascar	5.0	→
● Cabo Verde	2.6	→	● Greece	2.9	→	● Malawi	4.4	→
● Cambodia	4.7	→	● Grenada	1.4	→	● Malaysia	3.2	↘
● Cameroon	6.2	↗	● Guatemala	5.3	→	● Maldives	2.3	→
● Canada	2.5	→	● Guinea	5.0	↗	● Mali	6.0	↘
● Central African Republic	7.6	↘	● Guinea-Bissau	5.3	→	● Malta	1.8	→
● Chad	7.8	↗	● Guyana	3.0	↘	● Marshall Islands	4.4	→
● Chile	2.9	→	● Haiti	6.3	→	● Mauritania	5.5	→
● China	4.1	→	● Honduras	4.7	→	● Mauritius	2.1	→
● Colombia	5.4	→	● Hungary	1.9	→	● Mexico	4.8	→
● Comoros	3.6	→	● Iceland	1.0	→	● Micronesia	4.1	→

INFORM GLOBAL RISK INDEX



KEY

→ Stable ↘ Decreasing risk
↗ Increasing risk

COUNTRY	INFORM RISK	3 YR TREND	RANK	RELIABILITY INDEX*	HAZARD & EXPOSURE	3 YR TREND	Natural	Earthquake	Flood	Tsunami	Tropical cyclone	Drought	Human	Projected conflict risk	Current highly violent conflict intensity
New Zealand	1.8	→	161	3.6	3.0	→	5.1	8.2	3.7	6.7	2.8	1.5	0.1	0.1	0.0
Nicaragua	4.1	→	74	2.5	5.0	↗	6.6	8.9	5.5	8.3	3.7	3.9	2.9	4.1	0.0
Niger	7.2	→	7	1.6	7.1	↗	3.6	0.1	7.1	0.0	0.0	6.6	9.0	10.0	9.0
Nigeria	6.3	→	14	2.6	6.9	→	2.8	0.1	8.3	0.0	0.0	0.5	9.0	10.0	9.0
Norway	0.7	→	188	2.3	0.1	→	0.2	0.9	0.1	0.0	0.0	0.0	0.0	0.0	0.0
Oman	2.9	→	113	2.6	3.8	→	6.2	6.0	3.7	9.4	3.9	5.0	0.1	0.2	0.0
Pakistan	6.4	→	12	2.1	9.0	→	7.1	8.9	9.1	5.7	3.9	5.1	10.0	9.8	10.0
Palau	2.7	↘	123	5.5	1.7	→	3.1	0.3	0.1	7.7	4.0	0.0	0.0	0.0	0.0
Palestine	4.6	→	58	4.1	3.6	↘	3.0	5.5	2.3	5.5	0.0	0.0	4.1	5.8	0.0
Panama	3.2	→	104	2.0	2.8	→	4.9	6.2	3.0	8.6	2.1	1.0	0.1	0.2	0.0
Papua New Guinea	5.5	→	26	4.0	4.3	↘	5.3	7.0	5.2	7.4	2.5	2.6	3.2	4.6	0.0
Paraguay	2.9	↘	113	2.0	2.2	→	2.0	0.1	4.8	0.0	0.0	3.6	2.4	3.4	0.0
Peru	4.2	→	68	1.3	5.1	↘	7.0	9.2	6.5	9.1	0.0	4.8	2.2	3.1	0.0
Philippines	5.2	→	36	1.7	7.8	→	8.4	9.4	7.2	9.1	9.5	4.0	7.0	9.3	7.0
Poland	1.8	→	161	1.8	1.4	→	2.3	2.2	6.2	0.0	0.0	1.5	0.3	0.4	0.0
Portugal	1.6	→	166	2.2	2.0	→	3.6	5.4	3.7	5.0	0.2	2.5	0.0	0.0	0.0
Qatar	1.3	→	178	3.0	0.6	→	1.0	1.4	0.0	0.0	0.0	3.1	0.1	0.1	0.0
Romania	2.6	→	130	2.1	3.1	→	4.6	8.2	7.1	0.0	0.0	2.8	1.2	1.7	0.0
Russian Federation	4.4	↗	61	2.8	6.2	↘	6.3	7.1	8.4	5.4	3.7	5.4	6.1	8.7	0.0
Rwanda	5.0	↗	45	1.8	4.3	↗	3.1	4.0	4.9	0.0	0.0	5.2	5.3	7.6	0.0
Saint Kitts and Nevis	1.5	→	170	4.8	0.9	→	1.7	0.1	0.1	0.0	6.3	0.0	0.0	0.0	0.0
Saint Lucia	2.0	→	152	3.6	1.2	→	1.8	3.2	0.1	0.0	4.2	0.5	0.6	0.9	0.0
Saint Vincent and the Grenadines	2.1	→	147	4.1	0.8	→	1.0	0.3	0.1	0.0	3.6	0.5	0.6	0.8	0.0
Samoa	2.9	→	113	3.8	1.6	→	2.7	0.1	0.1	6.5	3.9	0.5	0.3	0.4	0.0
Sao Tome and Principe	1.3	→	178	3.4	0.1	→	0.1	0.1	0.1	0.0	0.0	0.0	0.1	0.1	0.0
Saudi Arabia	3.0	→	108	3.9	6.8	↗	2.3	2.7	3.9	0.0	0.0	4.1	9.0	6.7	9.0
Senegal	4.7	→	53	1.4	3.9	→	4.3	0.1	5.1	5.6	0.0	7.5	3.4	4.9	0.0
Serbia	3.4	↗	103	2.4	4.5	→	4.6	6.6	8.6	0.0	0.0	2.6	4.3	6.1	0.0
Seychelles	2.1	→	147	4.3	1.3	→	2.5	0.1	0.1	7.9	0.0	0.0	0.0	0.0	0.0
Sierra Leone	5.2	→	36	2.1	3.5	↗	2.3	0.1	5.0	4.1	0.0	1.0	4.6	6.6	0.0
Singapore	0.4	→	191	3.6	0.1	→	0.1	0.1	0.1	0.0	0.0	0.0	0.1	0.1	0.0
Slovakia	1.7	→	165	2.3	1.8	→	3.3	5.1	6.7	0.0	0.0	2.0	0.1	0.1	0.0
Slovenia	1.4	→	172	2.1	2.0	→	3.7	6.4	4.0	4.9	0.0	1.5	0.0	0.0	0.0
Solomon Islands	4.8	↗	51	5.2	3.4	→	5.3	6.3	0.1	8.5	4.7	3.4	0.8	1.1	0.0
Somalia	9.1	↘	1	8.2	8.9	→	6.8	1.5	8.1	6.4	1.2	10.0	10.0	10.0	10.0
South Africa	4.3	→	67	1.6	5.0	↗	4.4	0.5	5.2	2.9	0.4	8.6	5.6	8.0	0.0
South Sudan	9.0	→	2	4.3	8.3	↗	3.8	2.7	8.4	0.0	0.0	3.7	10.0	10.0	10.0
Spain	2.3	→	140	1.8	4.3	↗	4.4	4.3	5.5	6.3	0.0	4.5	4.1	5.8	0.0
Sri Lanka	4.0	→	82	1.7	4.5	→	4.9	0.1	6.2	8.2	3.5	3.6	4.0	5.7	0.0
Sudan	7.0	→	9	4.6	7.2	→	3.9	0.1	7.6	0.0	0.0	7.0	9.0	10.0	9.0
Suriname	2.5	→	136	2.4	1.9	→	3.4	0.1	8.6	1.7	0.0	1.5	0.1	0.1	0.0



























COUNTRY	INFORM RISK	3 YR TREND	RANK	RELIABILITY INDEX*	HAZARD & EXPOSURE	3 YR TREND	Natural	Earthquake	Flood	Tsunami	Tropical cyclone	Drought	Human	Projected conflict risk	Current highly violent conflict intensity
Swaziland	3.9	→	85	3.2	2.2	↗	2.2	0.1	4.0	0.0	0.2	5.3	2.1	3.0	0.0
Sweden	1.4	↗	172	2.4	0.7	→	1.1	0.1	3.3	0.0	0.0	1.5	0.3	0.4	0.0
Switzerland	1.3	→	178	2.4	1.0	→	1.8	3.2	4.3	0.0	0.0	0.5	0.1	0.1	0.0
Syria	6.9	↗	10	7.0	8.5	→	5.1	6.3	5.4	4.4	0.0	7.2	10.0	10.0	10.0
Tajikistan	4.4	→	61	2.3	5.7	↗	6.0	9.7	5.6	0.0	0.0	7.6	5.4	7.7	0.0
Tanzania	5.6	↘	25	1.8	4.8	↘	4.6	4.7	5.9	5.2	0.9	5.1	5.0	7.2	0.0
Thailand	4.1	→	74	2.3	5.5	↗	6.3	3.4	8.9	6.8	4.9	5.6	4.6	6.6	0.0
The former Yugoslav Republic of Macedonia	2.7	↘	123	3.0	2.8	↗	3.3	6.6	4.4	0.0	0.0	3.3	2.2	3.2	0.0
Timor-Leste	4.2	→	68	4.5	2.6	→	3.8	5.7	1.9	5.0	3.7	1.6	1.3	1.9	0.0
Togo	4.7	→	53	1.4	2.9	↗	1.6	0.1	4.4	0.0	0.0	2.6	4.1	5.8	0.0
Tonga	2.7	→	123	4.4	1.2	→	2.2	0.1	0.1	2.8	5.9	0.5	0.1	0.1	0.0
Trinidad and Tobago	1.8	→	161	3.6	1.1	→	1.9	3.9	0.4	0.0	2.4	2.3	0.3	0.4	0.0
Tunisia	3.0	↗	108	2.6	3.7	↘	4.5	4.1	3.9	7.2	0.0	5.3	2.9	4.1	0.0
Turkey	5.0	→	45	2.0	7.8	↗	5.8	9.3	6.1	6.3	0.0	2.6	9.0	9.8	9.0
Turkmenistan	2.7	→	123	5.4	2.8	→	4.5	8.5	5.3	0.0	0.0	4.6	0.7	1.0	0.0
Tuvalu	4.0	→	82	6.2	1.9	→	2.6	0.1	0.1	7.9	0.1	0.5	1.2	1.7	0.0
Uganda	6.0	→	18	2.2	4.9	↘	3.4	4.5	5.3	0.0	0.0	5.3	6.1	8.7	0.0
Ukraine	5.4	→	29	2.1	7.0	→	3.1	2.7	7.1	0.0	0.0	3.3	9.0	10.0	9.0
United Arab Emirates	2.0	→	152	3.0	3.7	→	6.1	9.3	3.9	7.4	1.8	4.1	0.1	0.1	0.0
United Kingdom	1.9	→	157	2.0	2.3	→	2.1	0.1	4.8	3.7	0.0	0.5	2.5	3.5	0.0
United States of America	3.6	→	94	3.1	6.1	↗	6.9	7.9	6.3	7.3	7.6	4.5	5.1	7.3	0.0
Uruguay	1.5	↗	170	2.2	0.7	→	1.3	0.1	3.9	0.0	0.0	1.8	0.1	0.2	0.0
Uzbekistan	3.0	→	108	4.8	5.0	↗	6.1	9.9	6.3	0.0	0.0	6.6	3.6	5.2	0.0
Vanuatu	3.9	→	85	4.6	2.3	→	4.0	3.4	0.1	7.7	4.6	1.5	0.1	0.1	0.0
Venezuela	4.4	→	61	2.6	5.7	→	5.8	8.7	5.5	6.2	4.6	1.3	5.6	8.0	0.0
Viet Nam	3.5	→	99	1.6	5.5	→	7.2	3.2	10.0	6.8	7.9	3.5	3.0	4.3	0.0
Yemen	7.6	→	5	3.5	8.1	→	3.2	0.1	5.0	6.1	0.0	2.6	10.0	10.0	10.0
Zambia	4.1	→	74	2.1	2.3	→	2.3	1.5	5.4	0.0	0.0	3.3	2.2	3.1	0.0
Zimbabwe	5.1		41	1.6	4.7	→	4.6	0.1	6.1	0.0	0.4	9.3	4.8	6.9	0.0



Figure 5: Hazards and exposure dimension

Table 5: Countries and Their Annual Budget at a Glance – 2017










Figures are given as million USD

Rank	Country	Revenues	Expenditures	Surplus (or Deficit)	Surplus Percentage of GDP	Year
1	 United States	6,028,001	6,807,161	–887,204	–4.6 per cent	2017
2	 China	3,312,308	3,787,245	–474,937	–4.0 per cent	2017
3	 Japan	1,678,000	1,902,000	–224,000	–4.6 per cent	2017
4	 Germany	1,598,000	1,573,000	25,000	0.7 per cent	2017
5	 France	1,334,000	1,412,000	–78,000	–3.1 per cent	2017
6	 United Kingdom	984,300	1,076,000	–92,700	–3.6 per cent	2017
7	 Italy	884,500	927,800	–43,000	–2.3 per cent	2017
8	 Canada	623,700	657,400	–34,000	–2.0 per cent	2017
9	 Brazil	618,853	779,532	–160,679	–7.8 per cent	2017
10	 India	544,422	725,052	–180,630	–6.9 per cent	2017
11	 Spain	492,400	535,900	–43,500	–3.3 per cent	2017
12	 Australia	461,000	484,900	–23,900	–1.7 per cent	2017
13	 Korea, South	351,600	338,000	13,600	0.6 per cent	2017
14	 Netherlands	344,800	340,200	4600	0.6 per cent	2017
15	 Russia	253,900	287,500	–33,600	–2.3 per cent	2017
16	 Sweden	274,800	269,900	4900	0.9 per cent	2017
17	 Belgium	249,700	260,000	–10,300	–2.1 per cent	2017
18	 Mexico	292,800	314,900	–22,100	–1.9 per cent	2017
19	 Switzerland	223,500	222,100	1400	0.2 per cent	2017
20	 Norway	214,300	198,000	16,300	4.2 per cent	2017
21	 Austria	197,800	201,900	–4100	–1.0 per cent	2017
22	 Saudi Arabia	185,600	246,333	–60,733	–8.3 per cent	2017
23	 Turkey	173,900	190,400	–16,500	–2.0 per cent	2017
24	 Denmark	173,500	175,500	–2000	–0.6 per cent	2017
25	 Finland	136,800	140,700	–3900	–1.6 per cent	2017
26	 Indonesia	130,600	154,800	–24,200	–2.4 per cent	2017

(Continued)

Table 5: (Continued)

Figures are given as millions USD.

Rank	Country	Revenues	Expenditures	Surplus (or Deficit)	Surplus Percentage of GDP	Year
27	 Argentina	123,300	161,100	-37,800	-6.1 per cent	2017
28	 Greece	95,360	98,080	-2720	-1.3 per cent	2017
29	 Taiwan	93,000	91,670	1330	0.2 per cent	2017
30	 Portugal	92,990	96,830	-3840	-1.8 per cent	2017
31	 Israel	92,820	102,100	-9280	-2.7 per cent	2017
32	 South Africa	92,380	103,300	-10,920	-3.2 per cent	2017
33	 Poland	90,800	102,200	-11,400	-2.2 per cent	2017
34	 Ireland	85,410	87,220	-1810	-0.6 per cent	2017
35	 Colombia	85,140	95,280	-10,140	-3.3 per cent	2017
36	Czechia	83,620	83,930	-310	-0.1 per cent	2017
37	United Arab Emirates	83,440	112,400	-28,960	-7.6 per cent	2017
38	Thailand	79,600	90,560	-10,960	-2.5 per cent	2017
39	Venezuela	77,890	160,000	-82,110	-38.1 per cent	2017
52	Malaysia	51,230	60,260	-9030	-2.9 per cent	2017
53	Vietnam	49,410	61,410	-11,730	-5.4 per cent	2017
54	Pakistan	45,640	59,280	-13,640	-4.5 per cent	2017
55	Philippines	44,740	53,550	-8810	-2.7 per cent	2017
64	Bangladesh	27,080	39,310	-12,230	-4.9 per cent	2017

Methodology

The key challenge for the national governments would be building financial and insurance resilience in changing climate. It becomes an important issue for the financial management to create financial protection and insurance means to manage the financial losses, reducing the economic impact of disaster events, and supporting better recovery. In accordance with that the paper provides an overview of the field and desk research of potential income implications of climate change for the financial management of disaster risks and losses.

