

**Floods and Poverty: A Study of Resilience Building
Measures in North-East Bihar**

*Dissertation submitted to Jawaharlal Nehru University in partial
fulfilment of the requirements for the award of the Degree of*

MASTER OF PHILOSOPHY

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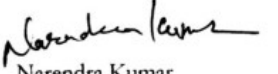
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DECLARATION

I declare that this dissertation titled **“Floods and Poverty: A Study of Resilience Building Measures in North-East Bihar”** submitted by me in partial fulfillment of the requirement for the award of Master of Philosophy of Jawaharlal Nehru University is an original piece of work. The dissertation has not been submitted for any other degree of this or any other university.


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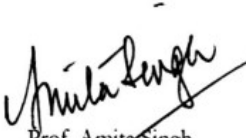
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TABLE OF CONTENTS

Chapter 1	1
Introduction	1
1.1 A Brief profile of Bihar.....	2
1.1.1 Hazard profile of Bihar	3
1.2 Objectives of the research.....	5
1.3 Research questions.....	6
1.4 Hypothesis	6
1.5 Chapter Plan.....	6
Chapter 2	8
Research Methodology and Literature Review	8
2.1 Research Methodology	8
2.2 Location of Survey.....	10
2.2.1 Methodology of Survey	12
2.3 Timeline of the Study.....	13
2.4 Literature Review.....	14
2.4.1 Housing.....	15
2.4.2 Food Stock and Safe Drinking Water	16
2.4.3 Agriculture	17
2.4.4 Official Neglect and Corruption	18
2.5 National and International Efforts for Disaster Risk Reduction	18
Chapter 3	20
Institutional Study of Flood Management	20
3.1 Disaster and Development	21
3.1.1 Disasters: Natural or Man Made	24
3.2 Disaster: From Techno-centric Approach to Community Based Approach	27
3.3 Legal Framework for the Study of Disasters	29
3.3.1 International framework for disaster management and its development	29
3.3.2 From Hyogo to Sendai	32
3.3.4 Development of Disaster Law in India	33
3.3.4 Institutional Framework of Disaster Management in India	35
3.4 Flood Management in India: A Hazard Based Approach	37
3.5 Conclusion	39
Chapter 4	41
Floods in Kosi Basin and Bihar Government’s Flood Control Strategy	41
4.1 Introduction.....	41

4.2 Bihar and its vulnerability to floods.....	42
4.2.1 Bihar and Floods.....	43
4.3 Kosi: A Never Ending Challenge	47
4.3.1 2008 Kosi Breach.....	48
4.3.2 Damage due to Kosi 2008 flood	48
4.4 Flood Affected Districts of North-East Bihar	50
4.5 Bihar’s Mitigation Plan for Floods	53
4.5.1 Flood control strategy to tame Kosi.....	55
4.5.2 Kosi embankments: a necessary evil?.....	56
4.5.3 An evaluation of Flood Control Measures	57
4.6 Bihar State Disaster Management Authority (BSDMA)	59
4.6.1 BSDMP and other institutions to deal with disaster in Bihar	60
4.7 Media Coverage of Floods in Bihar: The Reality and Visibility	61
4.8 Conclusion	62
Chapter 5	63
Field Survey in Supaul and Madhepura.....	63
5.1 Introduction.....	63
5.2 A Brief Profile of Supaul District	63
5.2.1 Hazard profile of Supaul district.....	65
5.3 A Brief Profile of Madhepura District	67
5.3.1 Hazard profile of Madhepura district	68
Impact of flood and damage in Madhepura:	69
5.4 Findings of the Survey	70
5.4.1 <i>The Reason of Flooding</i>	70
5.4.2 <i>Drinking water facility</i>	71
5.4.3 <i>Health care and sanitation</i>	72
5.4.4 <i>Shelter Home for People and Animals</i>	73
5.4.5 <i>Construction of Food-Bank for people and Fodder-Bank for Animals</i>	73
5.4.6 <i>Early warning System (EWS)</i>	74
5.4.7 <i>Training and awareness programmes</i>	75
5.4.8 <i>Boats</i>	76
5.4.9 <i>Agriculture and livelihood</i>	77
5.4.10 <i>Other Findings</i>	78
5.6 Conclusion	79
Chapter 6	82
Conclusion: Summary and Recommendations	82

6.1 Summary	82
6.2 Observations	84
6.3 Recommendations.....	85
Bibliography	88
Annexure.....	98

List of Abbreviations

BDO	Block development Officer
BKFRP	Bihar Kosi Flood Recovery Project
BSDMA	Bihar State Disaster Management Act
BSDMP	Bihar State Disaster Management Plan
CAG	Comptroller and Auditor General
CBDM	Community Based Disaster Management
CWC	Central Water Commission
DDMA	District Disaster Management Authority
DDMP	District Disaster Management Plan
DMA	Disaster Management Act
EWS	Early Warning System
FCI	Food Corporation of India
FMIS	Flood Information Management System
GFCC	Ganga Flood Control Commission
HFA	Hyogo Framework of Action
ICIMOD	International Centre for Integrated Mountain Development
NDMA	National Disaster Management Authority
NDRF	National Disaster Response Force
NIDM	National Institute of Disaster Management
SDMA	State Disaster Management Act
SDRF	State Disaster Response Force
SFDRR	Sendai Framework for Disaster Risk Reduction
UNISDR	United Nations Office for Disaster Risk Reduction

Chapter 1

Introduction

Floods and Poverty are intricately interwoven. Can floods be prevented or can poverty be reduced without addressing floods in regions which are trapped in abject poverty due to consistent washing away of their resources in recurrent floods. There are many similar regions around the world which have sunk deep into abject poverty since they have also failed to take action against floods or protected their life and property against devastating floods through better preparedness. A study by Amrita Dasgupta (2007) in Bangladesh demonstrates that flood-prone districts tend to have consistently greater headcount ratio of poverty. Geoffrey Sachs (2001) also argues about the co-relation between geography and poverty traps, particularly where the conditions like epidemic or flooding is recurrent.

A World Bank Study report, *Unbreakable: Building the Resilience of the Poor in the Face of Natural Disasters*, (Marrakesh, November 14, 2016) warns that the combined human and economic impacts of floods and other disasters on poverty are now far more devastating than previously understood. The report, which is based on the study of 89 countries, estimates that if all natural disasters could be prevented the number of people living in extreme poverty (those living on less than \$1.90 a day) would reduce by 26 million.¹

The Study has used new methods of assessing ‘Damage & Losses’ in relating it to its percolating effect on generations which live after the floods and other disasters. The North-Eastern states, Sundarbans’s to the Myanmar’s floods are a regular feature. The study on the 2008 Cyclone Nargis related floods highlights that it forced up to half of the country’s poor farmers to sell off assets including land, to relieve the debt burden following the cyclone. Economic and social repercussions of Nargis will be felt for generations. The Report found that the resilience building efforts such as investments into early warning systems, improved access to personal banking, insurance policies, and social protection systems (like cash transfers and public works programs) that

¹Hallegatte, Stephane, Adrien Vogt-Schilb, Mook Bangalore, and Julie Rozenberg. *Unbreakable: building the resilience of the poor in the face of natural disasters*. World Bank Publications, 2016, 6.

could help people better respond to and recover from shocks prevented and mitigated poverty. The Study also found that ‘these measures combined would help countries and communities save \$100 billion a year and reduce the overall impact of disasters on well-being by 20 percent’.²

The state of Bihar has seen massive floods during its course of history. Of the total geographical area of 94,160 sq km around 68, 000 sq km of the area is flood prone. A brief profile of the state has been given below.

1.1 A Brief profile of Bihar

India is one of the worst flood-affected countries of the world which has to suffer the loss of about one-fifth of the global death globally.³ It is the third most populous state of the country which is ravaged by floods each year. The human development indicators of the state are very low compared to other parts of the country. More than 70% of the geographical area of the state is flood prone. The floods cause a lot of misery in the lives of people as they wash away their important belongings, cattle, and other means of livelihood in a continuous pattern. Hence the role of disaster management in the state becomes significant to address the impact of floods in the state.

It is a land locked state in the eastern part of country and shares the international boundary with Nepal. The state came into existence during colonial period in 1936 when the Orissa was made a separate province. Earlier from 1912 the combined unit had been working as an administrative unit after carving out from Bengal. It consists of 38 districts which are grouped into nine Divisions⁴ and further sub-divided into 101 Sub-Divisions.

The history of the state has been very glorious. This is the birthplace of religions like Buddhism and Jainism. Many powerful kingdoms had their capital in the state like Mauryan, Mithila, Anga, Gupta etc. During the ancient period the state was very powerful and prosperous which has been mentioned by many foreign travelers like Hiuen-Tsang and Fa-Hien. But after the seat of power moving towards the western

² Ibid. p 6, 13.

³ Flood Hazard Atlas for Bihar- A geospacial approach. Available at: <https://www.isro.gov.in/> (accessed: 15.05.2018)

⁴ Division, locally known as *Pramandal* is the group of districts clubbed together for administrative purpose. It is administered by a Divisional Commissioner who is a senior ranking officer of Indian Administration Service (IAS).

part of country, the state saw gradual decline of its dominant political and economic status. The backward status of the state in country is now attributed as the result of deep historical legacy that started during colonial rule and has spanned the entire post-independence period. After bifurcation of the state the mineral rich and industrial based places went to the newly created state of Jharkhand.