Budgetary provision for transferring disaster risks has become more evident to post-disaster development. Only contribution of 0.1 per cent of annual budget can make a country disaster-risk resilient.

For example last year India's budget was US \$ 300 billion means US \$ 300,000 million and therefore 0.1 per cent of 300,000 is US \$ 300 million. The minimum probability of one-tyre fit (all disasters) is 50 times of insurance premiums to be paid to insurers. As such that India's 300 million annual risk investment in disaster risk insurance can provide US \$ 15,000 million risk safety means US \$ 15 billion. In 2018 only Kerala state lost 3.8 billion (US \$ 3800 million) (27,000 Crore Rs).

Sendai Framework for Disaster Risk Reduction 2015–2030 **Targets (C):** Reduce direct disaster economic loss in relation to global gross domestic product (GDP) by 2030.

Priorities for Action: There is a need for focused action within and across sectors by states, national, regional and global levels in the following four priority areas.

Priority 1. Understanding disaster risk

Priority 2. Strengthening disaster risk governance to manage disaster risk

Priority 3. Investing in disaster risk reduction for resilience

Public and private investment in disaster risk prevention and reduction through structural and non-structural measures are essential to enhance the economic, social, health and cultural resilience of persons, communities, countries and their assets, as well as the environment. These can be drivers of innovation, growth and job creation. Such measures are cost-effective and instrumental to save lives, prevent and reduce losses and ensure effective recovery and rehabilitation.

Priority 4. Enhancing disaster preparedness for effective response, and to “Build Back Better” in recovery, rehabilitation and reconstruction.

The global community increasingly underscored the interconnected nature of humanitarian, development and climate action. As disaster risk reduction falls squarely in this nexus, UNISDR championed the need for all planning, policies and actions to be risk-informed. The hazard landscape continued to evolve over the course of the biennium; 2017 was one of the costliest years for disaster losses ever, heightened by due key risk drivers of climate change, poorly planned urbanisation in hazard-prone areas, environmental degradation and rising inequality.

Achieving Target (e) by 2020

Target (e) of the Sendai Framework, “substantially increase the number of countries with national and local disaster risk reduction strategies by 2020”, is the first deadline in the Sendai Framework targets. Meeting this target is crucial in laying the foundation for other disaster risk management efforts. Over the course of

the biennium, UNISDR supported 29 Member States in developing and updating national strategies and plans.

To support Member States in the development of the strategies, UNISDR is coordinating partners to develop the words into action and vulnerability into resiliency on national disaster risk reduction strategies which promote the integration of disaster risk reduction, climate change and sustainable development considerations. It will be a step-by-step guide to governments in developing their national disaster risk reduction strategy in the context of sustainable development. The policy direction for implementation of the Sendai Framework in Asia (i): Coherence and integration: The Addis Ababa Action Agenda, the 2030 Agenda for Sustainable Development, the Sendai Framework and the Paris Agreement on Climate Change (COP21), all strive towards making development resilient and sustainable. Effective disaster risk reduction is an indispensable element towards this end. Integration of risk reduction in development will build resilience and protect development gains. Risk reduction and resilience is a common element across the various frameworks and agreements. This will help establish a more collaborative environment between the disaster risk reduction community and the development sectors. Further, the outcomes of the World Humanitarian Summit and the Habitat III underline the significance of disaster risk reduction in their respective sectors, particularly through local government actions. The incorporation of disaster risk reduction into the 2030 development agendas will provide an opportunity to break down silo approaches within and between respective sectors. The Sendai Framework states: “The development, strengthening and implementation of relevant policies, plans, practices and mechanisms need to aim at coherence, as appropriate, across sustainable development and growth, food security, health and safety, climate change and variability, environmental management and disaster risk reduction agendas. Disaster risk reduction is essential to achieve sustainable development.” The respective international frameworks/agendas mutually reinforce and depend on each other. For instance, the effective implementation of the Addis Ababa Action Agenda and the Paris Agreement will enable the Sendai Framework to contribute to the overall 2030 Agenda for Sustainable Development. Consequently, countries in

the region need to ensure that all planning on disaster risk reduction is an integral part of the implementation and monitoring of the SDGs while recognising the need to achieve more specific targets and indicators of the Sendai Framework.

Making Cities Resilient Campaign Towards National Disasters Resiliency Through Budgetary Insu-Resilience

In order to prevent new and reduce existing disaster risk, local authorities, states and nations must transform their approaches to make their cities resilient and villages smart. They are required to constantly assess and revise their strategies, actions and investments in line with the pace of social and economic development. To support local authorities, UNISDR provided almost 4000 local governments participating in the Making Cities Resilient Campaign with tools, best practices and policy guidance to implement the Sendai Framework at the local level. Throughout the biennium, UNISDR worked in close collaboration with a variety of actors involved in building urban resilience, notably UN-Habitat to build coherence with the New Urban Agenda, and the 18 members of the UNISDR Making Cities Resilient Campaign Steering Committee.

At present, 200 cities are implementing the Disaster Resilience Scorecard for Cities and will complete the self-assessment in 2018 (50 in Africa, 50 in Latin America, 75 in Asia Pacific, 25 in Northeast Asia and 100 in India). Additionally, 20 pilot cities (6 in Asia Pacific, 5 in Africa, 5 in Americas and 4 in Arab States) are working towards the development of local disaster risk reduction plans and strategies in line with Sendai Framework Target (e): Overview of the geographic distribution of the 87 countries that reported to UNISDR about the availability, quality and accessibility of national disaster-related data required to report on the 38 Sendai Framework indicators.

Disaster Risk Finance for Development

As decided by Member States in the intergovernmental-agreed conclusions and recommendations of the 2018 FFD Forum (E/FFDF/2018/3), the fourth FFD Forum will be convened by the President of ECOSOC from April

15 to 18, 2019, at the United Nations Headquarters in New York. The event will bring together ministers, high-level officials from ministries of finance, foreign affairs and development cooperation, Executive Directors of the World Bank and IMF, as well as senior officials from the UN system, including the major institutional stakeholders, and other international organisations.

Object

Strengthening the resilience of a vulnerable country for protecting livelihoods of poor and vulnerable people against the impacts of disasters through budgetary Insu-Resilience. As individuals, as an enterprise and as a country, a majority of us do not have the resources to manage all these effectively. So insurance is an important risk transfer tool that allows us to mitigate our risks and that we are protected when we fall with loss events.

Countries should adopt and make a provision for Budgetary-Insu-Resilience principles in their national policies and strategic action plans for implementation of the Sendai Framework. At the national level, countries will need to align their DRR strategies and plans with the Sendai Framework.

At COP24 in Katowice high-level representatives and experts from V20 and G20 countries, international organisations, and academia felt the need to advance financial protection for poor and vulnerable people and countries. Climate disasters throw back 26 million people into poverty every year. This budgetary-Insu-Resilience is to increase financial resilience of poor and vulnerable people and break the vicious circle of disasters and poverty. At COP24 European Union and International Development Finance Club, an association of 24 national and regional development banks from all over the world announced their joining of partnership.

Promoting and Enabling Risk-Sensitive Legislation and Budgets

Parliamentarians support the implementation of the Sendai Framework through adopting and amending legislation, providing oversight and seeking budget

allocations for disaster risk reduction. To further catalyse action, UNISDR worked closely with the Inter-Parliamentary Union (IPU) and engaged with more than 125 parliamentarians across the world to share approaches to strengthen disaster risk governance and promote resilient public and private investments. In 2017, UNISDR began to develop advocacy materials for parliamentarians and provide workshops on Sendai implementation. UNISDR also established partnerships with MP constituencies in addition to IPU, including regional parliaments, national personal capacity and organisations in Parliaments Global Forum and GLOBE Legislators. At the regional level, UNISDR established a new collaboration through a letter of understanding with ParlAmericas on parliamentary support for the implementation of the regional strategy and roadmap. Following the adoption of the first regional disaster risk reduction and disaster risk management law by the East African Community in 2016, Members of Parliament from the six-nation East African Community at the EAC Parliamentary Forum vowed to step up implementation of the Sendai Framework in their region. In Europe, UNISDR's collaboration with the Italian Banking Insurance and Finance Federation (FeBAF) and members of the European Parliament resulted in the recognition that avoiding the creation of future disaster risk is essential to the sustainability of EU finance policy. This was subsequently reflected in the Capital Markets Union work plan on sustainable finance in March 2018. A Japanese Parliamentary group in support of UNISDR and disaster risk reduction was launched in 2017.

YEAR 2019: A YEAR OF RESOLUTION

FOR BUDGETARY-INSU-RESILIENCE

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Collaborative Governance for Disaster Management: Linking Academic Institutions, Civil Society and Government in Alappuzha during the Kerala Floods of 2018

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ABSTRACT: Large-scale natural and man-made disasters are steadily increasing in intensity and frequency in every part of the globe and demands for an ever-increasing need for collaboration between the people and institutions of different spheres and expertise. There is also a growing recognition of the need of capacity building and involvement of the local communities so as to improve their own disaster resilience. This paper explores how the collaboration of the civil society platform of CANALPY, a youth initiative taken up to reclaim the canals in Alappuzha town, along with various governmental, non-governmental organisations and local citizens helped in effectively respond to the disastrous floods in Alappuzha and Kuttanad regions of Kerala in July–August 2018. It examines how the complementary strengths of these different institutions helped in addressing the various challenges during the rescue, relief and rehabilitation processes of this unprecedented disaster. The paper also looks into how capacitating the local communities in collecting crowd-sourced data can be a crucial element in augmenting the rescue, relief and rehabilitation efforts during disasters.

KEYWORDS: resilience, disaster management, collaboration, disaster risk reduction, resilience, community, decentralised, governance, citizen science, crowdsourcing, youth, technology, training, capacity building, sanitation, health, Kerala floods, Alappuzha, Kuttanad, India

Introduction

Democratic governance demands participation of different spheres of society beyond the government in decision-making. It is a twist and critique to the neoliberal ‘good’ governance arguments that simultaneously advocate ‘state failure’ along with collaboration of civil society and business in strengthening governance (Barten et al., 1992). Instead engagement of the other spheres in governance to ensure transparency,

accountability and participation will deepen the democratic character of governance. It can especially help bridge crucial gaps in knowledge and capacity building needed in difficult tasks of rescue, relief and rehabilitation during times of disaster (World Bank, 2004), where complementary strengths from these different spheres become an urgent need in delivery of these. To fill the apparent data and knowledge gaps, governments, academicians and researchers are turning to people. Known as crowdsourcing, the approach

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sources services, ideas and data from a large number of participants, paid or unpaid, and is one of the examples of ‘citizen science in practice’. Such an arrangement could (i) supplement/replace the institutional energy that a city government otherwise needs to spend in order to collect large volumes of data; (ii) open doors for an effective interaction between the citizens and the government and (iii) be instrumental in ensuring transparency and accountability in public services provision (Newman et al., 2012). Citizen science is a growing concept with the increasing use of technology and has the potential to be a democratising agent in the third-world countries (Murthy, 2011) (CSE, 2018) (Zook et al., 2012). It is increasingly being used during disasters in India and has the potential to improve community resilience during disasters (Pragya, 2014).

This paper will look into how the collaboration of the civil society platform of CANALPY, a youth initiative taken up to reclaim the canals in Alappuzha town, along with various governmental and non-governmental organisations helped in effectively respond to the disastrous floods in Alappuzha and Kuttanad regions of Kerala in July–August 2018. It examines how the complementary strengths of these different institutions helped in addressing the various challenges during the rescue, relief and rehabilitation processes of this unprecedented disaster. The paper also looks into how capacitating the local communities in collecting crowd-sourced data can be a crucial element in augmenting the rescue, relief and rehabilitation efforts during disasters.

Methodology

This case study analyses the various disaster-related activities that CANALPY was involved in along with various governmental and non-governmental organisations during the Kerala floods in 2018. The secondary data collection for this study was conducted through review of literature on collaborative governance, citizen science and their importance in the events of disasters. The various reports and presentations prepared by the CANALPY team were also studied. The primary data collection involved interviewing all the CANALPY members who were

working on ground during the rescue, relief and rehabilitation activities.

Emergence of CANALPY

With the closure of the centralised solid waste treatment facility, Alappuzha town began practicing decentralised solid waste management for the last six years and the town recently received recognition from the United Nations Environment Programme (UNEP, 2017). However, liquid waste management remains an enigma since the town lacks underground sewerage network and treatment facilities and relies on septic tanks or soak pit type onsite sanitation systems (OSS). The town is in urgent need of an alternate approach in technology and planning to deal with the growing problem of canal pollution. A decentralised sanitation planning at city level is perceived to be ideal to deal with this issue but it needs a new set of knowledge, tools, institutions and resources. The foremost requirement is to have quality data on the current status of water use and sanitation to identify issues and search for context-specific solutions.

To fine-tune this approach, CTARA, IIT Bombay, has developed a protocol for situational analysis of prevailing sanitation and wastewater practices by:

- considering the local municipal government as the locus of sanitation interventions,
- engaging academic institutions with the help of civic organisations to conduct household surveys to develop analytical capacity in local colleges and
- developing a protocol to train students and practitioners and bring in a fine-grained understanding of sanitation issues taking on board urban local bodies as partners.

Winter School 2017 and Summer School 2018

After the successful attempt at bringing science policy-citizens together in Alappuzha, IIT Bombay teamed up with local engineering institutions (SCMS College of Engineering, Cochin University College of Engineering,

Kuttanad) and with support from Kerala Institute of Local Administration (KILA) conducted a Winter School in December 2017 and a Summer School in May 2018. The activities of the Summer and Winter schools provided a platform to shape the future scope of the research and field activities and to disseminate this alternative knowledge through training environmental/civil engineering, planners, social science students and local youth something which is not taught to them in conventional educational programmes, thus allowing them to think and act on concrete issues on ground. The students were not only given an alternative perspective couched on environmental sustainability and affordability but a clear strategy to achieve it through multidisciplinary work and trans-disciplinary stakeholder engagement and were equipped to take forward the protocol and replicate it with context-specific alterations.

CANALPY: Making of a Civil Society Platform

The Winter and Summer schools played a significant role by making the household/institutional surveys a conscientisation exercise. More than 300 students went to almost 4000 households/institutions and explained the need and strategy for decentralised solid and liquid waste management. The students, many of them from local colleges, got the training for technical appraisal of water quality, wastewater flows and got equipped with the mobile-based apps. A media platform (<http://www.canalpy.com>) was created which helped in spreading the main message of the CANALPY campaign and also brought in several youth as volunteers to contribute to the canal rejuvenation project. Further, the local institutions that partnered in these efforts have become confident to take the process forward. The two achievements were as follows: (a) there was good analysis on local-level issues by generation of credible information and data by local academic institutions. The technical design exercise such as civil engineering plan for correcting the flow and side wall protection has been done almost free of cost. (b) Such demystification of science and technology design can make local government institutions more accountable

by triggering a process of democratising of knowledge ensuring better transparency.