The state lies in rich alluvial plain of Ganga basin, which is one of the most fertile regions of the world. The agro-climatic condition of the state is suitable for extensive production of cereals, pulses, vegetables, horticulture etc. the state is replete with rich farmlands and lush orchards. The major crops of the state are paddy, wheat, lentils, jute, and sugarcane. Now people also grow maize in large numbers in northern parts of the state. Major fruits grown in the state are banana, mangoes, litchis, mangoes, and jackfruit. The state comes under three largest producers of fruits and vegetables in the country. The state is also rich in water resources, both the surface water resource and ground water resource. But the frequency and spread of weather events like heat wave, cold wave, hailstorms, and floods and droughts have made state a vulnerable place for different disasters.

1.1.1 Hazard profile of Bihar

There are multiple contributing factors which makes the state of Bihar as the “House of Hazards”⁵. It is prone to multiple natural hazards including earthquake, flood, cyclonic storm, hailstorm, lightning, heat wave, cold wave etc. These hazards pose variable challenges according to the vulnerability of the area lying in 38 districts. 28 out of 38 districts of the state is flood prone, with 15 of them being severely flood prone.

The whole state is vulnerable to earthquake, and 8 out of 38 districts fall within Seismic Zone V. the state has experienced major earthquakes in 1934, 1988 and 2015. The tremor of 2015 had taken lives of 59 people, mainly from rural parts of northern-Bihar. Cyclonic storms are also becoming common in the northeastern part of the state. In April 2015 it killed more than 50 people and caused heavy destruction of infrastructure and crops. The state also witnesses many deaths due numerous fire incidents, hailstorms, and cold and heat waves. Lightning has lately emerged as a

⁵ Bihar State Disaster Management Plan (BSDMP), p xxiv.
Available at: <http://bsdma.org/images/global/SDMP.pdf> (accessed: 16.07.2018)

very threatening hazard for the state, as many lives are being lost each year and state has to issue many advisories to remain safe during it. Between 2010 and 2015, 948 lives were lost due to lightning.⁶ Disaster's impact gets multiplied by the existing low Human Development Indicators (HDI) of Bihar (0.536 compared to overall 0.6087 HDI of national average in 2015).

But the flood and drought remain the main challenge for the state disaster management. There are eight important river basins of Bihar: Gandak, BurhiGandak, Bagmati, Adhwara group of rivers, KamlaBalan, Kosi, Mahananda, and Ganga Stem in Bihar. The rivers of all these basins remain almost full to their capacity during monsoon period. The state consists of one of the worst flood affected regions of the country. 73 percent of the area of state is flood prone. Those areas which were earlier considered as safe from floods have now started witnessing occasional floods particularly in areas which lie in southern Bihar. The state is witnessing now unique paradox as in the same year some area of the state is facing flood and other is facing drought. The year 2013 witnessed such situation when 20 districts were hit by floods and 33 were facing drought. Sometimes even within the same district some part is facing flood and the other is reeling under drought. But among all disasters facing the state, floods are the most distinguished as it has caused massive destruction of life and property. According to vulnerability of the population, the floods affect those parts of the state which are poorer and have less coping capacity in terms of recovery. In north Bihar those districts that are severely flood prone are also the same districts whose performance in human development indicators is low. This vulnerability makes it more important for the policy makers to integrate disaster management activities into development planning and address the poverty trap of people.

Following are the major disasters faced by the state in the last ten years (source BSDMA):

Year	Disaster	No of blocks affected
2007	Floods	24 districts affected by the floods
2008	Floods	Breach in Kosi Afflux Bund, 9 districts

⁶ Roadmap for Disaster Risk Reduction 2015-2013, Government of Bihar p 21. Available at: http://www.disastermgmt.bih.nic.in/Circulars/Draft_Bihar_DRR%20Roadmap.pdf (accessed: 16.07.2018)

		affected and 5.3 million people affected
2009	Drought	26 districts were declared drought hit
2010	Drought	All 38 districts declared drought hit
2011	Floods	7 districts affected
2012	Drought	13 districts affected
2013	Flood and Drought	20 districts affected by floods and 33 districts affected by drought (some districts were facing both floods and drought)
2014	Drought	All 38 districts of the state
2015	Drought and Earthquake	All the districts
2016	Floods	31 district and 8.8 million people
2017	Floods (Flash)	21 district and 17.16 million people

The above table demonstrates the spread and frequency of floods in the state. The state has witnessed floods almost each year affecting a large number of people each year. The flood hazard and wide spread poverty in the state make Bihar one of the most vulnerable state of the country.

1.2 Objectives of the research

The study aims to achieve the following objectives:

1. It will try to investigate the vulnerability of people to floods and the kind of economic, social, emotional and livelihood losses and damages which these people undergo every time they encounter floods.
2. It will try to look at how development has been affected by floods.
3. It will look at the role of institutional arrangements both public, private and community based in the district, particularly the role of Disaster Management Authority, urban and rural authorities, Water Resource Department of Government of Bihar which is primarily responsible for the management of Kosi Project.
4. The study will also try to find out the link between resilience building against floods and development of local people. and,

5. Try to investigate if it is the lack of efficiency, integrity and accountability of governance which is the real cause of poverty or actually the recurrence of floods is used to cover the need for the above governance deficits.

Keeping the above objectives in mind the research attempts to address the following questions:

1.3 Research questions

1. What is the quantum of losses and damages due to floods in the flood affected districts in north-east Bihar?
2. What are the major sources of livelihood in flood prone districts of Madhepura and Supaul?
3. How would one connect resilient governance against floods to the mitigation of poverty?
4. Explore the key causes of poverty in the vulnerable zones?
5. What is the role of public institutions, disaster management offices and civil society in the flood management at river Kosi?
6. Is the institutional structure of Disaster Management in Bihar taking community resilience responsibility on a priority?

1.4 Hypothesis

Floods and poverty are intricately connected but it is not always this connection which throws people into abject poverty. Lack of governance which builds resilient policies against floods requires a serious commitment to integrity, accountability and transparency and it is the deficit of these characteristics which causes poverty rather than floods alone.

1.5 Chapter Plan

The study has been divided into five chapters which try to look into the flood management strategy of Bihar government and the working of district level governance. Following is the brief description about chapters.

First chapter, which is Introduction of the study, has tried to outline the huge economic impact of floods on poverty globally, and how this problem is a big challenge for disaster management in the affected regions.. The chapter sets the

broader plan through which the study will proceed, like the objective of the study and the research questions that it will address.

The second chapter gives the details of research methodology and literature review.

Third chapter deals with the institutional study of flood management at national and international level. It traces the historical development of looking at meaning of disaster from different perspectives. Then it looks the theoretical aspect of relationship between disaster and development by locating the causation of disaster in the realm of man-made activities. Next it shows how the disaster management paradigm has shifted from techno-centric approach to community based approach. Then, by describing the international and national efforts at legal and institutional levels, it shows how these efforts deal with flood disaster.

Fourth chapter demonstrates the vulnerability of the state of Bihar to floods. It shows the loss and damage caused by floods in the state and also northeastern part of the state which are frequently ravaged by floods and the extent of poverty prevalent there. Then it enquires into the working of state disaster management apparatus and evaluates the flood management strategy of the state.

Fifth chapter starts with looking at the vulnerability of Madhepura and Supaul districts to flood disaster, where the survey has been conducted to study the resilience building measures. It then gives the detailed findings of the survey.

Sixth chapter gives the summary of the study, and conclusion and recommendation for effectively enhancing the capacity of people to withstand the onslaught of floods.

Chapter 2

Research Methodology and Literature Review

2.1 Research Methodology

The research is basically the study of community resilience-building measures in northeastern Bihar. Madhepura and Supaul districts have been selected on the basis of purposive sampling to locate the study in the two of the most flood prone districts in the region. Purposive sampling provides the severity of the research problem of the study. The two districts lag in different human development indicators as pointed out by Census and other reports pertaining to socio-economic indicators.

The study has used the qualitative as well as quantitative method to test the research problem. The research mainly relies on qualitative method. The study has used primary and secondary data to substantiate each other to establish the validity of the research by testing ground realities on the basis of literature and facts available. The research uses data mainly from Census of India, and district Censuses of Madhepura and Supaul. For comparison and evaluation of physical characteristics and hazards like agro-climatic conditions, ground water quality, rainfall distribution, hazard profiling, and hydro-meteorological conditions the information has been collected chiefly through various government agencies like Indian Space Research Organization (ISRO), Central Ground Water Board (CGWB), Central Water Commission (CWC), Water Resource Department (WRD) of Government of Bihar, National Institute of Disaster Management (NIDM), etc.

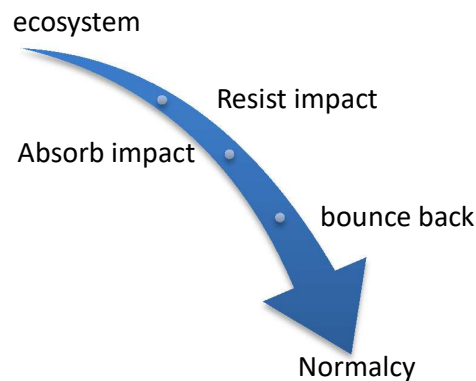
The research has used data, reports, publications, from various departments and ministries of Governments of Bihar and India. The data of loss and damage due to floods in state has been mainly taken from Disaster Management Department (DMD) of the Government of Bihar and Global Facility for Disaster Risk Reduction (GFDRR), an arm of World Bank. The data has also been taken from various international organization and NGOs.

To study the impact of floods on communities one has to explore a 'Database for economic analyses'. The Emergency Events Database EM-DAT available at CRED (Centre for Research on Epidemiology of Disasters) at Catholic University of Louvain, Belgium defines a disaster as an economic case, "Disaster is a natural

situation that overwhelms local capacity and/or necessitates a request for external assistance” (p, 7)⁷. This would mean that data collection from the field would mainly focus on DLNA (Disaster Losses and Need Assessment) and DNA (disaster and need assessment) to study disaster losses in 3 sectors;

1. Productive Sectors such as agriculture and industry.
2. The social and physical infrastructure like school, hospital, houses, road, electricity establishment, etc.
3. Provisions of timely assistance and mitigation policies by the government.

According to TopicsGeo (2010) resilience is the “ability to maintain or return to largely the same form, function, structure or qualitative state”⁸. Resilience in governance to mitigate and prevent floods is understood as measures which can resist the impact of floods through preparedness policies and also absorb its impact through measures such as early warning systems, medical assistance, shelter for humans and non-humans and machinery and equipment to bring normalcy of lives at the earliest i.e.; opening of markets, daily provisions, food supply, schools and other offices. See figure below:



Disaster is an extraordinary situation which affects the normal functioning of the system. The core competence of disaster management lies in its ability to make the system resilient to any shock. It should empower the community to bounce back in such less time as possible and start functioning in a normal manner.

⁷ Available at: <https://www.emdat.be/sites/default/files/Emdat.pdf>(accessed: 10.03.2018)

⁸ Available at: https://www.preventionweb.net/files/17345_munichere.pdf (accessed: 13.05.2018)

The survey was conducted to collect the primary data. 'Focus Group Interview' method was adopted to conduct the survey. Focus group interview made the discussions with the respondents informal and open ended which helped to investigate the problem deeply. Focus group was collection of 8 to 10 or more people who were selected on the basis of their ability to provide the relevant information. The size of the group and people participating in it is important for the reliability of the data because, if the participants are less the cross checking of data would be difficult. On the other hand if the size of group is big, there would be too many opinions and difficulty in finding a coherent result.

2.2 Location of Survey

In Madhepura district the survey was conducted in two blocks of Alamnagar and Chausa chosen by purposive sampling, both being severely flood-prone by the purposive sampling method. The villages covered come under *chaurs*⁹ region of Kosi, which act as natural storage of flood water. The fields of these villages remain water logged for more than 3-4 months during monsoon season and cause extreme hardship for people living here. People have to navigate through boats for communication during these 3-4 months. Muraut village from Alamnagar block was chosen by purposive sampling. The village has seen many devastating floods in the past, and river Kosi has eroded much of the area of the village. Some years ago the river swept away some habitations of the village, and people had to resettle in a different place from its original location. The erosion of its boundary is a regular feature of this village. The second village chosen from the block Alamnagar by purposive sampling was Kapasia. The village is situated approximately two kilometers away from Muraut. Both fall under the same Panchayat of KishanpurRatwara. In Kapasia the respondents said that the floodwaters remain in the village from mid-July to October. During this period people have to face extreme hardship. The connectivity to Alamnagar block gets affected and they have to use boats for communication. In some fateful years the flood water reaches even the houses of people. The third chosen village from the Alamnagar block by purposive sampling was KhawanDiyara. The village comes under ItahariPanchayat of Alamnagar block. One stream of Kosi which flows alongside the village has taken many lives in the past, the latest being the death of seven people who were crossing over the stream to attend some function in another

⁹*Chaus* are the depressions where water remains accumulated for most part of the year.

village situated across the stream. In Chausa block the survey was conducted in two villages-Chirauri and Morsanda chosen by purposive sampling. These all villages are situated in *Chauras* of Kosi. The fields in these villages remain submerged under water for 2-3 months during monsoon period. The road that connects these villages to Chausa block is in very poor condition, and due to non-protection of the newly built road in the area people fear that the new one will be swept away in the coming monsoon. The height of these villages have been raised by more than ten foot in the span of many years, thereby reducing the chances of flood water reaching the houses.

In Supaul survey was conducted in two blocks of Chhatapur and Triveniganj chosen by purposive sampling. Chhatapur and Triveniganj had been among the worst affected blocks during 2008 floods. These two blocks are surrounded by different streams of Kosi like Sursar, Genra, etc. which overflow during the monsoon period and inundate the adjoining villages. Many canals have also been constructed to smoothen the water flow of these streams and irrigate the adjacent lands. In Chhatapur block the survey was conducted in five villages by purposive sampling- Bhagwatpur, Pariahi, Lachhmipur, Ghiwaha, and Teen Tangi. In Teen Tangi, the focus group interview was conducted in a predominantly *Mahadalit*¹⁰ locality which falls under ward number thirteen. It is located within the panchayat of RajeshwariPurvi. These villages are situated adjacent to Sursar and Genra streams of River Kosi and their fields remain waterlogged for many months during the monsoon. From Triveniganj block two villages were selected by purposive sampling- Pilwaha and Daparkha. In Daparkha village, the survey was conducted in ward number eleven which is mostly inhabited by *Mahadalit* community. Daparkha village had witnessed massive destruction and loss of life and property during 2008 floods. It was struck by floods last year also.

¹⁰*Mahadalit* (literally meaning extremely down trodden) communities belong to marginalized sections of the society. Bihar government has selected these communities from amongst Scheduled Castes for the purpose of their empowerment and development.

Following is the brief description of the villages where the survey has been conducted:¹¹

No	Name of the Village	Population	Panchayat	C. D. Block	District
1	Muraut	2955	KishanpurRatwar a	Alamnagar	Madhepur a
2	Kapasias	2426	KishanpurRatwar a	Alamnagar	Madhepur a
3	Khaondiyar a	2568	Itahari	Alamnagar	Madhepur a
4	Chirauri	8880	Chirauri	Chausa	Madhepur a
5	Morsanda	4865	Morsanda	Chausa	Madhepur a
6	Bhagwatpur	3283	Udhampur	Chhatapur	Supaul
7	Pariahi	5779	Lalganj	Chhatapur	Supaul
8	Lachhmipur	2499	LachhmipurKhuti	Chhatapur	Supaul
9	Ghiwaha	8382	Ghiwaha	Chhatapur	Supaul
10	Teen Tangi	1150	RajeshwariPurvi	Chhatapur	Supaul
11	Daparkha	13,523	Daparkha	Trivenigan j	Supaul
12	Pilwaha	5785	Pilwaha	Trivenigan j	Supaul

2.2.1 Methodology of Survey

For the survey twelve villages were selected across two districts of Madhepura and Supaul. The survey was conducted in the form of Focus Group Interview. According to Lederman a focus group is ‘a technique involving the use of in-depth group interviews in which participants are selected because they are purposive, although not

¹¹ According to District Census reports of Madhepura and Supaul. The details of Teen Tangi Village and Chirauri Village have been taken from block office of the respective village, as District Census report did not mention them.

necessarily representative, sampling of a specific population, this group being ‘focused’ on a given topic’ (Thomas et al. 1995, in Rabiee, 2004). In each village a group of eight to ten people were assembled together and the questions were put forth amongst them for their answers and opinion. Due care was given during the formation of the group to include the people from all age group and different communities so that the difference of opinion can be taken into account.

In a region which has witnessed floods and consequent devastation since ages, the inclusion of senior citizens, who have witnessed it themselves, and have a range of experience to share, was necessary. They are also able to explain the changes that they have witnessed in the form of intervention by the government in pre, during and post-disaster period. So, in each group at least two senior citizens were included. The interview was conducted in a common area, preferably at the *chaupal*¹² where people gather informally and discuss about various issues. In a few villages the elected village representatives like *Ward Member*¹³, *Mukhiya*¹⁴, and *Sarpanch*¹⁵ were also included so that the reliability and accuracy of the data may be enhanced, because most of the development works in the village is implemented through their active participation and supervision.

2.3 Timeline of the Study

The synopsis of the study was passed in the month of August in 2017. The submission date of the study was 21st July 2018. Thus researcher got almost eleven months to conduct the study. The researcher divided the study broadly into the three parts which were intensive literature review on the broad area of the research and on research problem particularly, field survey and writing the dissertation.

The part on literature review was accomplished into first four months and theoretical framework was written in next two months. The tentative variables were chosen in these two months only. The tentative variables left the scope to change or include new variables after reaching for the field survey as the reality would have been different on the field work from which was assumed or found while deciding theoretical

¹²*Chaupal* is a common building or an area in a village in North India

¹³ A village in Bihar has been divided into many wards for the sake of administrative convenience. *Ward Member* is the elected representative of a *Ward*, the smallest unit of administration in the village.

¹⁴*Mukhiya* is the elected head of Gram Panchayat and has financial powers vested in them.