Collaboration of CANALPY with Other Actors during the Kerala Floods of 2018

Shortly after the Summer School 2018, all the activities of CANALPY came to a stand still during the July–August floods in Kerala. Since Kuttanad and Alappuzha regions were two of the worst hit regions due to the floods, all the resources were directed towards disaster recovery. Youth play an important role in responding to disasters and it was proved again in Alappuzha as well. With CANALPY being a platform for volunteers to respond to the disaster, many youth volunteers joined hands with the team in all phases of disaster management. Though not specifically trained to address disasters, the training and capacity building on online tools and in water- and sanitation-related work that the CANALPY team had received along with the social capital built through the Canal Rejuvenation Project proved handy during the floods. IIT Bombay, KILA and the CANALPY team collaborated with Kerala Shashtra Sahitya Parishad (KSSP) and Alappuzha Municipality for immediate response to the unprecedented disaster in these regions. While IIT Bombay could provide the technology support and the academic partnership helped in data analysis and recommendations, KSSP with their rich knowledge of working in Alappuzha and Kuttanad regions provided local-level coordination and expertise during the relief and rehabilitation activities aided by their experience during the previous floods. KILA provided the training and financial support as well as in replicating the protocol across various local bodies. The social capital created by the CANALPY team through the Canal Rejuvenation Project helped in collaborating with these different organisations during the disaster. The experience gained through earlier surveys, interactions and on-ground work in Alappuzha town aided the team to mobilise people quickly and to do the design, training and monitoring questionnaire surveys. CANALPY also provided the platform for the youth to bring in their skills, innovate when needs come

and collectively work with the municipality. In addition to lending hand to the rescue operations, the CANALPY team also mapped the relief camps in Kuttanad region through the GPS apps in the smart phones, which was helpful in assigning volunteers, managing the relief materials and planning access to these relief camps. The team also effectively used the social media for mobilising people and for coordination. Most camps in Kuttanad were in remote areas with no access to bigger boats and hence difficult to trace. The team with the help of tracking devices, geo tagged each camp with the help of small fishing boats, which facilitated the distribution of food, clothes and medicines. A survey was conducted to identify households with people needing special care (bedridden patients, patients requiring palliative care, pregnant women etc), and they were mapped so that such households can be focused in case of emergencies. The Kerala Government had made a call for volunteers to participate in the Operation Rehabilitation Drive for Kuttanad, which is considered to be the biggest rehabilitation mission that Kerala has ever undertaken after a disaster. This had an arousing response with more than 65,000 volunteering to be part of the drive and the objective was to ensure safe return of the people in the relief camp to their houses in Kuttanad. The CANALPY team was involved in this drive in registration and coordination of volunteers for this drive and also in conducting flood assessments in the flood-affected areas working closely with the concerned government departments. A socio-economic survey for the assessment of structural damage of households and public institutions was conducted as part of these activities. This was done after consulting with disaster management experts and civil engineers. An assessment of prevalence of diseases with the help of medical experts and personnel working in humanitarian agencies was also conducted later on. The biggest feature of these assessments was that they were meant to analyse problems quickly and quick solutions for rapid rehabilitation. The methodology used was later developed into a protocol to be replicated across other flood-affected regions in Kerala and it proved that volunteers who are not experts could aid in the assessment process if given a basic training.

Collaboration with KSSP and DMO

Kerala Shastra Sahitya Parishad (KSSP) is a voluntary organisation, which strives to popularise science and technology among common people, to analyse social and environmental issues in a scientific way and to play an active role in transforming the society (KSSP). KSSP has done extensive studies on Kuttanad region from the 1970s (Mohankumar, 2005). This experience of working on ground and knowing the social, environmental and political aspects of the Kuttanad region proved vital during the floods. CANALPY team worked with the KSSP in the rescue, relief and rehabilitation phases during the Kerala floods. Being a low-lying area, floods are a recurring event in Kuttanad, whenever there is heavy monsoon in Kerala. This is followed by deadly disease outbreaks, such as of leptospirosis, dengue, chikungunya, Acute Encephalitis Syndrome (AES), typhoid, avian influenza (Balakrishnan et al., 2017) (Kumar et al., 2007) (Govindaraj et al., 2017). The floods in July 2018 had submerged the region forcing number of families to stay in the relief camps leaving their homes. Citing the urgency to deal with any subsequent disease outbreak, the CANALPY along with KSSP mobilized about 1000 volunteers, gave them training of the data collection tools (OSM Tracker and ODK Collect) and did a disease surveillance mapping in the households and relief camps. The disease surveillance data collected was submitted to the District Medical Office (DMO). This was followed by distribution of medicine and sanitation kits for people in the camps. For easy access to the relief camps, the CANALPY team also used OSM Tracker to track all the relief camps and shared the map publicly. As most of the camps were in remote areas with no access to bigger boats, the team mapped the remote relief camps with the help of small fishing boats. This helped in facilitating better distribution of food, clothes and medicine to these remote camps. A short survey to know the households with people needing special care (palliative patients, pregnant women, infants, old people etc.) was also conducted. Open Street Map Tracker (OSM Tracker) tool was used to track each of the remote locations in small boats and geocode all the remote relief camps, while ODK Build was used to design the disease surveillance

questionnaire and ODK Collect was used to do the surveys.

Working with Alappuzha Municipality in Rescue Activities

While the relief activities were being carried out in Kuttanad, the disastrous August 2018 floods hit Kuttanad. CANALPY members coordinated with the Alappuzha Municipality in the rescue activities, attending the distress calls, collating the rescue needs from various social media platforms (WhatsApp, Facebook etc.) and providing immediate response by intimating rescue services. As there was a list of households with geo coordinates of people needing special care, the focus was on rescuing them on an urgent basis. With the help of the geo-tagged information, the evacuation process was considerably easier.

Addressing Sanitation Challenges in Relief Camps

Taking cue from the experience of working in addressing sanitation challenges in Alappuzha, CANALPY team developed a training team to disseminate the solid and liquid waste management in the relief camps. They constructed more than 50 temporary aerobic composting units with cheaper materials and low-cost bathroom facilities in the relief camps. For disposal of the sanitary waste, the team also arranged and supplied sanitary incinerators in these camps.

Involvement of CANALPY in Operation Rehabilitation in Kuttanad

Operation Rehabilitation, a drive to make the houses habitable and safe return of the flood-hit people from the relief camps to their respective homes, was organised in Kuttanad, one of the most affected regions in Kerala on August 28, 29 and 30, 2018. This massive drive consisted of providing sanitisation of the affected houses; support with the electric, carpentry and plumbing work that might be required in the houses; ensuring safety of the people by providing preventives

for leptospirosis, tetanus and so on. or from snake bites and electrical survey to assess the status of electrical connections at home. After a call for volunteers was mooted by the MLA and the Finance Minister of Kerala, there was an arousing response and more than 65,000 volunteered to be part of this drive. Various surveys were also planned including the combined socio-economic and civil survey organised by CANALPY to study the impact of floods on the water and sanitation services. A volunteering team of plumbers, carpenters, electricians, cleaning volunteers, snake catchers and surveyors joined Operation Rehabilitation drive. As part of Operation Rehabilitation, the CANALPY team decided to include a rapid assessment of the impact of the flood on the building structures, water, sanitation services and public health. About 2000+ volunteers had showed interest in volunteering for this rapid assessment exercise. Out of them it was decided that about 500 volunteers will be trained and can be part of the data collection and the rest will be assigned to each Grama Panchayat on the basis of requirement. The volunteers were sorted and those who were interested in cleaning activities were linked with the Grama Panchayat authorities and arrangements for food and accommodation were done for those who came from outside Alappuzha. Out of the 1500 volunteers, 500 of them were selected to be part of the various surveys to be conducted across Kuttanad. Around 250 volunteers turned out for the training as part of the socio-economic survey. This survey was planned for households as well as public institutions by the CANALPY team and it was decided that the survey team will accompany the people returning back to their flood-hit homes from the relief camps. The survey questionnaires for the household and public institutions were prepared carefully after consultation with various disaster management experts, civil engineers, medical experts, architects and people working in humanitarian agencies so as to ensure inclusiveness and have specificity. In questions related to health and diseases it was made sure that except for fever and athlete's foot, reporting of any other diseases will be done only if a doctor has confirmed the disease. On the day of arrival of the volunteers, they were given a short training on the questionnaire and were introduced to the mobile app, Open Data Kit

(ODK), which was to be used for the survey. There were sessions to introduce them to the Kuttanad floods, about the CANALPY project, the survey etiquettes and also about how to conduct the civil survey. Importance of taking proper photographs was reiterated during the sessions as it formed the basis of the structural damage analysis of the survey. Later on the survey team was divided into 16 groups to be assigned to the various panchayats. Buses were assigned to each of the panchayats and the survey volunteers along with other volunteers accompanied the people in each bus. Few areas to which the road network was still not in working condition from Alappuzha town, boats were used to transport people as well as surveyors and other volunteers. As the survey was to be conducted for two to three days, the panchayats were informed to provide food and overnight accommodation for the volunteers for these three days.

Collaboration with Academic Institutions, Local Bodies and Other Governmental Agencies in Post-disaster Assessments

The CANALPY team also collaborated with various academic institutions, local self-government bodies in Kuttanad and governmental agencies of KILA and KSBB in various post-disaster assessments.

Structural Damage Assessment of Houses and Public Buildings

Flood levels had risen on an average of 5 feet in most of the places and all the households surveyed were affected at least to some extent. Lack of tall structures has increased the impact of floods, as only 5 per cent of the buildings surveyed had more than one storey. Based on the photos of one-third of the house buildings taken using the app during the surveys, judgements were made by civil/structural engineering experts in IIT Bombay. Through the recommendations from the experts various buildings were categorised as those needing complete reconstruction, those requiring some intervention/repair and those not requiring any major intervention.

In addition to developing a protocol for rapid assessment of the buildings affected by floods, another important aspect of this exercise is that despite lack of expertise and minimal training, there was a reasonable degree of consistency between volunteer observations and expert findings of structural damages. This exercise also meant that photographs were important to remotely judge the structural integrity of houses if the documentation is proper as found from this exercise. The experts also were satisfied with the photo-analysis method of the houses as it helped them to make judgements easier than only looking into each of the data entries.

Flood-Level Mapping

Flood-level mapping in the various panchayats of Kuttanad was also conducted with the help of students from the local schools and colleges. The flood-level data with geo coordinates and photographs were collected at every half a kilometre interval across some of the worst-affected panchayats in the Kuttanad region. This data was then plotted on GIS and a flood map was created.

Biodiversity Survey

In addition to this, the members from the CANALPY team in collaboration with the Kerala Institute of Local Administration and Kerala State Biodiversity Board (KSBB) also trained an assessment team for the flood impact on biodiversity assessment (The Indian Express, 2018).

Building Blocks of the CANALPY Model

- Political buy-in: Working with government, especially the urban local bodies.
- Academic buy-in: Working in partnership with local educational institutions and experts to make them part of the process.
- Demystifying science through trainings, simplification by dividing into smaller tasks and presenting live models from elsewhere to legitimise alternate options.

- Engaging with the local people specifically youth by making them part of the learning process.
- Triggering interest/generating awareness through use of ICT tools.
- Constituting institutions for community participation and social regulation.

Role of Open-Data Collection and Citizen Science

The role of other actors especially the citizens in contributing towards knowledge is a well-studied aspect in public policy studies. The policy making, implementation and governance no longer depend upon the knowledge exchanges between the governments and scientific community. Various studies also have found the potential of crowdsourcing data through citizens to support disaster response. Rather than relying on the government to provide data, citizens can now generate and share reliable, relevant and accurate data on their own through simple data collection tools (UNEP, 2018). This can be extremely crucial when there are unprepared scenarios such as disasters, which can aid the activities done by the local organisations or even the government.

Data collection technologies can also assist response teams by transmitting real-time spatial information between field personnel and coordinating centres (Geoscience, 2001). This was evident from the various activities in which CANALPY was involved during the Kerala floods in 2018. Data, especially geo-coded data, was found critical in improving the rescue, relief and rehabilitation activities. Gathering data on health to provide rapid and effective medical relief is regarded as a critical public health challenge (Morton & Levy, 2011). The multiple disease surveillance surveys conducted with assistance from the District Medical Office (DMO) helped in offering basic healthcare services to the people in the relief camps. Similarly the geo-coded data (including the visual data through photos) of the buildings (houses and public buildings) collected also served as important inputs to plan the rehabilitation activities, with the state government taking cues from it in their own structural damage of buildings. The flood-level mapping conducted as well as the situational analysis of water and sanitation in the

flood-affected areas in Kuttanad will help in providing effective interventions during the rebuilding phase.

Discussion and Conclusion

Collaboration of various actors from different spheres including the civil society is considered crucial for any disaster-hit neighbourhood to recover back to normalcy. The collaboration between the academia, government and civil society in Alappuzha provides an opportunity to understand how the complementary strengths from these different spheres can be effectively used to strengthen governance for effective disaster risk management. Various studies state the role of social capital in disaster resilience and recovery (Aldrich, 2012). Also to improve disaster resilience and develop better disaster reduction strategies there is a need to combine knowledge, technology, expertise, management, institutional capacities and on-ground experience (Behera, 2002). The collaborative efforts at the time of despair by the academic institutions, civil society organisations, the district administration and the local bodies in Alappuzha reiterate the importance of building resilience through improving social capital between people and organisations. This study proves that such collaborations can result in the communities to be better equipped in adapting with disasters and is the need of the hour to build resilience in the complex urban environment.

Civil society organisations of KSSP and CANALPY had an important role to play while responding to the floods in Alappuzha and Kuttanad as they worked on ground and provided important information and knowhow on local ecosystems and environmentally sensitive areas, which is critical during emergencies. They also have better sense of the local sensitivities and priorities as well as have expertise in mobilising people towards rescue, relief and rehabilitation processes. This combined by the technology and research support from the academic organisation of IIT Bombay and financial and training support from KILA helped to deliver timely response to the people affected by floods along with the government and also to effectively contribute during the rescue, relief and rehabilitation phases during the disaster in Alappuzha and Kuttanad.

Sufficient and reliable data is a pre-requisite when it comes to any planning and it becomes utmost necessary at the time of emergencies such as at the time of disasters. The application of data-collection tools and crowd-sourced social media data for disaster management is a growing field and is being used by the communities around the world in tackling the disasters (Yore, 2017) (Forbes, 2018) (Jamali et al., 2019) (Ogie et al., 2019). The data generated through the citizen scientists and at local community level may be small but are important which helps to respond better to disasters and also to build resilience among communities.

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Disaster Recovery

Post-disaster Analysis on Rebuilding Livelihoods

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ABSTRACT: Coastal zones are always vulnerable to disasters like floods and cyclones. Throughout the world, disasters result in major social, environmental and economic problems. The recent cyclone, Gaja, affected many parts of Tamil Nadu. A large number of people were highly affected by it. They lost their livelihood and some places were so badly affected that people could not even be contacted.

The study focuses on the rebuilding of their livelihood, the resource availability for reconstruction, funding and the time estimated for their whole environment to become stable. It encompasses the sustainable planning of available resources which can be used effectively for both short-term and long-term rebuilding. It is to be carried out by using both qualitative and quantitative techniques that are represented with the geoinformatics application.

KEYWORDS: coastal zones, Gaja cyclone, quantitative techniques, application of geoinformatics

Introduction

The coast of India experiences severe cyclones every year during the months of November to January. The state of Tamil Nadu with a coastline of 1076 kilometres is also prone to cyclones during this period. The cyclone Gaja originated in the Bay of Bengal and traced its path along the coast of Tamil Nadu on November 15, 2018, in the districts of Nagapattinam, Thiruvavur, Thanjavur, Pudukkottai, Ariyalur, Perambalur and Cuddalore.

The eye of the cyclone passed Nagapattinam with a wind speed of 130 kmph. The study focuses on the villages of Kodiyakkarai, Kodiyakkadu, Agasthiyampalli, Pannal, Thennadar and Voimedu in the Vedaranyam block of Nagapattinam district.

The livelihood here depends on the economic activities related to sea-like fishing, boat construction and salt production. Kodiyakkarai and Kodiyakkadu are very low-lying areas and are located nearer to the coasts with a population of over 3000. Hence these villages are highly vulnerable to cyclones. Other villages are not completely surrounded by coasts but still experience dreadful loss.

Objectives

The main objectives of the study are:

- to analyse the damage caused by the cyclone and
- to suggest measures that must be taken to rebuild the livelihood of the people living in the affected area.

Study Area

The villages of Kodiyakkarai, Kodiyakkadu, Agasthiyampalli, Pannal, Thennadar, and Voimedu are located to the south of Vedaranyam block of Nagapattinam district in the state of Tamil Nadu. It is selected based on the population of the respective villages and its location.

Kodiyakkarai and Kodiyakkadu, approximately, have a total population of 6000. Agasthiyampalli, Pannal, Thennadar and Voimedu have a population of 2000 (approx.) in each village.

The primary occupation is fishing, manufacturing of boats and fishing nets. In Agasthiyampalli, almost

80 per cent of the population is dependent on salt pans either owning to the salt pan or working as a labour. Other villages depend on agricultural and other economic activities. Some people work commuting since they cannot find employment based on their qualification in their locality and due to the unreliability in agriculture.

Methodology

The study will use both qualitative techniques and quantitative techniques. In-depth questionnaire survey was conducted to understand the livelihood scenario in the villages. The questionnaire was made based on social, physical, economic and psychological factors to know the level of damage and the need to relieve. Participant observation and interviews were conducted to understand the impact of the cyclone.

Data Collection

The data collection was made based on the questionnaire and discussion with the people affected. Samples were collected equally from brick houses and huts. Some people were not psychologically relieved after the cyclone which made them struck while speaking.

During the cyclone and 15 days post cyclone, people were let to stay in “protection building” and government buildings like schools. The affected villages lacked water and food for almost three days due to the places being inaccessible on account of uprooted electric poles and trees. Electricity has not been regular in any of the places even after 45 days from the cyclone.

Results

From the data collected, we came to know the present condition of the people. Most of the people living in huts lost their homes due to the drastic wind speed. People in brick houses experienced severe infrastructure damages.

Presently the condition is that people of two to three households are staying together in a single brick house. Some people who did not get help are staying in just a temporary accommodation made with tramp sheets. Since the entire coast is affected, there exists a state of unemployment which prevents them from self-recovery.

In Thennadar and Voimedu, agricultural land, trees and tool were damaged. Coastal villages had huge damages to boats and fishing nets that led their livelihood under question.

Conclusion

People were not aware enough about precautionary measures, yet there was not much damage to human life since they migrated away from their houses few hours before the cyclone.

Awareness programmes and mock drills must be carried out in the villages in order to make people more prepared in such future incidents.

People are in need of housing materials and temporary employment opportunities.

There is a trend seen with the rate of literacy of a household and the precautionary measures taken by them.

Structuring Participation in Post-disaster Housing Reconstruction: A Case Study of the 2013 Uttarakhand Floods

Niti Mishra^a

ABSTRACT: Participation is generally understood as active involvement of the people in decision-making process. Post-disaster recovery planning is said to be enhanced by participation of people and is considered to be a vital component for the overall success of housing reconstruction. Literature on disaster recovery recommends the benefit of participation in disaster programmes. Present-day disaster management policies and plans designed by state and district authorities recognise the significance of people's participation. However, participation of affected people in planning and decision-making has always been concerns for post-disaster reconstruction.

In India, the state governments have a proactive role in shaping reconstruction and are responsive to the demands of the affected communities. Participation in reconstruction is not dependent on residents alone but is also influenced by the host of other organisations such as government agencies, NGOs and donor agencies that have stakes in the reconstruction programmes. In this context, the conceptualisation and structuring of participation by various agencies give insights on people's participation. In this regard, it is important to understand how state and its institutions understand and influence participation. This study examined the role of state and its apparatus in structuring participation in post Uttarkhand 2013 floods reconstruction programme. The study used qualitative research paradigm and case study approach. Uttarakhand Disaster Recovery Project (UDRP) that implemented the Owner Driven Construction of Houses (ODCH) approach was selected to study the participation in post-disaster reconstruction. The study examined the views of members from state and district administration, external agencies and villages using secondary and primary sources of data.

The key feature of the Uttarakhand Disaster Recovery Programme (UDRP) by the Government of Uttarakhand (GoU) policy on housing reconstruction with the World Bank aimed at reducing the impact of the future disaster through multi-hazard resilient reconstruction. The housing policy ensured that the process of reconstruction was based on technological solution and observed to be hazard centric. The programme claimed to be people centric through the application of owner driven reconstruction model (ODCH). The roles of affected people were restricted to consultation meetings to receive and provide information. The individual house owners were focus of the programme, and the state ensured that they are provided all the important information on the reconstruction process and financial arrangement. The limitation of ODCH was that it follows standardised process that focused on individual owners and ignored their involvement in the planning of the programme.

The ODCH approach undertaken neglected the local context to concentrate on achieving the programme goals of constructing resilient structures. The technical process of governing reconstruction based on calculative

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management of deserving candidates, assessing the damage and managing the financial mechanism was observed in the programme. However, the aforesaid hazard-centric approach neglects the vulnerability of the people. The mechanism adopted by the government was aimed at conveying culture of safety among the people. The approach followed top-down mechanism, while the policies and guidelines concentrated on building resilient structures. Consequently, the policy viewed participation only at the implementation phase of the programme. This paper advocates an approach which considers involvement of people at planning stages of post-disaster reconstruction to ensure reduction in vulnerability of the affected community.

KEYWORDS: disaster reconstruction, participation, Uttarakhand floods, owner driven construction

Introduction

Placing community at the centre of disaster management has emerged as a result of decades of experience and studies based on communities' role in the aftermath of a disaster (Darabi et al. 2013). Participation of community in disaster management is associated with the connection between development studies and disaster management. In the context of developing countries, the emergent community participation is associated with development activities and humanitarian relief (Méheux, et. al. 2010). The importance of community and individual participation in structuring the resultant development and post-disaster activities has been recognised globally. The participation of beneficiaries in planning and implementation of disaster projects contribute to the sustainability of the particular interventions and empowerment of the local population (Tozier and Baudoin 2015). In disaster reconstruction programme, participation in decision-making can lead to vulnerability reduction and ensure sustainability of the structures (Davison et al. 2007). Literature that recognises the importance of institutions in disaster recovery are recently. Studies are needed to build on the emerging literature that examines formal institutions that impact participation in post-disaster reconstruction. Participation in reconstruction is not dependent on residents alone but is based on relation between state and civil society. In Indian context, government plays significant role in disaster response and recovery. Therefore, this study attempted to understand the state and its apparatus that structure participation in post-disaster housing reconstruction.

Literature

Understanding Participation

The concept participation is understood in various ways, which has led to the mystification of the term. However according to Giles (2001), there is no particular definition of participation, but one can understand it through different ideologies that utilise it. One view is participation as "instrumental" which focus is to increase the efficiency of development programmes or as an instrument to achieve an end or induced participation is encouraged by donor or government programmes through community-based development activities or programmes (Giles, 2001; Hussain and Mishra, 2007). Puri (2004) argues that the idea of participation as an instrumental means to an end fluctuates between the state-led institutional efficiency and state-defined public interests (Puri 2004). Participation can be seen as the purpose of the activity and as "an end in itself" (Kelly 2001). The promoters of the instrumental agenda argue for participation based on three grounds: freedom, ownership and contribution. Freedom is to choose between various options as a part of the development programme. Ownership ensures quality, appropriateness and durability of the improvement where involvement will facilitate people being responsible for their maintenance. Mobilising communities through their contribution in terms of time, effort and money are used as means to increase efficiency and reduce cost (Berner 2010).

The second view by Giles (2010) focuses on participation through the "transformative agenda"

that believes advocates of participation were seen as means to achieve empowerment, equity and democratic governance (Giles 2001). The agency-based view is concerned more with the role of human agency in policy and political changes (Hussain and Mishra 2007). The organic participation is a collective action that is organised by the community or even through political action. There is importance given to empowerment of those affected by policies and political transformation along with an equal allocation of cost and benefit. Participation here becomes the goal itself (Puri 2004). These distinctions present a clear divide of the conceptualisation in variety of interpretation that participation has gathered. (Giles 2010). The government or decision makers are generally known to utilise the instrumental model that is attributed to efficiency and cost reduction (Kelly 2001).

Different types of participation has elucidate by various authors is another concept popularised in literature on participation. It was first initiated by Arnstein in 1969, in the ladder of participation. It is a simple grading process on citizen participation that is based on power and change with eight types of participation to determine the end product enlisted under three broader levels. The first two are 'Manipulation' and 'Therapy'; these decide levels of non-participation that are deliberately created by some to substitute for actual planning. The next two informing and consultation are referred to as levels of tokenism that allow the excluded to be heard and to have a voice, but there lacks the power to ensure that their views will be considered. The next level is the increase in degree of decision-making through Partnership, Delegation of Power and Citizen Control where the citizen obtains full decision-making power (Arnstein, 1969). Over the years various additions to the typology of participation have been produced. Among them, Chougill (1996) modifies Arnstein's (1986) concept for housing project of underdeveloped countries by adding new criteria and certain changes in terminologies that are adaptable to this context. Further, Davidson (2007) has adapted the 'ladder of community participation,' from Chougill (1996) and Arnstein (1986) in post-disaster housing reconstruction (Davidson 2007).

The typologies elucidate different kinds of participation that take place but do not specify who participates. The question of who is included or excluded from participation is critical (Cornwall 2008). Cohen and Norman (1980) described dimensions of participation, what kind of participation, who participates, when to participate and which are institutions participating that provide details about the nature of participation (Cohen and Norman 1980; Chambers 1986). To evaluate participatory process, it is recommended to move beyond individual participation and look at the institutional impact of participation. These questions serve as an important guide for a self-critical participatory practice which is more focused on looking at the long-term political value that participation is for the poor (Williams 2004).

Participation and Post-disaster Reconstruction

Experiences of post-disaster recovery suggest that participatory approaches improve the efficiency and overall quality of reconstruction and rehabilitation programme. Therefore, participation in disaster should ensure that the interventions translate into long-term development measures (Andharia 2002). The emphasis on working and relating with communities puts a strong onus on disaster managers and community planners to involve the public in their planning. If reconstruction is to be successful, it should incorporate participation in decision-making that will ensure the sustainability of its strategies (Hayles 2010). A good housing reconstruction strategy will take into account the social need together with long-term disaster mitigation and sustainability. Reconstruction implemented after taking into account the desires of the affected population avoids replicating previous patterns of vulnerability (Karunasena and Rameezdeen 2010). Barkat (2003) has identified the two types of methods for housing reconstruction as a) Self Model and b) Contractor Model (Barkat S 2003). The self-model or owner driven approach enables the community to build their own houses with financial and technical support from the external agencies. The homeowner has the complete power to control the inputs of the given structure. The contractor-driven approach, the designs and built the houses

done by the contractor. As a result, the materials and expertise are imported from outside the community (Barenstein 2006).

Post-disaster reconstruction is usually plagued with the chaotic situation and resource scarcity; there is a rush to complete the construction according to timelines (Davidson et al. 2007). It is comprehensive and involves multi-disciplinary contributions from a variety of stakeholders. Therefore, the scale of institutions and government involvement in reconstruction programme, is significantly high (Barkat 2003). In any reconstruction programme the physical aspect is the visible part; however, the unseen parts, the livelihood opportunities, cultural values and aspirations, are most important aspects of successful housing. This knowledge resides with the people, and ignoring their involvement can lead to increase in vulnerability and damage to the long-term physical and socio-cultural environment (Sanderson and Sharma 2008). Recognition and incorporation of the community, local leaders and authorities in recovery programmes are considered essential for its efficient planning and implementation. The government can benefit from localised decision-making processes that ensure meaningful contribution from those involved (Barnstein 2006).

While studies based on community-centric participation are valid and important, there is no denying the fact that participation is also influenced by government and its apparatus, and external agencies like international and national organisations (Barkat 2003). The participation of the affected community in reconstruction ensures accomplishment of low-cost housing projects in developing countries (Davidson et al. 2006). Therefore, government and implementing agencies need to undertake reconstruction programmes that encourage community involvement (Darabi 2013; Samaddar and Okada 2006). The reconstruction sector lags behind in the participatory process as many agencies still struggle to achieve more than consultation of affected households. As a result, the key factors for sustainable reconstruction, local knowledge and ownership are not generated (Schilderman 2010). The idea of participation is closely connected to the people-centred housing-recovery in planning, design and implementation (Maly and

Shiozaki 2007). Beneficiaries should be involved in decision-making that will help policy-makers understand their needs and preferences. Additionally, users will understand the rationales for the decisions taken. Community involvement in post-disaster reconstruction is a vital component for the overall success of housing and infrastructure redevelopment. Therefore, government and implementing agencies need to undertake reconstruction programmes that encourage community involvement (S. Samaddar and N. Okada 2006).

Concerns about Participation

Participation is often romanticised as a cure-for-all formula, such that anything portraying the term 'participatory' is considered good and empowering (Kelly 2001). Mainstreaming has depoliticised participation and made it a technical instrument. It is assumed that beneficiaries have essential information about the requirement and capabilities which would be more reliable and competent and are central to the improved effectiveness of development projects (Berner 2010). State-run agencies tend to maintain a strong hold over the policies and implement it with minimal consultation with the local population (Kelly 2001). Even though administrators feel the need to bring public in decision-making, they find it difficult to accommodate it. Citizens, on the other hand, feel cynical or apathetic towards the false efforts to stimulate participation. Many programmes are still top-down, where local people are forced to involve for bureaucratic efficiency. The standardisation of the participatory process is in direct contrast to the flexible, context-specific approaches that were meant to enhance learning (King et al. 1998). Participatory approaches that were previously seen as radical and controversial are now mainstreamed and being routinely applied by various development agencies (Berener 2010). The present practices and techniques of participation are identified as the most common barrier to participation. The most commonly used current participatory techniques like public hearing are ineffective approach. Low attendance in public gathering is considered as silent consent to status quo which is evident in the structure of public hearings.

In addition, the administrators are aware that the construction of public hearings and public meetings prohibit significant exchange and is generally one-sided (King et al. 1998).

Participation discussed as tyranny are seen as dominance of funders and agencies that are present just below the rhetoric and processes of participation (Christens and Speer 2006). This tyranny is understood as the control on decision-making maintained by the funders and agencies. The overemphasis on techniques and formulas of participatory approaches neglects dynamics and results in exclusion (Chaudhari 2013). The top-down status quo of multinational organisations are not challenged by participation. Instead its use is justified for efficiency to achieve set goals. Participatory approaches have been combined with various terms like empowerments that are expected to informally occur in parallel with participation. However, one misses the fact that participation is highly political and individualised. In practice, participation and empowerment have been reshaped to have standardised values and represent initiative, accountability and good citizenship (Christen and Speers 2006).

Technologies of Recovery

Post-1990s, culture of risk was transformed into diverse form such as a culture of prevention in which knowledge, rules, values and measures are related to preparedness in post-disasters. However, the application of these concepts are seen in the existence of an expert culture where the knowledge of risk resides only with the actors who have received formal training. Confronted with risk that is presented as real and tangible and which include assortment discourses, knowledge and practices, action is taken to save lives, mitigate loss and reduce damage. Objective here is to disseminate this culture of risk within populations considered as powerless and vulnerable. Effort is made to educate and transform attitude of people to inculcate good practices that are proposed by the experts through mechanism of risk (Revet and Langumier 2015). In governmentality view of risk, knowledge is used to hold individual accountable to a particular behaviour and thus scrutinise their conduct. In post-disaster scenario, a general shift is observed

in the temporality and materiality of disaster that is accompanied by change in the field from a relief centred to an emphasis on preparedness and built environment. Disaster management is also changing due to the available expertise and source of funding that involve actors from local to international organisations (Deville et al. 2014). Groups existing within and outside the government become important centres of power in the context of disaster cost as recovery is an expensive phenomenon and few have such savings. As the need for funds exceeds the existing availability of recovery funds, technologies are used to device strategies that govern the distribution of funds. These techniques often involve schemes based on classification which are related to the neoliberal discourse of 'deservingness, sustainability, and resilience'. This is the consequence of the neoliberal government, where the state executes various action and distributes fund based on calculations on how little the government can provide while locals are made responsible for their own recovery (Paganini 2015). The impact of this partnership of funding, practice, expertise and control is evident on transformation of disaster to manageable events which are shaped as concrete form of action for future disaster. The general belief is that the more expertise gets incorporated, the more resilience will be developed to withstand disasters (Deville et al. 2014).

Various techniques, tools, dispositifs and practices for managing disasters are used to instill good practices produced by experts where meetings and consultation in reconstruction becomes a tool for experts and governments. The aim of these dispositifs is to supply norms for disasters to make it manageable and unexceptional (Revet & Langumier 2015). Attempts are made to manage the messy realities of post-disaster scenario through processes like emergency planning. This process is more or less an instrument in form of documents, tables and checklists developed by distilling and reducing accounts of previous emergencies. The author calls these tools, 'technologies of recovery' which are human and non-human; material and informal which are designed to change or manage human behaviour. They are both social and material and are designed to reach a desired state. Emergency planners try to achieve this through conditions laid down in documents and guidelines, tools and formats. At the same time for the community

to achieve this desired state, it has to take actions that are underlined in the guidance documents. The bases of these recovery guidelines are based on lesson learnt in various post-disaster events. However, the emergency planners refer to lessons that are not based on localised set of circumstances (Easthope & Mort 2014).