¹⁵*Sarpanch* is the elected head of Gram Kachahari which looks into minor judicial problems in the Gram Panchayat.

framework. Next two months were given to the field survey with repeat visit in the month of June, when the monsoon arrives in the region. Lastly, the writing of the dissertation was accomplished in three months.

2.4 Literature Review

Floods have been a recurring cause of devastation and destruction in the lives of people. It has caused massive loss of lives and damage to property and infrastructure causing extensive misery at local and national level. It has also tested the state capacity and commitment to deal with the flood disaster. Hurricane Katrina that caused floods in New Orleans is an example where even a developed nation like the United States could not manage the magnitude of a disaster which resulted in huge loss of lives and property. Various studies have been done in different parts of the world to study the impact of floods on different aspects of people. The proposed study tries to investigate the link between the governance in the region which makes communities resilient towards recurrent floods and its relationship to poverty.

Adrian Howitt (2006) has studied about the institutional preparedness in the face of disaster caused by hurricane Katrina. He talks about recognizing the novelty of the disaster and remain prepared for enhancing the state capacity in case the magnitude of disaster is astounding like that happened in New Orleans. He terms it as the 'surge capacity'. The river Kosi has been infamous for causing massive floods frequently in the North-Eastern part of Bihar, particularly after the construction of embankment and barrage, where the normal life of people is thrown into abnormality for days, even months in case of worse floods, like that occurred in 2008 (Mishra 2009). But the state has resorted to dealing with it in a routine manner, and not applied innovation which is important for development in a complex natural system, like Kosi area (Sebastian 2009). During hurricane Katrina the public management system could not respond to it properly at different levels, and the information about the exact condition did not reach the senior officials (Howitt 2006). It also exposed the past and present official neglect in dealing with emergency situations. Hence there was problem in decision making during the very crucial phase of the disaster.

Amrita Dasgupta has studied the correlation between floods and poverty in Bangladesh and her finding suggests that the floods and poverty are inextricably interlinked. Floods can destroy the physical and social capital of the societies and

wipe out the small savings that the poor household possesses (Dasgupta 2007). AbdurRafique (2003) has conducted the study of a village in Murshidabad district of West Bengal which witnessed a massive flood in year 2000. The administration issued the warning but there was no follow up and the villagers did not take the warning seriously. The local administration did not act quickly and the result was that people were left with no time to find the safe place and arrange for safekeeping of valuables. The roads and local infrastructure was washed away and people remained stranded for days on their roofs.

During Kosi floods of 2008 almost entire infrastructure of the area comprising five districts (Sharasha, Purnia, Madhepura, Araria, and Supaul) was wiped out. The road networks comprising rural road networks, state highways, and national highways were completely destroyed, bridges and culverts were washed away, and the power infrastructure got severely damaged. Health and educational infrastructure were also devastated. The government estimated the damage from floods to be around 14808 crores.¹⁶ This loss was huge for people and the underdeveloped state like Bihar.

2.4.1 Housing

Due to multiple failures of the hurricane protection system during Katrina, a committee was constituted to study the reason behind it. It observed that the settlements near the storm surge were badly affected and suggested for the improvements in construction procedures and building codes, like the elevation of the first floor of the buildings, and flood proofing and strengthening of the critical public and private infrastructure. Because of all-round damage to the infrastructure there is more push to poverty (Seekins 2009). There was massive loophole in the evacuation and rescue procedures, which resulted into widespread chaos and confusion among the people, particularly poor, old and infirm (Howitt 2006 and National Research Council 2009). In New Orleans thousands of poor people were dumped in a filthy and ill-ventilated football stadium (Seekins 2009). During Nargis in Myanmar, which was the biggest natural disaster in its recorded history (ibid.), the housing was badly affected because in Myanmar the coastal areas are densely populated and the storm had entered the country from the sea route. The houses in this part of the country are generally made of bamboo and thatch, rather than permanent materials (ibid).

¹⁶According to Bihar Government's Memorandum to 13th Finance Commission of Government of India.

Rafique's study in West Bengal (2003) as well as the study by different writers in the Kosi area demonstrate that in rural areas, and particularly backward regions, many poor people live in thatched and mud houses (Mishra 2008; Dixit 2009). The poor structure of the houses do not provide much protection and sometimes get washed away too. In Brahmaputra flood plains people use houses made of bamboo and woods, which are structurally weak to withstand the massive floods which river Brahmaputra brings (Hazarika 2005). In the Kosi area the houses built under Indira AwasYojana (IAY) were also not useful as the floods of 2008 stayed for longer time. The houses of weaker sections lying outside the village got more affected in these circumstances as they got no help from the village due to destruction of the connecting road. The Government of Bihar has only now proposed to rebuild the houses and roads on raised platforms after so many instances of destruction. After the floods of 1987, the state government made the promise to rebuild around 17 lakh houses those were destroyed, but the promise was not fulfilled (Mishra 2009).

2.4.2 Food Stock and Safe Drinking Water

During Hurricane Katrina there was widespread failure in relief operations also. There was shortage of food and drinking water all around and the worst to suffer were children and old people. The people who were coming to large dome to take shelter were asked to bring their own food and water supplies that could have sustained them for four days (Brinkley and Brewer 2006). Due to damaged water pipes the safe drinking water was not being supplied and in hospitals also there was problem of drinking water (ibid). The study by Rafique (2003) illustrates the dismal picture of the Jalpara village where, following the floods people were not able to feed themselves properly for many days. The poor were worst affected because they had very low or no amount of food stock. The devastation of crops due to floods meant that the condition would remain the same in coming days too (ibid). The situation of those living in the outskirts of the village was much critical as they could not even access other people's stock of food and had nothing to feed themselves for longer period.

In Kosi region, where the flood waters remain for more than 2-3 months the food storage is of vital importance. The sight of people looting the food supplies dropped by air presents a dismal picture of their condition in a state which supplies food and food products nationwide. The government of Bihar in its memorandum to 13th finance commission after the Kosi floods of 2008 had demanded for specific funds to

construct the food storage facilities and cattle fodder storage facilities in the affected blocks, and a larger one in the district headquarters of the flood prone blocks. Kosi flood of 2008 had devastated the fisheries and livestock of the region. For a predominantly agrarian economy the animal husbandry plays an important role. The loss of animals was acute as these were, in some instances the only source of livelihood of households. Many cattle who survived the flood waters starved. In the aftermath of the floods due to destruction of meadow the prospect of their survival was low without the state support. Following the 1957 floods the government had proposed to construct the raised platforms in every panchayat where people could take shelter as well as food during flood disaster, but these were never made (Rorabacher 2008).

2.4.3 Agriculture

Bihar is predominantly an agriculture based economy with more than 70% of the population engaged in this activity. North-East Bihar is also heavily dependent on agriculture with rich water resources. So the development of the region mainly depends on the development of agriculture. River Kosi and many other rivers in the northern plain bring floods annually but the flood waters recede in some time and they bring with themselves the rich sediment which is very useful for fertility of the soil. But after the construction of barrage and embankments the severity of the floods has increased, with more loss and damage to the lives and property (Mishra 1997, 2008, Rorabacher 2008 and Sinha, 2008). Without the commensurate change and institutional reform in agriculture with the structural measures adopted to control the floods, the results have proved to be skewed in favour of large landholding farmers and the small landholders have not benefited (Appu 1973). The region has a huge population of landless agricultural labourers. When a major flood arrives in the region, it witnesses huge outmigration. The small land owners are also compelled to move out of their place for employment due to destruction of the standing crops. Rohan Desouza (2006) has analysed the institutional response to floods in eastern India by the colonial government from historical point of view, and suggested that the measures of flood control have not benefited the farmers having small landholding.

The report by the Bihar government related to 2008 Kosi floods has estimated heavy loss in economic capacity as well as agriculture production capacity of the region.

After the floodwaters recede the field is left out with a thick layer of sand and renders the land uncultivable and which requires investment to make the land reusable.

The outmigration after the natural disaster has been reported from many places due to loss of livelihood. In Jalpara, West Bengal the poor people had no other choice than to migrate after the flood of 2000, because they had neither food stocks left with them, nor the possibility of earning from their own labour due to more competition in the domestic labour market (Rafique 2003). The Kosi region also witnesses heavy outmigration after floods due to the same reasons.

2.4.4 Official Neglect and Corruption

As in the case of New Orleans in USA or the Bihar in India, the story of official neglect and misconduct remains the same. In Bihar the management of embankments has become a cash cow for engineers, contractors, and politicians and they all are interested in keeping the levees in place so that the breach and consequent floods keep their cash registers busy (Rorabacher 2009). Various reports highlight the corruption in relief distribution, and suggest that not more than 10-15% reach the actual beneficiary (ibid). Due to corruption, waste, misuse and mismanagement the relief supplies and food hardly reach the affected and displaced people. Mishra calls this annual organized corruption as a 'fourth crop of the year', which is to be cultivated each year when flood comes (2004). Then there is issue of official apathy that has been consistently highlighted by CAG Reports. The funds meant for WRD of the Government of Bihar has frequently remained underutilized due to lack of poor planning and management. The report also brings into notice that the officials are interested in taking only those measures of flood protection schemes which are short term and structural in nature (CAG Report 2012).