Methods and Material

Uttarakhand was the locale of the study. Annually the state of Uttarakhand faces heavy losses, especially during the monsoon season, due to rain, landslide, cloudburst, flood, water logging and flash flood. Rudraprayag district was the site of study. Rudraprayag district was selected as it was the epicentre of the disaster and it is prone to various disasters. It falls under the seismic zone V and has been affected by seismic tremors in the past. Between June 15 and 17, 2013, the State of Uttarakhand faced cloudbursts and heavy to very heavy rainfall that resulted in flash flood. This unprecedented rainfall resulted in a sudden increase in water levels that resulted in flash flood that affected the Kedarnath town, Rambara, Gaurikund and others. According to official records, around 9,00,000 people were affected; 580 human lives were lost; 5200 people are reported missing and around 3320 houses were fully damaged. In the aftermath of the disaster the Government of Uttarakhand (GoU) identified 2499 disaster resilient houses to be constructed in five districts as a part of the Uttarakhand Disaster Recovery Project (UDRP). This was a joint initiative of the World Bank and the Government of Uttarakhand (GOU). The project aimed at improving the resilience of the State's infrastructure and its communities from the impacts of future disasters and climate change. The aim of this project was the building of multi-hazard resilient structure as Uttarakhand that lies in Zone IV and V of the earthquake mapping zones (World Bank 2013). The state of Uttarakhand was selected as the state was implementing the owner driven housing approach, formally called the Owner Driven Construction of Houses (ODCH) programme. In literature, the owner driven model is known to have participation of affected people in planning, designing and construction of the houses. The field visit was conducted for a period of

three months from June to mid-September 2016. In Rudraprayag district, four of the worst affected villages in terms of houses damaged in floods and adopting ODCH, namely Chaka, Chandrapuri, Batwari Sunar and Gabanigaon, were selected.

The study attempted to understand the institutionalisation of participation in context of Uttarakhand housing reconstruction. The role of institutions in shaping participation was an important area of inquiry. In Indian context, government plays significant role in disaster response and recovery. The studies on participation and disasters that explore the role of institution in disaster are rare (Maly and Shizoaki 2012; Darabi et al. 2013). Studies are needed to build on the emerging literature that examines formal institutions that impact participation in post-disaster reconstruction. The state becomes the key stakeholder in the housing reconstruction programme in the Indian context, while other stakeholders operate within the framework provided by the state. With this background, the states' perspective, its administrative systems and frameworks that structure participation were important for the study. The objective of the research was to understand the state and its apparatus that structure participation in post-disaster housing reconstruction.

The research dwells on case study approach to examine the participation in the housing reconstruction programme of the Uttarakhand Recovery programme. The study uses an embedded single case study design. In this the case study of Uttarakhand recovery is examined from various units at state, district and village levels. Each subunit addresses the nature of participation within their own frame of reference that can be related to experience, knowledge and usage of participation. This included officials in the state, district and block levels from various departments; official from World Bank and the hired NGO. In order to gain an overall understanding of participation, the study also covered informants from villages like the panchayat leaders and its members along with the beneficiary of the housing programme. Purposive sampling was used with the focus on institutions involved in reconstruction policy formulation and implementation undertaking recovery measures. The study uses maximum variation sampling in which within a single programme different

units were selected for the study. Multiple source of data including primary and secondary source that included in-depth interviews, project-related document and reconstruction guidelines was used. Officials from state-level department, World Bank, district, tehsil and block and the NGO appointed to facilitate the programme were interviewed. To conduct the interviews, a semi-structured interview guide was used to cover the processes followed in reconstruction programme. The case study notes resulting from the interviews and the field notes were transcribed and analysed using Atlas Ti software. Open coding for each individual interview, categorisation of family of codes was followed by structural analysis. The structural analyses of the categories were done by developing families of primary document. Analysis was done through comparing and correlating the narratives at each level.

Result of the Uttarakhand Floods Reconstruction Programme

The aim of the reconstruction housing policy designed by the state GoU was to reduce the impact of future disaster in the state and provide immediate reconstruction. Multiple hazard resilient reconstructions in terms of seismic and other disaster safety were the main objective of the policy (GoU 2013). At the district level, the state machinery from tehsil and block offices to the district collector and State Disaster Management Authority (SDMA), World Bank were involved in the reconstruction project, the Owner Driven Construction of Houses (ODCH). The district administration was responsible for selection process at village and preparation of beneficiary list. The teams at tehsil level were formed for assessment. Damage assessment was divided into three categories: fully, partially and severely impacted/damaged structures. The criteria for selection was set by the GoU in which houses that needed complete reconstruction (severely and fully damaged) were selected (GoU 2013). The selection of beneficiaries was pre-decided based on policy guidelines. The role of tehsil and block official was established through formats and procedures of damage assessment. Role of affected people and leader were restricted to providing information about

the extent of damage. There was emphasis on physical damage by the state and its functionaries and neglect of socio-economic vulnerability of people.

At the start of project, two options were given to the affected population: the self-made approach where the beneficiary constructed his/her own house and the cluster approach where the government was constructing for the people. People generally chose the self construction method known as ODCH, as they wanted to build their own houses. This choice of type of house to be constructed was discussed in meetings and consultations. The community choice was based on the option provided by the government which would best suit the project aim of resilient infrastructure. Choice came with norms and regulations for construction and financial processes. The graded financial payment arrangement was associated with completion of level of house construction specified in the recovery documents and guidelines and informed to the beneficiaries in meetings.

The role of the beneficiary was to construct the ODCH houses directed by guidelines from the state. The state provided the design (on resilient technology) for constructing the houses. The information about these design was provided in village-level meetings, while the community was not consulted to provide inputs on this. In such meetings and consultations beneficiaries were given information on safety features to be incorporated at each level of construction by NGO and tehsil/block officials. The NGO was hired and co-opted by the state to look at implementation and compliance. Its main function was to provide implementation support to resilient housing construction at state and district levels. Responsibility of the beneficiary was to follow the norms of the housing designs, layout and resilient features in construction, while participation in designing and layout was minimal. Penalties were put in place in terms of recovering the entire amount if the norms were not followed. The government officials considered participation in the reconstruction as the individual's role in construction. According to the officials, participation is when people decide the ODCH housing type they want to construct. The project aimed at bringing changes in practices of people. Awareness, training and manuals for the affected population were designed to ensure adoption of disaster resilient

features. The state government tried to bring in the culture of safety in the region through introducing and promoting safety features in construction practices.

Discussion

Technologies of Recovery in Uttarakhand Programme

Post-disaster recovery process utilises guidelines, documents, tables and checklists developed through a process of distilling and reducing accounts of previous emergencies. These technologies of recovery are adopted by emergency planners to achieve the desired result with the aim to change or manage human behaviour. These tools and techniques are based on lessons learnt from previous disaster. These instrument may appear neutral and applicable to multiple situations but are actually highly variable and context-dependent (Easthope and Mort, 2014). In the UDRP, specially the housing component draws reference from previous national-level disasters like the Tsunami Recovery and Bihar Floods Recovery programme. However, this programme ignored one of the many such differences like geographical variability and vulnerability between these region by neglecting the local conditions. The ODC model has been adopted in India since 2001 Gujarat earthquake. This model was also replicated in the Uttarakhand without involvement of people in the planning phase. The ODC is known for its people centric approach; however, in this programme the emphasis was on construction of multi-hazard resilient structures. Thus the guidelines, documents and format of these plannings actually obstructed the meaningful engagement of those affected by the disaster and discouraged voices of the people from start. Recognition and incorporation of the community, local leaders and authorities in recovery programmes can benefit from localised decision-making processes that ensure meaningful contribution from those involved (Barnstein 2010). In contrast the UDRP had limited role of the affected community in the reconstruction to providing information and completing construction of the houses. A hazard

centric approach was adopted that used technical solutions ignoring vulnerability and capacities of the affected people.

Categorisation of Selection

The district administration was responsible for selection process at village and preparation of list of beneficiary for housing (GOU policy). The information on damage assessment was based on three categories of physical damage collected at tehsil level. The criteria for beneficiary selection was set by the GoU for houses that need complete reconstruction (severely and fully damaged). The role of tehsil and block official was established through formats and procedures and that of affected people and leader were restricted to providing information about the extent of damage. Benzer (2010) says that to improve efficiency of project, information is taken from people as they are resilient and competent. Village leaders and people in damage assessment and beneficiary selection were restricted to providing information. Paganini (2015) in his discussion on recovery explained the linkage of neoliberal state and the process of calculability that make classifications to suit the recovery programme designed by agencies (Paganini, 2015). The affected families were identified based on criteria for the damaged house while the people were not involved in this. This categorisation was based on physical vulnerabilities focusing on the extent and per cent of damage which completely ignores the social vulnerability of the affected people. The discussion on recovery by Paganini (2015) categorisation of the damage and hence the deservability of beneficiary were based on the knowledge produced by funding agencies. The aim was not to just control the disbursement of fund; there was also an element of transferring the responsibility from the state to individual. Hence, the categories of the extent of damage for identification were used to decide who would be included and excluded, ensuring that the state was in control of the selection process. State in neoliberal era is placing categories to keep up with its strategy of making individual responsible for their own endeavour (Pangini 2015).

Consultations and Meetings

The reconstruction sector lags behind in the participatory process as many agencies still struggle to achieve more than consultation which ignores local knowledge and obstructs ownership (Schilderman 2010). Even in case of Uttarakhand, reconstruction witnessed various consultation which aimed to inform the community about the options provided by the government. After various consultative processes and meeting in the affected villages, it was seen that majority of people choose the self constructed option as they preferred to make their own house. Choice came with norms and regulation for construction and financial processes. In case of the Uttarakhand this option and flexibility were considered participatory in nature. However, this option was based on information and guidelines owned by the state. The state restricted the role of beneficiary to choose from the available options through meetings and consultations. Participatory regimes are known to benefit planners but made to appear as a wish of targeted local community. (Pangini, 2015). This type of participation can be understood as Tokenism, which is evident when the information shared belongs to external agency with an appearance of consultation and information (Davidson et. al, 20107).

The most commonly used current participatory techniques like public hearing and meetings are observed to be ineffective approach as they prohibit significant exchange and are generally one-sided (King et al. 1998). The house owners had the options to choose among the available design stated in the manuals. The government followed the consultative process to inform the people about the options. It was the decision of the government that the community followed in the ODCH approach that appears as choice. The owner driven construction model implied financial and technical guidelines by the government. There were mandatory norms set by the government to be followed during the construction. The project and government structure failed to realise that the people had the different capacities that would ultimately affect their recovery process. Promoters of instrumental participation consider freedom of choice, ownership and contribution in development programme (Berner, 2010). The beneficiary choose from the available

designs and layout given by government. The ODCH approach was considered flexible as people could choose from the available options and construct according to capacity. Contribution was seen in terms of labour and individual resources. These were indicators of participation according to the government where there is flexibility and choice to build according to requirement. But people were not a part of the decision-making but only implementation. Instead co-option described as participation by material incentive was observed in the construction of houses. Major decisions were taken with the aim to achieve goals and communities inputs were needed to achieve project goals. Taheri (2012) criticises the owner driven model in which the house owners are seen to be independent in their building efforts that affects the time duration of recovery. The approach assumes that all the affected households have equal capabilities (Taheri 2012). Similar observation were seen in ODCH that ignored the capacities and hindrance that households face. The standardised procedures and technical inputs did not take into account the capacities of the households. Some households were able to invest more resources beyond the government support while some had to wait for the financial installments to complete the reconstruction. Cooption was seen as beneficiary participated through contribution in project, using their own resource and labour. Officials saw participation in housing reconstruction as a tool to achieve the goals of reconstructing resilient house. Participation was structured to completed construction, and target was individual households. Giles (2010) described this as instrumental agenda of participation that was efficiency based.

The purpose of meeting in the village was to interact with the house owners to ensure adoption of resilient features, but it was made to appear as choice of people. The owner's role was to comply with the norms and pay penalty on non-fulfilment of clauses in form of stalled payments for construction. People choose from the options provided by government, while the officials understood it as freedom given to community. According to the officials, participation is when people decide what they want to construct. The information flow was from officials to beneficiary. The tyranny of participation (Christens and Speer 2006) explains this

dominance and control of funders and agencies on decision that are presented as process of participation which in turn maintains the top-down status quo of multinational organisations, and participation merely become a means to achieve goals. Similarly, the ODCH beneficiary were informed about model choice, guidelines of construction, financial process and technical requirement through meetings and individual interaction without having a voice in policy formulation, planning or decision-making. Though the owner driven programme is supposed to be people centric, people were only involved in implementation of the construction.

Top-Down Approach in Reconstruction

Multiple hazard resilient reconstructions in terms of seismic and other disaster safety were the main objective of the housing policy (GoU 2013). The World Bank project component on resilient infrastructure reconstruction focused on targeting the affected households (World Bank, 2013). The programmes followed still top-down approach, where local people were merely involved for bureaucratic efficiency as it focused on providing hazard-based technical solutions. This approach in reconstruction was justified by agencies for its efficiency to achieve resilient infrastructure. The incorporation of resilient features was vital component of the reconstruction programmes. The selected families were informed about these features through various meetings and consultation at village level organised by the government. The construction was guided by the instructional manual (ODCH Booklet) that was prepared at the state level and distributed in the community through the NGOs. The resilient features were based on risk calculation by the government based on the seismic and other geographical vulnerability of the region. According to Deville et al. (2014) concrete governmentality conceptualises risk as structured by the governmental institutions through use of concrete structures with the understanding that the material properties of concrete can offer solutions to problems of preparedness. By introducing standards for buildings, the state controlled the citizen's action (Deville et al., 2014). The adoption of resilient features was mandatory for all the ODCH beneficiaries. Any

default in following the process of constructing multi-hazard safe resilient structure had sanction and financial penalties. Monitoring by NGO and district official was aimed at ensuring that people understand and adopt these features in construction. NGO was assimilated in the process to ensure compliance. The field officers of the NGO played important role to stimulate reconstruction by providing information and technical support but has no role in encouraging participation, resolving issues/constraints faced during construction. For instance, the geographical location made transportation of housing material costly and difficult. Such hazard focused approach that concerns with providing technical solution and is focus on resilience understood as structural safety alienates community from reconstruction process.

Individual Ownership

Responsibility of the beneficiary was to follow the norms of the housing designs, layout and resilient features in construction, while participation in designing and layout was minimal. Penalties were put in place in terms of recovering the entire amount given by the government if the norms were not followed. The financial payment process and the penalties improved the hold of the agencies on the reconstruction and its beneficiaries. It ensured that the participant followed the norm that was linked to the financial aid. The outcome of neoliberal government, where the state executed various actions and distributed fund based on calculations. Thus the state transfers the responsibility of recovery to the individual owners. The technical process of governing was based on calculative management of deserving candidates, assessing the damage and managing the financial instalment process. The characterised aspect of the calculation was introduced with the aim of infusing house ownership among the people (Deville et al. 2014).

In modern style of governance, strategies are put in place with the aim to transform the person with technologies to manage, conduct and guide the person to a path of control that is concerned with population, factors and indicators. The individual here became a specific group that is identified as outcome of certain

indicators. There is a shift from people centred to risk centred approach. They create subjects who accept risk and danger as permanent features of life. They are seen to undermine the capacities of people and replace it with adaptive ones. Finally, it becomes a programme of social compliance and not transformation against the inequality and injustice that the marginal population experiences (Paganini 2015). Measures were taken by the government to ensure that there was awareness about the safety features especially among the affected families. Hence, construction manual (ODCH booklet) and awareness course were set. Trainings, construction manuals, formats were assigned to the NGO team members to ensure that the people not only built the house but also undertook the adoption of multi-resilient construction. The objective according to Revet and Langumier (2015) is to disseminate the culture of risk proposed within populations to educate and transform attitude of people. Preparedness requires various techniques, tools, dispositifs, and practices for managing disasters with the aim to manage people and their behaviour. The UDRP project aimed at bringing changes in practices of people. Awareness, training and manuals were introduced for the affected population, which is adoption of disaster resilient features. The state government tried to bring in the culture of safety in the region through introducing and promoting safety features in construction practices. Though this is a long-term process, current method is hazard-specific approach, where the focus is agent based and people are considered passive victims. The mechanism adopted by the government was aimed at conveying culture of safety among the people through standardised mechanism focused on technical solutions ignoring vulnerability and capacities of the affected people. Making people a part of designing the housing reconstruction practice would require taking their inputs on regional practices of construction and designing or incorporating safety features. Community were not involved in policy formulation but in fulfilling norm decided in housing policy. This includes making the selected beneficiary responsible for constructing resilient structures. The reconstruction approach was top-down, while the policies and guidelines concentrated on building resilient structures.