2.5 National and International Efforts for Disaster Risk Reduction

Through successive World Conferences on Disaster Risk Reduction held in Hyogo (2005) and Sendai (2015), and before that the Yokohama Strategy (1994), there has been now international acknowledgement that endeavors to reduce disaster risks should be systematically integrated into plans, programs, and policies for sustainable development and poverty reduction. The focus on institutional preparedness and poverty reduction find resonance in all the reports, because it is widely acknowledged that the poor people are disproportionately affected by the natural disasters. These

reports suggest to promote diversified income opportunities and food security; better healthcare and safe hospitals, protection of critical public infrastructure and public facilities. Sendai Framework for Disaster Risk Reduction (SFDRR) talks about more investment in disaster risk reduction for resilience, and allocation of resources to the appropriate levels for the development and implementation of the disaster risk reduction strategies. The report also talks about the development and revision of existing building codes and construction practices, particularly in informal and marginal human settlements to promote safe habitats. Healthcare resilience also finds mention in all reports. The National Disaster Management act, 2005 (DMA) presents a comprehensive framework for dealing with disaster in the country. It talks about the authority and role of different institutions and persons during various stages of disaster. There are provisions for statutory authorities at various level of government so that DM planning could be integrated at all levels.

But the question remains as Amita Singh (2016) argues in her writing Disaster Law: The Rubric of Institutional Preparedness in Disaster Risk Reduction, ‘What would a district planner do if a riverbed area is demarcated as open for construction? His legal mandate to prohibit constructions is derived from a set of laws which are yet to become disaster conscious and ecosystem compliant. If the presence of geotechnical engineers for soil testing and structural engineers for metal usage in building designs is not mandatory through laws then river beds would be left open for multi-storey building constructions and soft foundations would become unstoppable design choices in a greed hungry realtor driven city.’¹⁷ Thus a set of good disaster law and efficient working of various institutions both are necessary for building effective community resilience.

¹⁷ <http://www.mei.edu/content/disaster-law-rubric-institutional-preparedness-disaster-risk-reduction>

Chapter 3

Institutional Study of Flood Management

According to a report of Red Cross ‘over a twenty-five year period ending in 1995, more than 1.5 billion people worldwide have felt the impact of floods’.¹⁸ Among those who were affected, the death toll was more than 318,000 and more than 81 million people were rendered homeless (p, 133). In addition to that , ‘over the period 1991-95, flood related damages totaled more than US\$200 billion (not inflation-adjusted) worldwide, representing close to 40 percent of all economic damages attributed to natural disasters in this five year period’ (Ibid.). According to Asian Development Bank, Asia Pacific is the most disaster-prone region of the world. This part of the globe faces around 40% of the world’s natural disaster; causes 60% of all deaths due to natural hazards and affects this region’s 80% of people who live here. There is also no sign of abatement in these extreme events, and due largely to the effects of climate change, the number and destructiveness of disasters are on rise.¹⁹

Floods are becoming the gravest of human misery in the last two decades as habitations have started spreading over riverside areas including river beds, water channels or flood plains. Global estimates of homelessness, deaths, economic loss and other effects have shown that whether it is the rich USA’s Katrina floods or India’s Bihar, the most vulnerable populations are the world’s poorest and most neglected communities. It is not just about the design of human habitations such as structurally unsound houses, roads connectivity, medical support, lack of transportation, limited access to sufficient water supplies, and inadequate arrangements to serve the specific needs of rural people such as rescue of their cattle and other animals which happens to be their life line are immediate factors that create a dire situation for impoverished members of a community. In floods, the after affects are further uncontrollable as there is little study on epidemiology of post-floods epidemics due to greater risk of being stranded, contracting disease, suffering from

¹⁸Pielke, Jr., R. A., Flood Impacts on Society: Damaging Floods as a Framework for Assessment (Routledge Press: London, 2000) 133.

¹⁹ Asian Development Bank. Available at: at www.adb.org/ (accessed: 16.07.2018)

lack of medical care, and also silent criminality such as child and women trafficking which leaves behind no records as the governance is poor and dismissive.

A report by the United Nations on flood disaster towards contribution to the International Strategy for Disaster reduction underlines the necessity of moving from current paradigm of post-disaster response to mitigation and preparedness for imminent flood disaster.²⁰ It also talks about the co-relation between different social groups and their capacity to protect themselves and their assets. Poverty plays a significant role as these social groups ‘have less social power and fewer economic resources and physical capacity to anticipate, survive and recover from the effects of massive flood’.²¹ These people have to remain dependent on the institutional support during and post disaster for survival and regaining the employment opportunities lost due to disaster.

The present chapter underlines the relationship between disaster and its effects on developmental process. The developmental approach followed in India is often criticized for its neglect towards environment, its non- inclusive character which further alienate majority of population and its techno-centric approach. However, its importance cannot be contested. Disasters have adverse effects over development process which remains a major concern for governments all over the world. This chapter further analyzes the institutional framework for flood management followed in India and its efficacy.

3.1 Disaster and Development

Generally development is assumed as a positive change in living standards of people, with better social and economic conditions. L T Hobhouse enumerates four broader parameters through which the extent of social development can be measured in a society: scale, efficiency, mutuality, and freedom (1924). The scale and efficiency connotes the change in material condition and its perseverance through gradual up-gradation of quality of processes and products. Mutuality and freedom are important from a viewpoint of social capital and realization of common ideals in a society.

²⁰ Guidelines for reducing flood losses, A contribution to the International Strategy for Disaster Reduction. United Nations 2002.

Available at: https://sustainabledevelopment.un.org/content/documents/flood_guidelines.pdf (accessed: 12.07.2018)

²¹ Ibid.

According to United Nations International Strategy for Disaster Reduction a Disaster is “*a serious disruption of the functioning of a community or a society at any scale due to hazardous events interacting with conditions of exposure, vulnerability and capacity, leading to one or more of the following: human, material, economic and environmental losses and impacts*”.²² It is different from a routine emergency situation whose magnitude can severally strain the local capacity to react and manage it. A disaster can wipe out partial or whole physical infrastructure of the region and cause massive hindrance in providing the assistance to people who are struck.

Disaster and development are closely interlinked. The place which witnesses frequent disasters has more probability of losing on development scale because of disruption in normal functioning of the system and wastage of resources which could be employed in other productive sectors. The hazard of a large scale has the potential to hit the vulnerable community the hardest and reverse the hard won development gains, destroying years of effort and labour, and entrench the people in poverty cycles (Asian Disaster Research centre 2002, Sanderson 2000). The vulnerabilities may create further conditions like lack of initiatives in enterprises and agriculture, particularly by poor and marginal sections of the society due to their subsistence level of living. They cannot afford to invest their resources in those productive activities which have the probability of getting affected by recurrent disasters. In Kosi region during survey people said that the farmers were less willing to use intensive capital in their fields due to fear of flood. Sometimes they don't even sow the crops for fear of being washed away.

Traditionally the hazard centric approach in disaster studies neglected the processes within a society that can result in more damage and loss of life and property. These processes within social development have the capacity to exaggerate the vulnerabilities and the exposure to risk. Lavell (2004) has conducted a study of Lower River Valley in El Salvador. The region which was known earlier as the bread basket of the nation was rendered vulnerable to disastrous floods. Earlier the settlements in the river basin were located outside the flood zone of the river, but within the time period of 1970's and 1990's, particularly the Programme for Land Transference caused a large sum of population to settle in the flood prone area, which

²² Available at: <https://www.unisdr.org/we/inform/terminology> (accessed: 15.05.2018)

started bearing the brunt of frequent disasters.²³ The study points out the increase in vulnerability of poor people who have little resilience and the capacity for self-protection. Hewitt's critique of hazard paradigm in disaster research was basically focused on the political economy approach to the study of causation of disaster through case studies (Fordham, 2008). He was of the opinion that the disaster was the result of a complex intermix of social, political and economic conditions, generated through a process of development in a particular society and which creates vulnerabilities through 'development gone wrong' (ibid).

In addition to this, a study by Oliver Smith in Peru (1994) demonstrates the impact of colonization and its development paradigm slowly creating vulnerability for a large section of population in the country, which resulted in catastrophic earthquake of 1970 taking more than 65,000 lives. Thus it seems the disaster is not a sudden event as shown by the hazard scientists, but rather it is constructed over time, and has close relation to societal development.

The traditional practice in disaster management has focused on the rescue and relief operations, which are post-disaster activities. Pre-disaster activities which comprise mitigation, prevention and preparedness did not get much attention. This approach gives less importance to the communities and assumes them as the passive recipients of external support. Now with the emerging consensus through various global forums, particularly after Hyogo meet in 2005, the priorities have changed. The communities are now the focal point of disaster management. The effort has been directed to make the communities more resilient so that it can effectively deal with the crisis situation on its own. The sociological approach of disaster management provided a bottom up approach. To deal with a disaster the community shall be viewed as the basic unit, where the resilience should be promoted in order to develop interdependence and mutuality among them.