Conclusion

Beneficiaries should be involved in decision-making that will help policy-makers to understand their needs and preferences. Additionally, users will understand the reasons for the decisions taken. The capacity of a community to develop itself is one of the crucial factors which affect the way a settlement develops and reconstruction projects can be engendered or enhanced by participation. Government and implementing agencies need to undertake reconstruction programmes that encourage community involvement. Thus making community a part of disaster recovery policy, planning and implementation should take precedence while designing for a recovery programme. Also, reconstruction policies and schemes should take into account the local context of terrain, geography, space availability and accessibility while designing the programmes. While lesson learnt from previous emergencies are important, rather than a standardised process the state should put in efforts to make policies more local centric. This will need the engagement with people from the stage of policy formulation and involvement in planning and decision-making.

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Comprehensive Understanding of Critical Human Infrastructure Leads to Sustainable Disaster Recovery: Case Studies from Successful Flooding Resilience, Earthquake-Tsunami Disaster Emergency Response and Post-hurricane Damage Assessment

Kedar Bhuskute, Tushar Kulkarni^a and Gunjan Shetye

ABSTRACT: An organisation having a comprehensive understanding of the Critical Human Infrastructure such as power, water, oil and gas and telecommunications can provide a disaster recovery plan which is well-suited to rebuild such infrastructure in short time. In this study, we have gathered insights from real projects from this organisation that performed flood resilience, earthquake-tsunami emergency response and damage assessment post-hurricane to present a case of strong resiliency planning for better disaster management for infrastructure owners. A natural hazard can be prevented in becoming a disaster if we can issue a forewarning much ahead of impending disaster. While remote sensing assists us in decision-making, it takes enormous human-effort in data processing, prediction, forecasting and implementing emergency actions so having thorough understanding of the disaster and critical infrastructure allows developing and deploying of recovery strategies that get their operations back online quickly after a fire, natural disaster, power outage or computer system breakdown. Through business resiliency planning, one can act in advance to mitigate or completely avoid these potentially crippling business interruptions. Innovative solutions to complex problems in building resilient and sustainable infrastructure and deliberative approach provide affected communities and stakeholders with a say on the development of solutions, creating a positive legacy beyond infrastructure resiliency. This understanding in building resilient and sustainable infrastructure will help to build a world of difference.

KEYWORDS: flood resilience, flood alleviation, flood risk management strategy, earthquake- tsunami disaster emergency response, post-hurricane damage assessment

Introduction

Our world is facing new challenges every day, and we believe it's our responsibility to meet the needs of the

present generation while improving the ability of future generations to meet their own needs. This is achieved by enabling the delivery of safe and reliable energy, clean water and instant access to communications

^a Black & Veatch Corporation

through effective planning, design, procurement, construction and management of critical human infrastructure around the world.

Black & Veatch (B&V) has performed security vulnerability assessments for dozens of water and power projects at hundreds of sites. These assessments examined vulnerabilities and suggested countermeasures for the sites that included proactive solutions (including upgrades and improvements to security systems and operations, eliminating single point failures) as well as reactive solutions (including emergency response plans).

Flood Resilience

Assessing existing food risk and developing alleviation options are major activities completed by Black & Veatch consisting of hydrology, hydraulic modelling and flood mapping. Some of the case studies in Flood Resilience are presented below.

Consistent Flood Warning Thresholds Study and Modelling

Black & Veatch defined new flood warning thresholds for three levels of flood impact in 130 Community Flood Warning Areas across South East England. The project was driven by the Environment Agency's aim to adopt a more consistent approach to flood warning thresholds nationally as part of the drive to improve their flood warning service.

The Client Environment Agency is tasked with providing a Flood Warning Service to all those at risk of fluvial or coastal flooding in defined areas of the floodplain. Flood warning thresholds are used to predict the onset of flooding and provide the necessary lead time.

Following on from an initial study, Black & Veatch undertook the hydrological and hydraulic modelling studies to determine the flood warning thresholds in approximately 130 fluvial and tidal (not coastal) Community Flood Warning Areas throughout the Environment Agency's Southern Region (the river level at which a flooding event affecting properties is likely to occur).

Using digital data and historic flooding (Figure 1) information held by the Environment Agency and others, locations and assets at greatest risk of flooding were

identified. Levels at which flooding commences were related back to gauges in the water level monitoring network which are used to issue flood warnings.

The work undertaken led to a huge improvement in the consistency of flooding thresholds, as well as a better understanding of flooding mechanisms at each site. Model outputs were linked to GIS mapping.

Key tasks undertaken as part of the project included the following:

- Compilation and review of all available information relating to historical flooding, topographic survey including LiDAR, hydrometric data and the results of hydraulic modelling studies as seen in Figure 2;
- Organisation of disparate multiple datasets into a centralised geodatabase which could be used for spatial analysis and rapid tabular querying;
- Analysis of data to determine flooding mechanisms and threshold levels for the onset of flooding (Figure 3);
- Use of hydraulic models to relate water levels at flooding locations to monitoring gauges;
- Analysis of hydrometric data to assess likely rates of flood rise to provide two to three hours lead time for flood warnings;
- Preparation of reports detailing the derivation of thresholds for each flood warning area, the data used and the assumptions made.

Added Value

The detailed analysis of river flow and level records revealed many data quality issues with data held on an Environment Agency database. These were fed back to the client in a separate Hydrometric Review Report. Similarly, weaknesses and possible improvements to existing hydraulic models were highlighted in project reports.

Innovation/Sustainability

An innovative new approach was developed for this study to assist in quickly identifying flooding locations and defining threshold levels where a hydraulic model is not available and there is only limited historical flooding information. The approach (the 'GIS long section') creates a water surface profile based on river bank levels in the LiDAR topographic data. The water surface is gradually increased until properties or assets are predicted to flood.

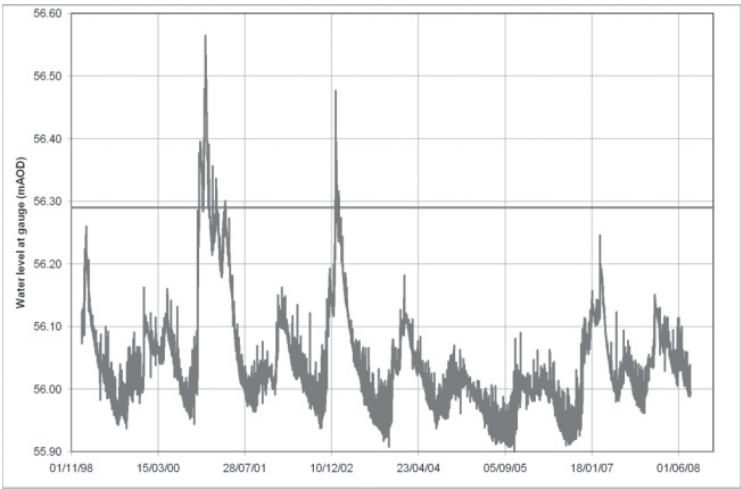


Figure 1: Historic river level records

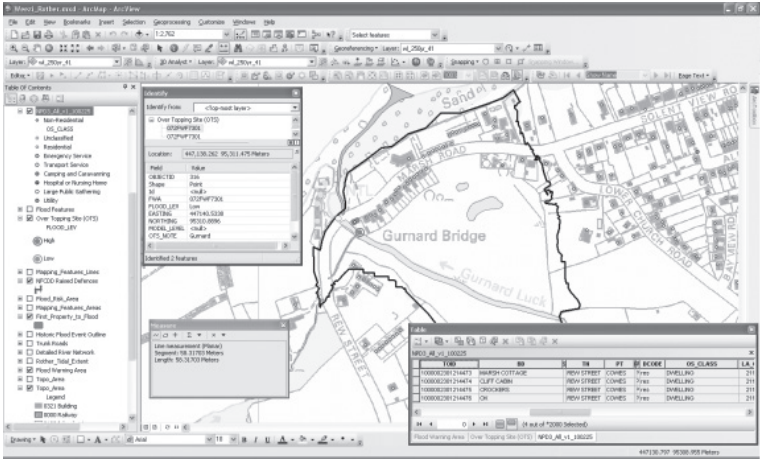


Figure 2: Integrated approach to data with GIS

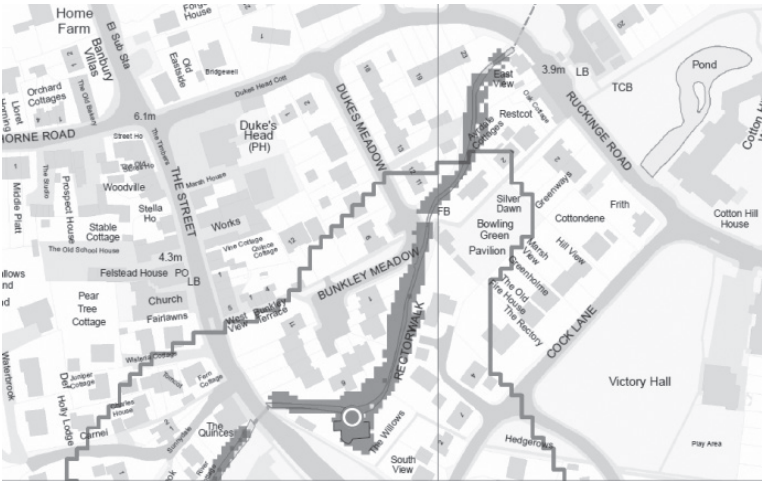


Figure 3: Example threshold derivation from flood outline

Challenges

During the project Black & Veatch had to address issues relating to models in different formats, relatively little reliable data on historic flooding and levels not related to a consistent datum.

Bedfont Court Flood Alleviation Detailed Design

The project required the removal of a temporary flood defense and the construction along a similar alignment of an earth embankment. The 560m long embankment included a sheet pile cut off. The design utilised the original material used for the temporary bund providing a low cost, sustainable solution. The scheme also included the construction of an access track crossing the embankment for maintenance vehicles and a simple flow control structure to maintain surface water drainage whilst limiting the flow in times of flood.

For the Black & Veatch Client the goal was to protect 172 residential and 9 commercial properties, to a standard of protection of 1 in 100 years, a temporary flood defence created in 2001 was removed and replaced with a 560m long permanent earth embankment along a similar alignment.

B&V carried out the Project Appraisal report to enable the Environment Agency to secure funding for the design and construction of the scheme. B&V were then responsible for the detailed design, contract preparation and site supervision of the construction works. The scheme included a sheet pile cut off and included the construction of an access track crossing the embankment for maintenance vehicles. A simple flow control structure was used to maintain surface water drainage, whilst limiting the flow in times of flood. Figure 4 shows before and after photograph of the site.

Added Value

The design utilised the original material used for the temporary bund, providing a low cost, sustainable solution. This also meant less lorry movements to and from the site.

Innovation

The client required a drought tolerant and low maintenance grass, so a special grass seed mix was designed and this was sown in a low nutrient topsoil.



Figure 4: Completed flood embankment

Deben Flood Risk Management Strategy

The Environment Agency is working in partnership with a community-based group called the Deben Estuary Partnership to develop a plan to manage the Deben Estuary in the future. Prompted by growing concern over several areas in Suffolk that are susceptible to flooding, the Environment Agency commissioned the development of a long-term strategy to manage the flood defences for three of the Suffolk Estuaries. Flood risk is a key component of the plan as with sea level rise the level of protection provided by the existing defences will decrease over time. This increase in flood risk will affect existing land uses (leisure and commercial) in the future. Given the rural nature of the estuary, continuing to maintain the existing defences is uneconomic in many areas, whilst in other parts of the estuary significant local contributions will need to be sought.

The Environment Agency's objective was to contribute to the Deben Estuary Plan by providing technical information in support of community decision-making for the future management of the estuary. Black & Veatch has been appointed to provide technical input to the development of the Plan, including hydraulic and estuary evolution modelling, economic appraisal and environmental assessment (Figure 5).

Black & Veatch's Flood Damage Economics Model (FDEM) was used as the basis of its economics assessment. Team of surveyors captured existing defense line and over 1000 property thresholds. Each measurement was interrogated against 'off-the-shelf' topographic data and combined to create the most detailed, seamless DTM of the estuary to date. The benefit was that 40 options were effectively assessed on 1700 at-risk properties and environmental receptors with high-level cost-benefit assessment for all flood cells and options to bring focus to the stage 2 detailed assessments. FDEM is an Information Management and Analytics (IMA) based tool developed by Black & Veatch which has been used successfully for a number of years for food damage calculations. It uniquely bases all the calculations at property level which means superior flexibility for assessing, visualising and understanding flood damages and identifying beneficiaries of flood defense schemes. It is used for:

- Prioritising investment decisions through high level validation of business cases using a consistent approach to flood damage.
- Visualising funding shortfall and identifying potential contributors.
- Better communication/collaboration with local authorities, utilities and other stakeholders.

Economic analysis is at the heart of the food risk management option appraisal process. It is vital that Black & Veatch consider the economics of all options at the best possible level of detail, in order to present a reliable business case to priorities Environment Agency spending. As more digital data is becoming available at a national level, it is now possible to include more detail in higher level strategic studies, as well as at a project level. To make the most of this digital data, Black & Veatch has developed the Flood Damage Economics Method (FDEM), which uses a Geographic Information System (IMA).

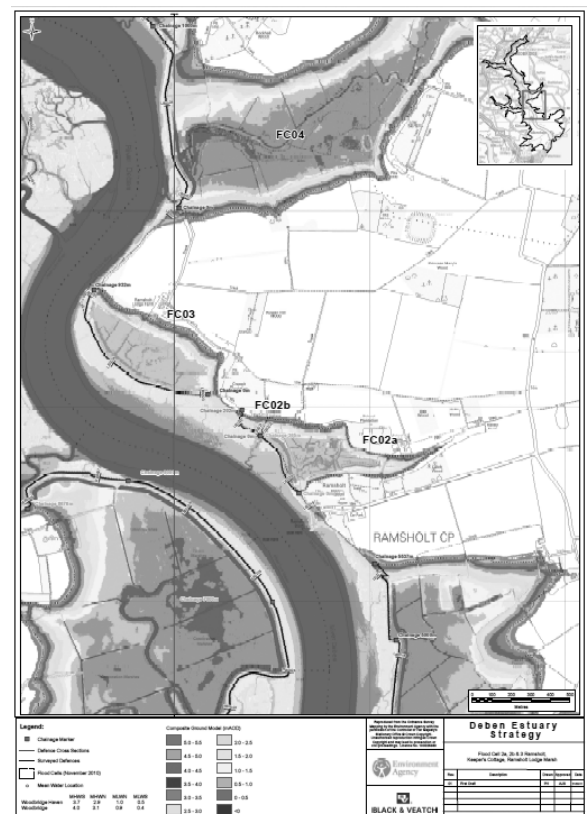
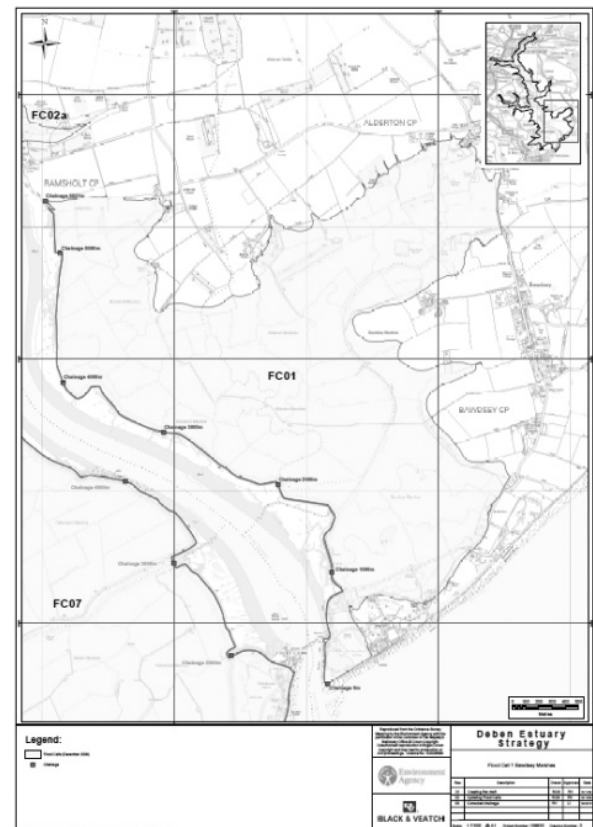


Figure 5: Consultation mapping

Added Value

Black & Veatch used the outputs from the national flood risk mapping for the economic appraisal to ensure a consistent flood risk message is conveyed to the community. In doing this Black & Veatch provided a peer review of the national flood risk mapping outputs for the Deben Estuary, which has led to several improvements to the representation of flood risk that might not otherwise have been made.