As Singh points out in her book *'Disaster Law: Emerging Thresholds'* (2017) the pedagogy of disaster management has changed from disaster risk reduction (DRR) to resilience building, risk reduction and mitigation (RRM), which is a more empowering approach that takes care of a community's need . The previous techno-

²³Lavell, Allan. "The Lower Lempa River Valley, El Salvador: Risk Reduction and Development Project." In *Mapping vulnerability*, pp. 86-101. Routledge, 2013.

centric approaches followed by governments failed to underscore the role of ‘vulnerabilities’ that furthers the impact of disaster. UNISDR in its review “Living with Risk” also argues for better integration of disaster reduction, social and economic development, and sympathetic environment management for the sustainable development.²⁴

The studies by Dasgupta (2007) and Kelly and Chowdhury (2005) have tried to investigate the linkage between poverty and floods in Bangladesh. Their findings point out the positive co-relation between the floods and poverty, though they have also suggested that other factors may also be responsible for people to live into the poverty-cycle. The impact of a disaster on poor people is more because they are less equipped to deal with the risk, from shelter, to managing day to day affairs during disaster to later reconstruction of their dwelling and return to normalcy in livelihood without proper external support. Thus their chances to fall back on low income status are ever present in a disaster prone area. The disaster losses are also different for different class of people.

3.1.1 Disasters: Natural or Man Made

The initial scholars of disaster research were mostly from the physical sciences and geographers, who viewed disaster from what was later known as hazard based or engineering approach. After going through various literatures available on disaster through last three decades, Quarantelli (1985) was of the opinion that most of these literatures had described the disasters as mainly caused by a physical agent and its physical impact was at the core of, whether it was social disruption, social construction of reality or the political definition of certain crisis situation.

The dominant techno-centric view of disaster was criticized by many researchers. Their view was that the disasters were the result of human frailty and not by the nature only. Kenneth Hewitt (1983) argued that in many societies the vulnerability of people to a disaster is predominantly the result of an array of developments, and hence the cause of disaster should be located in the social realm rather than the nature. He criticized the Hazards Paradigm in the disaster studies and emphasized on the social nature of the disaster. The immediate cause of an event may be geophysical, but

²⁴International Strategy for Disaster Reduction. *Living with risk: a global review of disaster reduction initiatives*. Vol. 1. United Nations Publications, 2004. Available at: https://www.unisdr.org/files/657_lwr1.pdf (accessed: 17.02.2018)

its conversion into disaster constitutes multiple failures in the part of society, economy, polity, and particularly the governance of the region where the event occurs. It is the dereliction of duty, and negligence of local and national authorities which systematically converts a geophysical event into a disaster causing massive misery to the people.

In the literature of disaster there has been a successive phase through which the meaning of disaster has found different expressions among scholars of various disciplines. Quarantelli (2001) identifies three important phases in this regard. In the initial stage the people attributed catastrophe to a supernatural power, i.e. an act of god. Thus people in the Middle Ages treated volcanic eruption, earthquakes as well as the solar eclipses and comets to be the signs of divine anger by the almighty against the human beings (Kemp 2003 in Furedi 2007). So nothing could be done about it and people silently faced the consequences of the disaster. Then with the development of science and technology, people started questioning the reason behind the natural events. There was also shift in the way people started to conceive the disasters, whereby the attribution was given to nature as the main cause behind it (Quarantelli 2001).

In more recent times, the disasters are more understood in terms of the acts of men and women rather than the act of nature (ibid). But the media and governments in many parts of the world still portray any disaster as the result of divine intervention and try to shrug off the accountability and responsibility. This has been fashionable among politicians and officials to divert the attention from their negligence from duty, and attribute any such case as an act of nature or god. This fatalistic attitude among Indians regarding the role of fate in life and death (Weber 1916) gets easy acceptance, and due to poor literacy and ignorance among a vast section of population they fail to hold the government accountable for lack of governance.

Generally disasters are assumed to be a crisis event of a large magnitude which is beyond the capability of a society to manage and thereby calls for external assistance. The triggering event in any natural disaster is a geo-physical hazard that has the potential to alter its surrounding in a significant manner. But these hazards are not the sole reason that causes disasters; these are caused by multiple factors in which the anthropogenic factors play a significant role. The disasters caused by natural events

are inevitable but its impact on human can be analyzed as to how the institutions have worked to reduce the disaster risk (Farber and Faure 2010). They have argued that there is actually no such thing as a natural disaster.

With the development paradigm adopted by the global north after “a new deal” the ‘consumerism’ has been the sole motive of progress and prosperity. The whole humankind started looking at the environment as a force to be overpowered and modulated it according to its own need. This paradigm of development has neglected the concerns of those people living in socio-ecologically vulnerable spaces, where the risk of loss and damage is huge.

In the context of India, the unbridled development in the coastal zones around sea and in riverbeds around the country has pushed a large number of people into the risk-zone. The tsunami of 2004 in Eastern coast and Uttarakhand deluge in 2013 demonstrated how the development can go wrong if ‘vulnerability’ is casually dealt within risk zones. In Bhopal Gas leak case of 1984, the frequent inspections and recommendations had no impact and follow up by the officials of both the government and the company, which resulted in one of the worst industrial disasters in modern era. Despite increase in funds over the years for management of Kosi basin by the successive governments, why the region has seen increasing devastation and people have been rendered hopeless and on the mercy of government assistance? These events point to the increasing role of human activities in exacerbating the already fragile ecology in certain places, and increasing the risk for humans, and flora and fauna as well as the environment.

Thus a disaster can be seen today as largely a product of anthropogenic interferences in the already risk-prone area. The immediate cause of the disaster may be any geo-physical event; but the social, and economic conditions created by the administrative structure and the political class over a period of time leads to the event turning into a disaster. Oliver-Smith (1999) has analyzed the different approaches to study the disaster, particularly the anthropological perspective. While outlining the various strands within the anthropology to define a disaster he suggests for the development of political ecology of a disaster. For him the political ecology approach acknowledges that the role of social institutional structures which help human beings

in accessing and changing the physical environment for living and sustenance plays crucial part in the evolution of disaster (ibid).

Now ecological perspective in disaster has emerged which views disaster from a vantage point of “extreme environment” (Furedi 2007). The world has now entered in a post modern age, where the mode of production has changed with commensurate change in technology. New technological applications of science like nuclear technology, cloning, genetic engineering in plants, space technology etc. are increasing different set of vulnerabilities. Three miles accident of USA, Fukushima disaster of Japan, Union Carbide plant accident in Bhopal etc. are a few examples which demonstrate that the disasters may not only be caused by a natural hazard. Technological disasters are creating far more severe and long-lasting pattern of social, economic, cultural and psychological impacts than do the natural ones (Freudenberg 1997 in Furedi 2007).

3.2 Disaster: From Techno-centric Approach to Community Based Approach

The field of disaster management has traditionally been dominated by geographers and geophysicists, who view a disaster from the lenses of ‘natural events’. This has been often criticized for being narrow. Therefore any effort to deal with it, according to them, should be based on science and done by experts from their field. Various agencies dealing with the disaster management like government agencies, NGOs, international organizations etc employed this techno-centric or top-down approach that treated the local communities as the passive recipients of aid and assistance in the events of disaster.

Contrary to this approach sociologists argued that the local communities who experience the impact of disaster at its first onset should be ‘disaster fronts’. Disaster risk arises when hazards interact with physical, social, economic and environmental vulnerabilities²⁵. As Hewitt (1982) points out that a disaster is not a natural event, and its causation should be located within the social, political, and economic realms, the efforts for its effective management should be done in a more holistic manner. They cannot be merely thought of as victims and numbers to be dealt with and receiver of aid. The government agencies and various organizations work in a command and

²⁵ Hyogo Framework of Action, 2005

control approach and respond to a crisis situation according to their own perception of “need” rather than the actual needs felt by the local people. As Allen (2006) points out that since last few decades the disaster management strategies have started treating local communities as the major stakeholder. The efforts are geared towards making the communities resilient by developing their adaptive capacities and providing them with resources to mitigate the impacts of disaster.

Community resilience may be said as “a process linking a network of adaptive capacities (resources with dynamic attributes) to adaptation after disturbance or adversity” (Norris et al. 2007). According to them, community resilience comprises of four basic set of adaptive capacities: economic development, social capital, information and communication, and community competence. These all four should combine to prepare for effective disaster management. The local communities which are the frontiers of disaster should be made resilient and robust to minimize its impact. This ability to bounce back involves immense work both at individual and organizational level. A community is aware of the traditional ways and methods to cope up in case of a frequent occurring crisis situation through its age old wisdom and adaptive capability. But the evolving nature of a risk and its magnitude variability poses danger for the ability of a community to effectively prepare. The sustainable development also requires the capacity building at the local level so that the community can face the crisis situation on its own and better prepare without much external assistance.

The principal elements of community involvement in a Community Based Disaster Management (CBDM) may include: participation, partnership, empowerment, and ownership by the local people (Pandey and Okazaki 2005). Both local authorities and communities should have access to necessary information, authority and resources to take steps for disaster risk reduction.²⁶ In each stage of disaster management viz. mitigation, preparedness, rescue and rehabilitation the communities may be involved at varied degrees depending on the risk assessment. Guidelines have been issued by the international organizations regarding the participation of local people in disaster management process starting from school education and awareness generation to training and capacity building at various levels. The participation of local

²⁶ Ibid.

communities ensures the sense of ownership among them and increases the chance of their continued engagement and lasting commitment (ibid). The use of Information and Communication Technology (ICT) has enhanced the reach and rapidity of the information dissemination potential of the agencies.

This theoretical change in disaster studies has also impacted the institutional mechanism of disaster governance. It is evident from the legal as well as administrative framework that now disasters are not merely seen as an end product but 'as a process'. The increasing role of 'community-centric' approach in disaster governance has changed the way governments were to cope up with disasters. Let us analyze this development through legal framework.

3.3 Legal Framework for the Study of Disasters

The development of legal framework can be divided into two parts: First, International Law and second, Municipal Law. However both the developments have directly influenced each other, it is important to note that they have different institutional focus. On one side, international law has focused to develop a co-operative mechanism among different nations to cope with disasters. It includes both pre- disaster and post- disaster co-operative mechanisms. On the other side, municipal law deals with the domestic legal framework with focuses on a multi-modal approach. The focus remains to develop a more responsive and accountable mechanism for disaster governance.

3.3.1 International framework for disaster management and its development

Disasters do not see boundaries; their impact is trans-national. At the global level there is ample of recognition that the disaster is causing a massive loss to human lives and damage to property. In addition to this, its co-relation with degradation of environment cannot be neglected. Agenda 21 of UN Conference on Environment and Development (Rio Summit 1992) recognized the linkage between environmental degradation and disaster losses and emphasized that disaster losses cannot be reduced without ushering into path of sustainable economic growth and sustainable development.²⁷ Principle 18 of Rio Declaration talked about the international

²⁷Strategy, Yokohama. "Plan of Action for a Safer World; Guidelines for Natural Disaster Prevention, Preparedness and Mitigation." In *World Conference on Natural Disaster Reduction, Yokohama, Japan*, pp. 23-27. 1994.

assistance and co-operation in the face of disasters to save lives and property.²⁸ It is interesting to note that earlier development in international law was concentrated only on the links between environment and disaster. Later disaster management emerged as a specialized and multi-disciplinary field in parallel to international environment law.

United Nations General Assembly (UNGA) has passed two resolutions 1989 and 1991 and exhorted the nation states to adopt an integrated approach to disaster management in all its aspects and to initiate a process towards a global culture of prevention. One of the goals of UN resolution 44/236 says “to develop measures for the assessment, prediction, prevention and mitigation of natural disasters through programmes of technical assistance and technology transfer, demonstration projects, and education and training, tailored to specific disasters and locations, and to evaluate the effectiveness of those programmes”.²⁹ Resolution 45/185 of UN asked the international community to implement the International Framework of Action for the International Decade for Natural Disaster Reduction which was contained in the previous resolution (Resolution 44/236).

The Yokohama Strategy and Plan of Action for a Safer World: Guidelines for Natural Disaster Prevention, Preparedness and Mitigation held in 1994 was the next step in the line and proposed a plan of action for nation states at different levels, from international and regional levels to national and sub national level up to community level. The conference reiterated the global concern related to impediment to development and continued human suffering caused by the disasters. It also recognized the fact that the most affected population by the natural and other forms of disasters are the poor and socially underprivileged sections in developing countries, because they are less prepared to look after themselves when faced with it.³⁰ It appealed the nations to ‘build a safer world’ by initiating the process towards a “global culture of prevention”.

The primary focus of the Yokohama Strategy was towards disaster prevention and preparedness. The Plan for Action also talked about the participation of people at the community level and understanding their traditional knowledge about the physical

²⁸ Ibid.

²⁹ Available at: http://www.un.org/en/ga/search/view_doc.asp?symbol=A/RES/44/236 (accessed: 23.05.2018)

³⁰ Ibid.

environment and coping pattern in the face of disaster. The decade of 1990's was declared the International Decade for Natural Disaster Reduction and the efforts of Yokohama Strategy was geared towards formulating and suggesting some concrete measures to be taken by the international community for disaster risk reduction.

The next World Conference on Disaster Reduction was held in Hyogo, Japan in 2005 and formulated '*Hyogo Framework for action 2005-2015: Building the Resilience of Nations and Communities to Disasters*'. The conference conducted the review of Yokohama Strategy and identified some specific gaps and challenges. It identified five major gaps from Yokohama Strategy:³¹

- (a) Governance: organizational, legal and policy frameworks;
- (b) Risk identification, assessment, monitoring and early warning;
- (c) Knowledge management and education;
- (d) Reducing underlying risk factors;
- (e) Preparedness for effective response and recovery.

Hyogo Framework identified these institutional gaps and suggested for the legal framework for disaster risk reduction to enhance a coherent and well organized approach to mitigate vulnerabilities and risk to hazards³². It emphasized the imperative to building resilience of nations and communities to disasters. It called for endeavors on the parts of nation to systematically integrate the disaster risk reduction efforts into policies, plans, and program for poverty reduction and sustainable development³³. The objectives of the Framework were aimed at generating awareness among the stakeholders, at all levels of the government, and the communities. For this the information availability at all the levels was emphasized, particularly in public and disaster management agencies.

One important goal of the Framework was to develop and strengthen the institutions, mechanisms, and capacities at all levels, particularly at the community level so that

³¹ UNISDR, Hyogo Framework for Action 2005- 2015 (January, 2005) available at <http://www.unisdr.org/2005/wcdr/intergover/official-doc/L-docs/Hyogo-framework-for-action-english.pdf> ; also see *Review of the Yokohama Strategy and Plan of Action for a Safer World (A/CONF.206/L.1)* (accessed: 30.03.2018)

³²ISDR, UN. "Hyogo framework for action 2005-2015: building the resilience of nations and communities to disasters." In *Extract from the final report of the World Conference on Disaster Reduction (A/CONF. 206/6)*, vol. 380. 2005.

³³ Ibid.

effective resilience building could be made to the hazards³⁴. Hyogo Framework was a break from the past in “converting a neutral and isolated science and technology based learning to the one embedded in political, social, and cultural categories” (Singh 2017). It was more participatory in nature as it promoted collaborative learning of all stakeholders, like scientists, administrators and communities to find ways to ‘care for’ rather than impose drill learning in human lives (ibid).

From Yokohama Strategy to Hyogo Framework one major point of departure was the institutionalization of Disaster Management policies at all the levels of governance, from international to national to community level. The shift from top-down approach to a more decentralized approach was envisaged through legal framework. In addition to this, now community became the centre for plan of action for all the activities.

The non-structural measures like disaster education and training, capacity building and awareness generation through different media were more focused. There was also call for special attention on assistance to vulnerable sections among the population like poor, elderly and disabled. It touched upon diverse but interrelated fields related to disaster risk reduction and preparedness through appropriate measures to be taken into sectors like food security, health sector planning, safety of critical public facilities and infrastructure, social safety mechanisms, psychological assistance in the post-disaster period particularly to children, financial risk- sharing mechanisms, diversified livelihood options in the disaster prone-area etc.³⁵ the Framework acknowledged the need for good legislation.

3.3.2 From Hyogo to Sendai

Sendai Framework for Disaster Risk Reduction 2015-2030 lists four areas for priorities of action, they are: understanding disaster risk, strengthening disaster risk governance to manage disaster risk, investing in disaster risk reduction for resilience and enhancing disaster preparedness for effective response and to “build back better” in recovery, rehabilitation and reconstruction.³⁶ It defines Disaster risk reduction as “*concept and practice of reducing disaster risks through systematic efforts of analyzing and managing causal factors of disasters, including through reduced*

³⁴ Ibid.

³⁵ Ibid.

³⁶ Assembly, UN General. "The Sendai Framework for Disaster Risk Reduction 2015–2030." *Resolution A/Res/69/283*, see http://www.unisdr.org/files/resolutions_N1516716 (2015).

*exposure to hazards, lessened vulnerability of people and property, wise management of land and the environment and improved preparedness for adverse events*³⁷. The concept of ‘risk’ which was limited to the economics made its way to disaster management too. For the first time a value was added to disasters and they were seen as a ‘process’ rather than just mere events. Thus instead of following a linear approach for disaster management, it emphasized on continuous evaluation of underlying disaster risks and adoption of methods to lessen it.

While the Sendai Framework acknowledged that some gains have been made after the Hyogo meet, a substantial effort has to be put for disaster risk reduction, and loss of lives.³⁸ The four priorities of action exhaustively demonstrate the steps needed by individual states for effective disaster management. It specifically calls for better science-policy interface so that the knowledge available at all level like scientists, governments, and at community level can be better synchronized for resilience building. It calls for educating and enlightening masses through both formal and informal mediums to understand the risk and better preparedness. To strengthen the disaster risk governance the laws and by-laws should be made disaster-conscious and integrated within all sectors of the government. As Howitt puts out about the surge capacity during the crisis situation, the Framework calls for better understanding of the disaster situation and make plans according to it. The resilience building of communities and people require heavy resource allocation which was recognized in Yokohama Strategy also. But this resource should be understood as investment rather than wastage, because disasters cause much loss of lives and property which is increasing by each year.

3.3.4 Development of Disaster Law in India

The Asian tsunami of 2004 catalyzed many Asian states to formulate specific legislation for disaster risk management with strong institutional support to deal with all the stages of the disaster viz mitigation, preparedness, response and recovery. In the Indian context too the need was being felt to give disaster management the legal footing after witnessing perennial disasters in the country, and particularly Bhuj earthquake of 2001, and Indian Ocean tsunami of 2004. A national legal-framework

³⁷ UNISDR, *Terminology on Disaster Risk Reduction* (Geneva: UNISDR, 2009) available at <http://www.unisdr.org/we/inform/publications/7817> (accessed: 04.04 2018)

³⁸ Ibid.

in the form of National Disaster Management Act, 2005 (DMA) came into being to address the concerns related to effective management of disasters in the country.