Innovation

A staged approach for project implementation was taken. This involved the development of a clear scope of the current phase of work, with clearly defined objectives.

Challenge

- Complex tidal system with offshore undersea banks impacting tidal prism.
- Large, low lying and largely uneconomic flood envelope.
- Active local action group.

Dam Break Studies

Black & Veatch has worked on various sites for Environmental Agency (EA) – UK for Dam Break

Studies. EA were looking to quantify dambreak risk and report consequences cost effectively and comprehensively with a standard approach for various project sites.

Major challenge was complex landscape with many variables affecting impact assessment. Also, joint assessment of variety of consequences like population at risk, potential loss of life and economic (business, transport and agriculture), community, environmental, cultural heritage were quality important.

As part of solution, Black and Veatch developed repeatable GIS tool analyses multiple receptor datasets, efficiently allowing sensitivity and scenario assessment. Tool also held in Integration of model outputs to create seamless, auditable consequence assessment. At the end relational geodatabase populated with receptor level consequence data to enable multi-level reporting and visualisation of results (Figure 6).

One of the significant benefit was time and cost saving for reservoir and dam assessments. Visualising the process enables better understanding of the consequences and mitigation measures. Ability to re-run assessments against updated receptor data and allowing efficient results auditing were the value addition. Tool was helpful to support due diligence and owner objection processes.

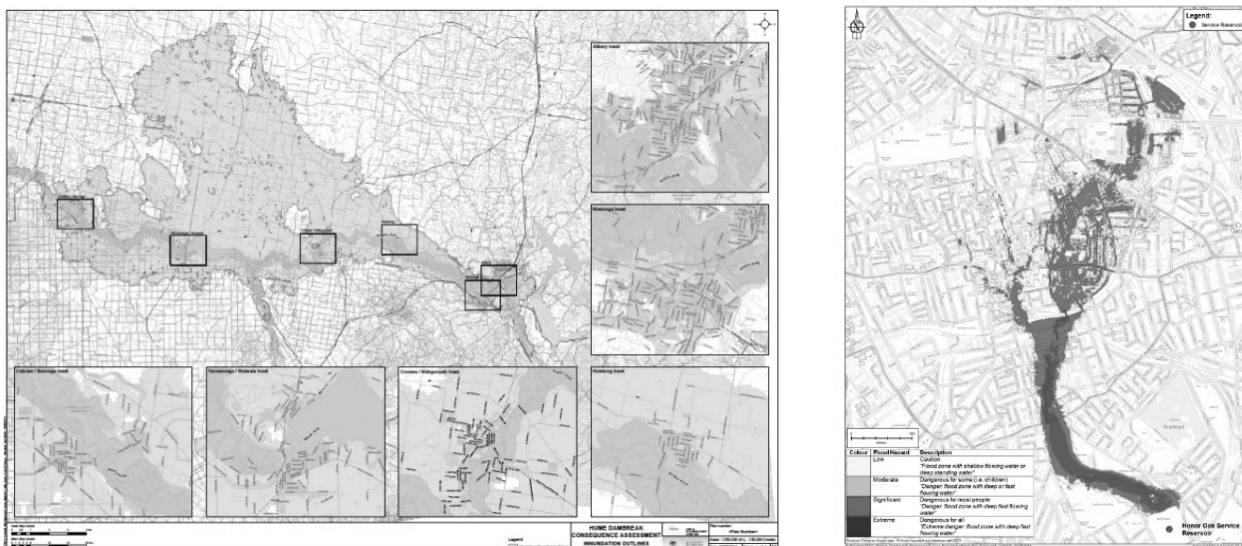


Figure 6: Consequence mapping supplied to State Emergency Services and Automated Reporting

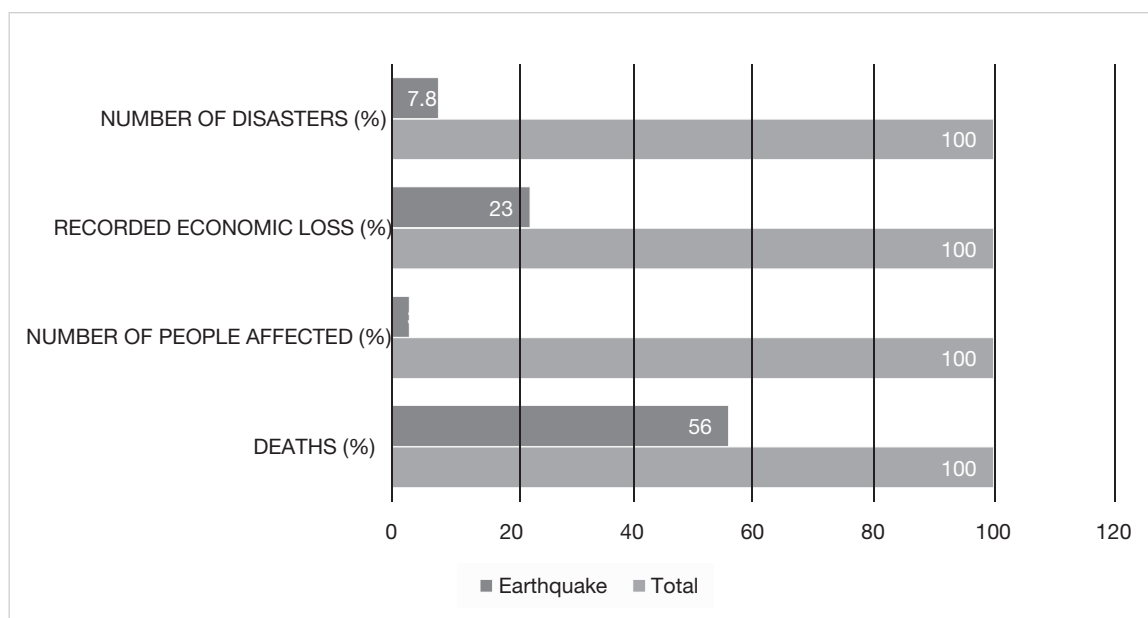


Figure 7: Contribution of earthquakes in all disasters

Earthquake-Tsunami Disaster Emergency Response

According to the UNSPIDER report¹ “Report on Economic Losses, Poverty and Disasters: 1998–2017”, earthquake accounted for 7.56 per cent (563 earthquakes) of the total number of disasters occurred due to disaster during 1998 – 2018. Figure 7 shows the percentages of number of affected people, number of deaths and number of disasters:

The above statistics highlights the necessity of having resilient infrastructure in the case of earthquake. Black & Veatch, as an organisation who wants to Build a World of Difference, understands this reality and has helped various agencies to recover from such disasters and also to build the resilient infrastructure which will reduce the impact of such disasters in future.

To highlight the type of the work Black & Veatch has done, we have shortlisted following two projects:

Aceh Shallow Marine Nearshore Project

As the result of a tremendous earthquake and tsunami that hit the area on December 26, 2004, the coastal fishing communities of Aceh needed urgent assistance

for restoration of their livelihood. As a part of the Marine Coastal and Resources Management Project (MCRMP), Black & Veatch played a key role to support recovery and rehabilitation programmes in the disaster-affected areas. The new activities under the MCRMP contribution to the programme were called Aceh Shallow Marine Nearshore Survey.

As a part of MCRMP, Black & Veatch created a comprehensive geodatabase of Aceh with updated base maps derived from high resolution (2 m) SPOT imagery integrated with a variety of spatial data compiled from numerous sources. At the completion of the preparatory work the geodatabase consisted of more than 12 GB of spatial data including satellite imagery, thematic data and base maps updated with SPOT. In the next stage, Black & Veatch mapped the shallow marine seabed habitats from Lhokseumawe to Meulaboh in water less than 100 m deep and less than 5 km offshore using the Quester System to identify potentially new fishing grounds and to assess where possible the effects of the tsunami on these benthic communities.

Flores Emergency Earthquake Reconstruction

Approximately 2 000 people were killed and widespread damage was caused on Flores Island by the earthquake

and resulting tsunami in December 1992. The affected area was inhabited by approximately one million people and is one of the most poverty stricken and least industrialised provinces of Indonesia. Due to the overall low level of precipitation on Flores, water resources management and irrigation was critically important to ensure sustainable agriculture, on which over 80 per cent of the 1.4 million population of Flores Island depends.

A reconstruction project was established using Asian Development Bank emergency funds. The total project involved repairs to roads, bridges, ports, water supply, buildings, irrigation schemes and river training works.

Black & Veatch was commissioned to carry out the water resources component. The objectives of the project were to alleviate poverty and hardship because of the earthquake by rebuilding damaged infrastructure, establishing water user associations and involving them in irrigation management and hence increase crop production and farm incomes. The tasks included:

- Data collection and studies, including hydrological and climatological data, land use and soil surveys, topographical maps and aerial photography, irrigation layouts and detailed designs, geotechnical investigations, tube well location and levee alignment;
- Preparation of a detailed inventory of earthquake damage, review the Indonesian earthquake design code in the light of the data collected;
- Review of current methods of earthquake design and development of an appropriate methodology for withstanding seismic forces;
- Review of methods of estimating reliable flows in rivers to comply with DGWRD guidelines. Matching and optimising river flows to irrigation requirements to determine the optimum area which can be reliably irrigated;
- Hydrological analysis to determine flood magnitudes, risks and water levels for scheme headworks, drainage structures and areas liable to inundation;
- Review of original designs for schemes and involve WUAs in a participatory approach to redesign.

- Preliminary earthquake and geotechnical designs and costings to establish viable redesign options for major structures.
- Scheme justification for each option, including a cost-benefit analysis; detailed design of selected options and supervision of local design consultants; production of contract documentation and construction support; operations and maintenance planning and assistance; and strengthening of project benefit monitoring and evaluation (PBME) unit through advice on resource allocation, training and assistance with design of monitoring and impact evaluation systems.

Post-hurricane Damage Assessment

Black & Veatch help clients develop and deploy recovery strategies that get their operations back online quickly after a fire, natural disaster, power outage or computer system breakdown. Through business resiliency planning, one can act in advance to mitigate or completely avoid potentially crippling business interruptions. Black & Veatch methodology is based on the US federal government's Continuity of Operations Planning (COOP) guidelines (FPC-65) and business continuity/disaster recovery industry best practices. Black & Veatch-certified professionals are trusted advisors to clients just beginning their continuity planning efforts, as well as to clients needing to reevaluate, test or strengthen existing plans. Only after performing thorough risk assessment and a business impact analysis a specific strategy for data recovery, computer forensics and the continuity of critical operations is determined.

Hurricane Katrina Recovery Activities

On August 29, 2005, the Gulf Coast of the United States and Keesler Air Force Base were hit by Hurricane Katrina. Black & Veatch assembled a team of engineers, architects and technicians to help with the reconstruction effort for Keesler Air Force Base in Biloxi, Mississippi. Black & Veatch and SEI worked under subcontract to RMS (Readiness Management Support) under AFCAP II contract in response to the hurricane.

Black & Veatch responded by providing over thirty engineers and were on site within two days of notice to respond to the disaster. Black & Veatch personnel helped the US Air Force by inspecting the various facilities and assessing the damage. On some facilities Black & Veatch personnel developed repair methods, wrote white papers and helped develop repair costs. In all over 115 different buildings were inspected in about one week. The assessment effort was performed well ahead of the projected schedule.

The deliverables were produced on or ahead of a tight schedule and included:

- A detailed cost estimate to demolish the damaged elements of buildings, facilities and grounds, including reasons for the damages,
- A detailed cost estimate to demolish and replace/repair the damaged/missing elements of buildings, facilities and grounds, including reasons for the damages,
- A detailed room-by-room (and area-by-area) list of the damaged elements to be demolished, Auto-Cad drawings identifying by floor and room (and area), the elements to be demolished,
- An area map showing the location of the buildings and facilities (and areas) where elements were to be demolished,
- A summary scope of work identifying the total quantities of the various items for demolition, and all original field notes.

B&V also prepared and implemented a site health and safety programme (HASP) for the Keesler Field Office. The HASP included an emergency action plan which included evacuation procedures in case of another hurricane. Safety briefings were held daily, emphasising pertinent OSHA and B&V health and safety requirements.

Hurricane Mitch: Re-establishment of Power to Critical Facilities

In October 1998, the Atlantic Tropical Storm named Mitch was upgraded to the hurricane level to become one of the most powerful and destructive storms to hit the Caribbean and Central American coasts. The damage to the nation's infrastructure was also widespread and resulted in the complete isolation

of several communities. Besides the damage caused to the drinking water and wastewater infrastructure, public health problems arose overnight because of the displaced persons and the lack of adequate infrastructure.

Black & Veatch is associated with local firms for the design and supervision of twenty-seven projects related to hurricane reconstruction, located in various departments of Honduras, situated all over the national territory.

Unquestionably, a key element for the success of Black & Veatch in this project has been its capability to provide an immediate response to the client and to deploy a numerous team of bilingual professionals for these multi-disciplinary projects. Black & Veatch mobilised 266-man months in a six-month period. This implied a load of approximately fifty professionals per month.

Summary

To summarise, given the significant role that environmental conditions play on asset performance and longevity, and the increasing variability of environmental conditions, it is critical to use the best information available to understand and predict such changes.

With the inseparable relationship between various resources and impacts of various disasters, most of the critical infrastructure (power plants, water supply, transport links, etc.) is by necessity located at or near the strategic areas. Yet, many of these critical assets are in locations that could be affected, or are already affected, by environmental disasters like flood and climate change. This makes steps to protect and build resiliency increasingly important.

The extreme climate events of the decade have already demonstrated that many critical infrastructure assets are vulnerable for such variability of environmental conditions. It also requires that governments, utilities and their stakeholders measure their systems' ability to bounce back.

Notes

- ¹ UNSPIDER report "Report on Economic Losses, Poverty and Disasters: 1998–2017"

Food Security Assessment at Household Level in Rudraprayag District of Uttarakhand

Priyanka Tyagi^a and Ravindra K. Pande^a

ABSTRACT: Food Security Assessment is a very important component to assess the level of preparedness of a community to deal with forthcoming disaster as communities become vulnerable to meet their alimentary needs. The study area faces natural disaster very frequently, and villages are remotely located. Hence, the villages get cut off for days and they have to deal with it. This paper presents food security assessment at household level in twenty villages of Rudraprayag district of Uttarakhand. Food security assessment has been classified in three categories: daily, weekly and monthly. With the help of this study, an account of households is done which needs immediate assistance if any disaster strikes. This is an approach through which effective disaster management is done from providing assistance to the one who needs it first.

KEYWORDS: food security, assessment, preparedness, household, natural disasters

Introduction

Food Security assessment is the need of today with the increasing frequency of disasters which are snowballing the vulnerability of communities. The situations of disasters give the precarious food situations and hinder communities to meet up the nutritional needs. Disasters lead a community to the state of food insecurity, as it threatens availability of food, access to food, utilisation of food (in terms of nutritional concern) and the most important food stability, which controls all the three mentioned dimensions of food security. Food security assessment is key for enhancing the preparedness of community and increasing their resilience to cope up with disasters.

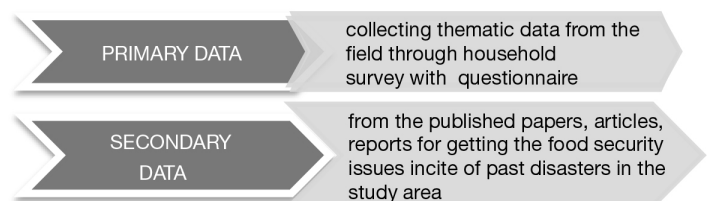
This study has been conducted to assess and make account of households which need immediate assistance if a disaster occurs in the study area.

Objectives

- Assessing the duration of stockpiling at household level.
- Identifying the household which needs immediate assistance.
- Providing the required calories for survival ration.

Methodology

- Two sources of data are used:



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- **Purposive sampling** method was used for site selection and stratification sampling for conducting interviews.
- **Data presentation:**
 - General information about responders are presented by using MS word and MS excel (MS Office).
 - Generation of map through Arc GIS-10.1 version.

Study Site

The communities of Rudraprayag district are dealing with disasters since history due to its geo-physical location, geological structures and climatic diversity. The whole district is sensitive for the seismic activities,

from June to September highly prone to landslides, cloud burst in high lands, steep valley and mountain slopes, hailstorm during April and October, Avalanches at Kedarnath, Madhyamaheshwar, Tungnath during January to April, Drought and floods due to irregular patterns of rain and forest fire near pine tree forest during summers. Lake on the peaks poses the threat of Glacial Lake Outburst Flow (GLOF).

The evidence of food insecurity in the study area has been traced from the papers and reports conducted to assess the food security of community at village level after 2013 flash flood disaster.

The study consists of 200 households from the most affected villages of the Ukhimath and Agstyamuni block during 2013 flash flood.

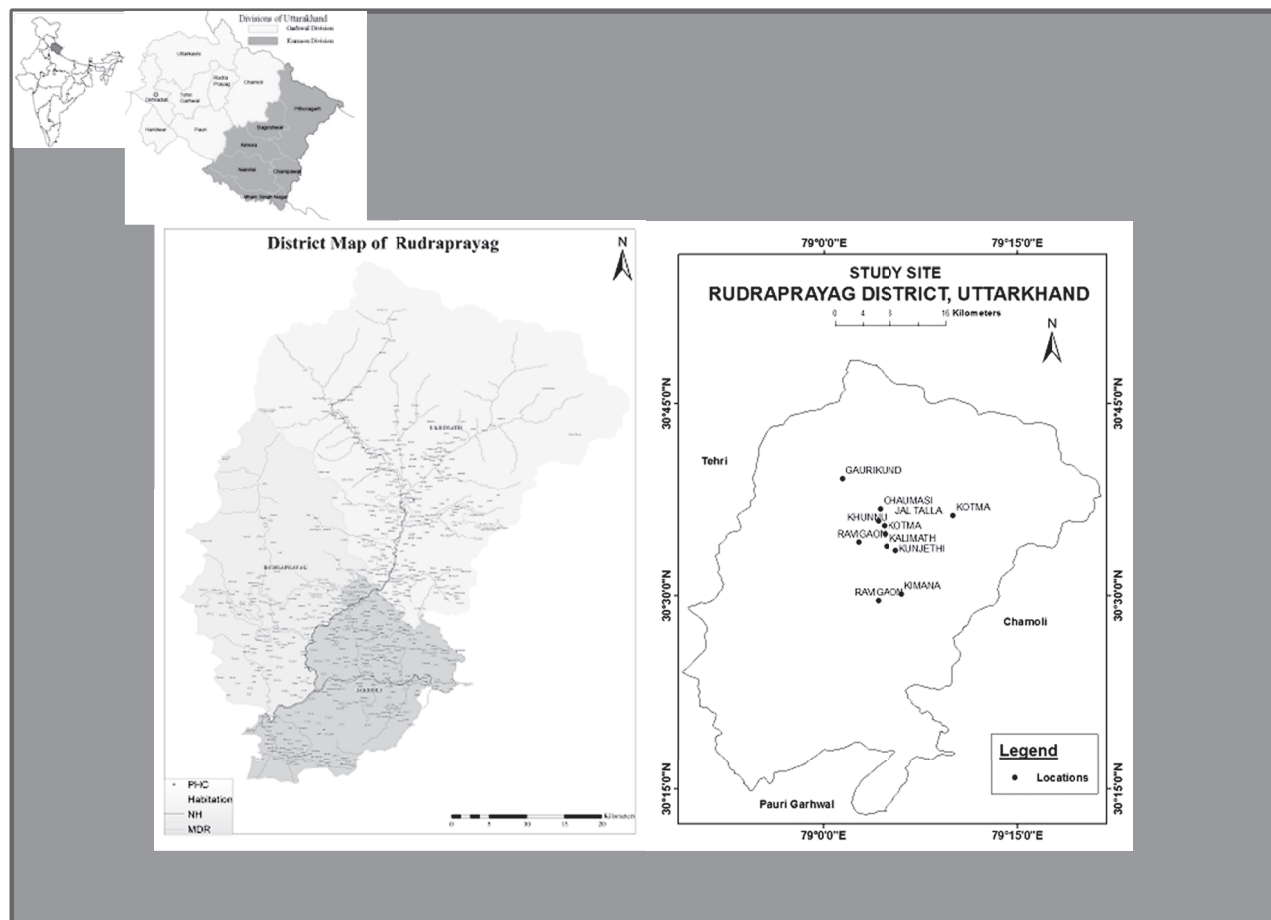


Figure 1: Study site.

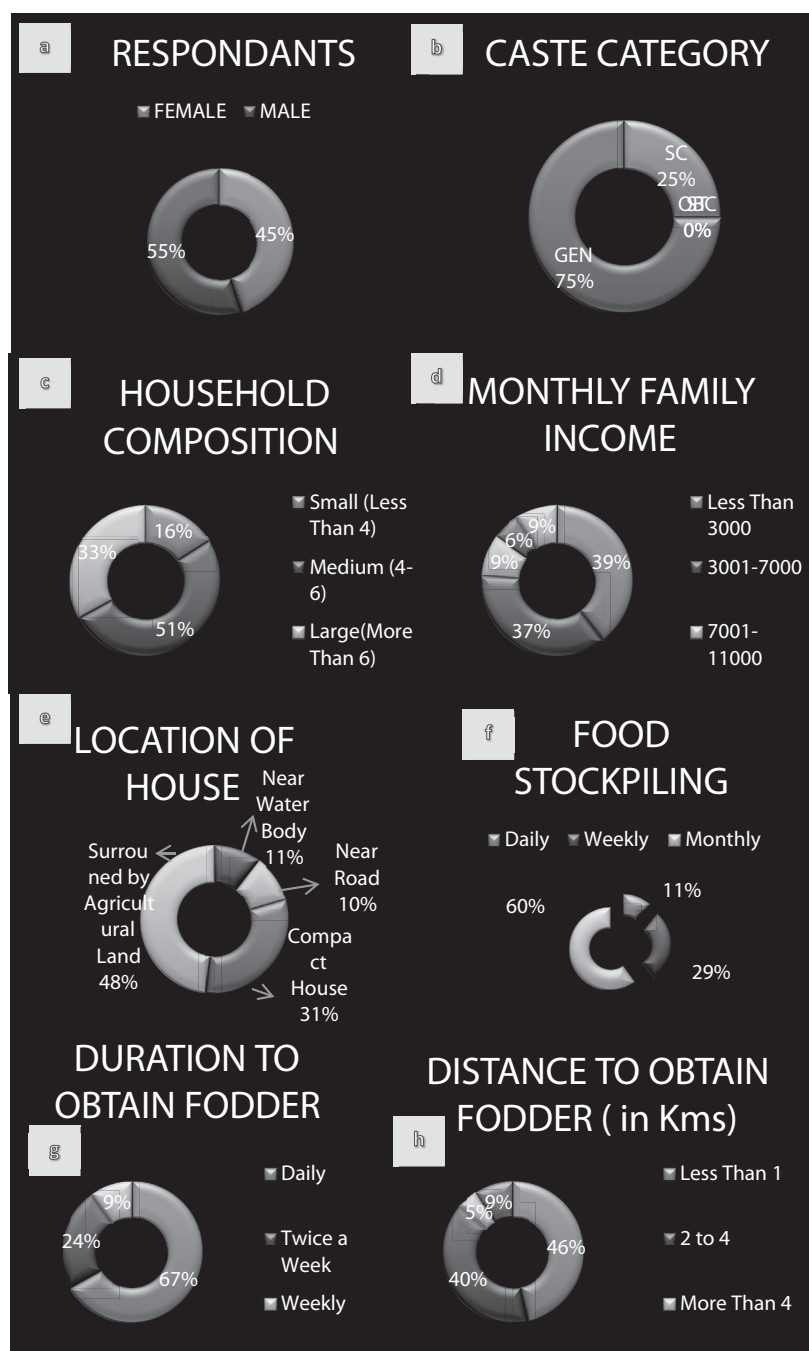


Figure 2: (a) Profile of households respondents; (b) Caste category; (c) Household composition; (d) Monthly income; (e). Location of the house; (f) Food stockpiling; (g) Duration to obtain fodder; (h) Distance to obtain fodder

Results and Discussion

Two hundred households were involved in the study. Socio-demographic elements were asked on the basis of the need of study, that is, caste category,

size of family, household income, location of house, fodder (duration and distance for obtaining) and food stockpiling. It is necessary to study the sources through which communities access their food, the composition of households and availability of food stockpiles.

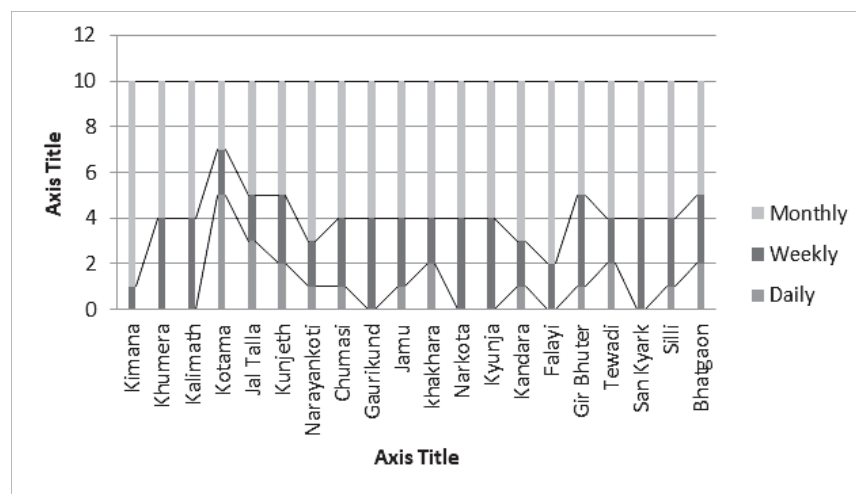


Figure 3: Village-Wise food stockpiles

Assessment of food in the household depends on tourism (providing transports and lodging services to pilgrims); animal husbandry; agriculture which is very subsistence in remote villages selected for study; and daily wages. Tourism is seasonal from May to October which was worst affected the income and livelihood sources of village communities. On the basis of analysis it is observed that there are 39 per cent of households (fig- 2.d) that earn less than 3000 INR per months. With this small amount it is very difficult to meet the nutritional needs on day-to-day basis, but if a disaster occurs and they lose the mode of earning or producing food, then the situation becomes very crucial and communities are forced to go through the situation of food insecurity.

According to the Uttarakhand Floods 2013: Joint Food Security and Livelihood Assessment Report, households belonging to the scheduled castes (SCs) and Muslims were not able to get two times meal a day during that time and even they did not get proper compensation for their loss.

Households that have big composition plus low income linger for external assistance when a disaster occurs. There is need to mark these families and provide assistance if disaster strikes to prevent the situation of food insecurity.

On the basis of survey, there are 11 per cent of households (Fig-2.f) that maintain food stocks on the daily basis; hence, their vulnerability stretch period for food security is of 11 months 29 days. 29 per cent households having weekly food stockpiling have the

vulnerability stretch period for 11 months 23 days and 60 per cent households having monthly food stockpiles have 11 months of vulnerability stretch period. If there occurs no disturbances for their sources of income, then they will get utilisation of food and stability, but if there will be any disaster through which their source of access to food get hindered then there will be the scenario of food insecurity. During disaster households that stock their food on daily and weekly basis needs external assistance immediately, and the households that stock their food on monthly basis would need assistance later.

In Kotama village households which come under SC caste group are the one who stocks food on the daily basis and comes under the income category of below 3000 INR per month followed by Jaltalla village. The remaining villages, that is, Kunjeth, Narayankoti, Chaumasi, Jamu, Khakhara, Kandara, Gir Bhuter, Tewadi, Silli and Bhatgaon, are under income category of below 3000 INR per month. Households pose the socio-economic vulnerability in term of food security in the study area (fig-3).

Food security for animals depends on the fodder availability. During disasters people become very afraid that they do not step out of homes for day. In those conditions animals do not get proper food and faces the situation of food insecurity. In the study, there are 67 per cent households that obtain the fodder daily, and if disaster strikes, they are unable to provide fodder to their cattle. There is no provision of fodder stockpiling in households that have large number of animals during rainy season, and during summers

people stocks fodder for winters. If a disaster occurs during rainy and summer season, then the cattle will be vulnerable to fodder in security. It is very important to ensure food security of cattle as they are an important mean of access to food for the village households.

According to analysis of Uttarakhand Floods 2013: Joint Food Security and Livelihood Assessment Report, households had reported decline in daily food consumption which impacted their nutritional intakes. Disaster Mitigation and Management Centre, Dehradun, has provided the survival ration list with calories required in daily food consumption per person.

Table 1: Survival Ration

Food Item	Quantity (in grams)
Grain	250
Pulses	50
Milk Powder	15
Fat	15
Sugar	15

Source: DMMC, Dehradun.

Survival Ration (Table 1) must be in the relief kits in the prescribed quantity by Disaster Mitigation and Management Centre (DMMC), Dehradun. Assessment of food habits of community should be done before deciding the grain, either wheat or rice, as in study area

communities prefer rice to wheat in day-to-day life. Same in the case of selection of pulses for survival ration. There are many examples when communities get relief kits from external assistance, but they are not as per their food habits. Thus, the attempt of providing relief creates chaos, and communities do not eat that food and their nutritional level gets affected. The quantity of food items in survival kits should increase gradually, grain 300 grams, pulses 60 grams, fat 20 grams and sugar 20 grams based on the phases of response.

On the basis of joint report of UNHCR, UNICEF, WFP and WHO, 2100 kcal/person/day is required initially. There are factors which influence the calories/person/day upward or downward. Temperature of a place: if the temperature is below 20°C, then there is need to readjust the quantity of food with increase in 100 calories for every 5°C below 20°C. Economic status of population: community which are poor and unable to store sufficient food to deal with the situation that causes malnutrition needs ration which has 100 to 200 calories/person/day. Demographic distribution includes age-wise data of households as different age groups require different quantity of calories. For example, as per the DMMC guidelines 0–15 age groups require 1500 kcal/person/day, 15–45 age group require 2300 kcal/person/day and 45+ people require 1800 kcal/person/day. Activity level, depending upon the activities done by community, they require calories on that basis.

Table 2: Seasonal Calorie Chart

Month	Temperature	Calories/Person/Day	
		During Maximum Temperature	During Minimum Temperature
January	8° C (maximum) to 0° C (minimum)	2340	2500
February	18° C (maximum) to 2° C (minimum)	2120	2460
March	25° C (maximum) to 10° C (minimum)	2100	2300
April	32° C (maximum) to 20° C (minimum)	2100	2100
May	35° C (maximum) to 25° C (minimum)	2100	2100
June	40° C (maximum) to 26° C (minimum)	2100	2100
July	36° C (maximum) to 27° C (minimum)	2100	2100
August	37° C (maximum) to 26° C (minimum)	2100	2100
September	36° C (maximum) to 22° C (minimum)	2100	2100
October	26° C (maximum) to 16° C (minimum)	2100	2180
November	16° C (maximum) to 13° C (minimum)	2180	2240
December	10° C (maximum) to 0° C (minimum)	2300	2500

*Note: temperature data is taken from source: <http://weather.ournet.in> and calorie assessment is done on the basis of formula provided by joint report of UNHCR, UNICEF, WFP and WHO.

Calorie/person/day is calculated to enhance the quality of survival ration if a disaster strikes in a particular month and then the survival ration should include food quantity which provides the calories/person/day mentioned in the Table 2. Initial calorie has been kept stagnant in the above table in the months of high temperatures as it is taken as minimum required calorie. It will prevent the situations of food insecurity and malnutrition in communities. Through this approach effective food assistance will be given which will prevent the development of other disasters which are malnutrition and food insecurity among the community.

Conclusion and Recommendation

With the threat of almost every hazard except cyclone of India, the district Rudraprayag faces disaster almost every year on high to low scale. From the lesson learned through assessments and published reports of 2013 Flash Flood disaster, it is seen that access to food, utilisation of food and availability and stability of food was impacted at households level which represents the need of household food security assessment and accounting. If there will be any scenario as 2013 or

any disaster strikes then the target group needs the immediate external assistance. At the time of disaster, it is very crucial to ensure the adequate amount of basic ration for the community in need. If there will be quick provision of supplying the adequate ration to the needy, it will not only save life but make the provision of disaster management institutions meaningful and purposeful.

For effective food security assessment, there is need of joint food assessment with Vulnerability Analysis and Mapping (VAM), Households Food Economy assessment and Household Stockpile Assessment. Combining all these approach together will help in ensuring the food security of community during the situation of emergency. It will also help in providing the immediate and better response to deal with the disaster.

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