The Disaster Management Act was enacted in 2005. The main objective of this statute was to provide enabling provision for different governmental agency to co-ordinate and take a planned approach towards disasters. It provides for the constitution of institutional mechanisms at different levels of governments, as well as within the different ministries and departments of the government at different levels for drawing up and monitoring the implementation of Disaster Management.³⁹ It elucidates the roles and responsibilities of newly constructed institutional structures regarding the planning and management to effectively deal with the disasters. A great emphasis has been placed to make each organization sensitive towards risk reduction.

The Act defines '*Disaster Management*' as "a *continuous and integrated process (emphasis added)* of planning, organising, coordinating and implementing measures which are necessary or expedient for—

- (i) prevention of danger or threat of any disaster;
- (ii) mitigation or reduction of risk of any disaster or its severity or consequences;
- (iii) capacity-building;
- (iv) preparedness to deal with any disaster;
- (v) prompt response to any threatening disaster situation or disaster;
- (vi) assessing the severity or magnitude of effects of any disaster;
- (vii) evacuation, rescue and relief;
- (viii) rehabilitation and reconstruction".⁴⁰

The approach underlined by the legislation included all four stages of disaster management that includes preparedness, mitigation, rehabilitation and recovery. As noticed, that the developments taken in international law are also well accommodated in Indian context. In addition to this Supreme Court of India has also emphasized in *N.D. Jayalv. UOI*,⁴¹ that 'disaster management' is a "combination of all aspects of planning, implementing and coordinating of all measures which are necessary or

³⁹ Disaster Management Act, 2005.

⁴⁰ *Supra* note 39 at s. 2 (e)

⁴¹ AIR 2004 SC 867

desire to *prevent, minimize, overcome or to stop the spread of a disaster* upon the people or any property and includes all stages of rescue and immediate effect.”

3.3.4 Institutional Framework of Disaster Management in India

The Disaster Management Act, 2005 extends to whole of India and provides a framework for establishment and administration of authorities at national, state and district level. This Act empowers central government to constitute an authority at national level known as the National Disaster Management Authority which shall be headed by the Prime Minister of India.⁴² This national authority shall have responsibility for laying down appropriate national plan, policies, guidelines for state authority and ministries or department of GOI, for effective and timely response to disaster. National Authority may also appoint a committee constituted of experts for seeking recommendations on various issues.⁴³ The Central Government shall constitute a National Executive Committee headed by Secretary to the government of India (heading concerned ministry or department of disaster management). This committee shall assist the National Authority for performing its functions by: coordinating and monitoring disaster management, preparing the national plan, checking implementation of the national policy, laying guidelines to be followed by Ministry and State authorities.⁴⁴

Following the same pattern, State Management Authority shall be headed by Chief Minister of State, laying down policies and plans for disaster management in the state and shall be assisted by State Executive Committee.⁴⁵ District Disaster Management Authority shall be headed by Collector, DM or Deputy Commissioner. It shall be laying down policies and plan based on national plan and state plan for the district and local authorities of district.⁴⁶

With the administrative framework, Disaster management Act also lays down certain principles to be followed by authorities in framing plans. Act states that all National Plans prepared by NDMA should incorporate:

- a) Measures to be taken for prevention of disaster and mitigation of its effects.

⁴²DMA, 2005. Chapter II s.3

⁴³*Ibid*, ss. 6,7

⁴⁴*Id.*, ss. 8-10.

⁴⁵*Id.*, Chapter III.

⁴⁶*Id.*, Chapter IV.

- b) Integration of measures to be reincorporated within development plans.
- c) Special measures to be taken for preparedness and capacity-building for effective response.
- d) Specification of roles and responsibilities of each department of government of India must be done, in accordance to the abovementioned clauses.⁴⁷

The state and district authorities have also to prepare disaster management plans at state and district levels respectively. The Disaster Management Act, 2005 aims to strengthen institutional framework for disaster management in India. As mentioned above there are certain provisions in the statute which act as a guidelines to be followed at all levels. These guidelines bring uniformity in the institutional approach which further adds in inter-state coordination.

The development of legal framework has brought certain vital changes in the approach of disaster management, however there are many concern related to its implementation. As Amita Singh (2016) in her work explains the underlying governance deficits which weaken even the best laws through lack of enforcement. The focus therefore becomes as her writings suggests:

1. Enhanced mainstreaming of disaster risk reduction and resilience building within the agriculture policy, planning and institutional designs.
2. All institutions which affect and impact upon the agriculture and associated human and animal life should be well informed and trained to mitigate the impact of disasters.
3. The key data gaps on the impact of disasters on the agriculture sectors in developing countries must be systematically collected and included in national and international disaster loss databases.
4. The agriculture sectors should work to enhance local action and build resilience of the most vulnerable and their issues of food insecurity and safety from trafficking. Local institutions should create appropriate awareness, preparedness for coping with such situations.

⁴⁷*Ibid* s.11(3)

5. Dealing with disability, gender and marginalized with reference to caste, class or religion.
6. Insurance and safety nets and the role of macro-economic planning and sustenance of agriculture and farmers.⁴⁸

3.4 Flood Management in India: A Hazard Based Approach

India is one of the most flood-prone countries in the world.⁴⁹ Floods bring havoc in many parts of India almost every year, particularly in eastern and north-eastern part of the country in south west monsoon period. The retreating monsoon brings heavy downpour in coastal Andhra and Tamil Nadu, sometimes causing massive floods, like the 2015 southern Indian floods. Cloudburst causing floods in mountainous areas and flash floods in some parts of the country, like those in Mumbai almost every year call for integrated and long term planning for their effective management. Due to high population density, illiteracy, unemployment, widespread poverty, enormous pressure on rural land and traditional agricultural economy the people are rendered vulnerable to floods and other natural disasters.⁵⁰

However, the traditional mode of government intervention in flood prone area has been the structural measures like construction of embankments, dams etc. But now due to changing orientation of disaster management across the world and the recognition of the synergetic collaboration between engineering and social science approaches, the main focus has shifted to community level. In addition to this, the overriding concern of the policymakers and practitioners has been to develop the resilience of the community, so that it can gain “the capacity to withstand and insulate suffering from the combine of nature and human frailties” (Singh 2017). Many provisions of the DMA acted as the catalyst for the district and local administration to effectively manage the flood disasters in the country. There are many steps taken to ensure effective planning for disaster governance.

The geographical extend of India is vast. The vulnerability to floods in India is not mere a resultant of varied river systems but also its unplanned developmental process.

⁴⁸ Published on July 12, 2016 in John Calabrese’s Middle East-Asia Project (MAP) series on Humanitarian Assistance and Disaster Relief: Rising to the Challenge? Available at: <https://www.linkedin.com/pulse/disaster-law-rubric-institutional-preparedness-risk-john-calabrese> (accessed: 30.05.2018)

⁴⁹ Disaster Management in India, Ministry of Home affairs Government of India, 2011.

⁵⁰ Ibid.

The risks to floods have immensely increased also due to enhanced ‘exposure’ of human population. NDMA came up with the “National Disaster Guidelines for the flood management” in 2008. These can be broadly divided into: pre-disaster and post-disaster management guidelines. The main objectives of these guidelines were “*to minimize the vulnerability to flood and consequent loss of life, livelihood system, property and damage to infrastructure and public utilities*”⁵¹.

The guideline aims to take a comprehensive approach to address different factors of floods in India. Whereas certain factors are natural causes of rare, uncertain and catastrophic events, the others are mere man-made like unplanned urbanization along the river-sides. In addition to this the guidelines focuses to mitigate direct as well as indirect effects of flood such as loss of livelihood. It included taking proper steps for preparedness, prevention and mitigation.

One of most important aspect dealt in these guidelines is financial arrangement. Since it can be gauged by previous experiences that financial arrangement are mostly directed to post- disaster rehabilitation and recovery part and mitigation is totally neglected resulting into huge losses after a disastrous event. Special emphasis has been placed over ‘flood insurance’ to mitigate the financial losses incurred to lives and property. It should be noted that any step taken to mitigate the socio- economic as well as physical risk underlying to floods decreases both direct as well as indirect losses. Therefore, financing disaster risk reduction is the most vital part of flood management.

‘The setting up of early warning system (EWS) and dissemination of information among the people’⁵² can be very useful in containing the loss and damage caused due to floods. Central Water Commission (CWC) issues the flood forecasting for various places in the country. This forecasting may be used by district and local authorities for better preparedness in case a warning of flood has been issued. The information by Indian Meteorological Department (IMD) regarding the regular collection of data related to rainfall for each district, coupled with the forecasting by CWC should be available in public as well as official domain for better preparedness.

⁵¹ Available at: <https://ndma.gov.in/images/guidelines/flood.pdf> (accessed: 10.06.2018)

⁵² Disaster Management Act, 2005.

The constitution of National Disaster Response Force (NDRF) and State Disaster Response Force (SDRF) by DMA has proved very crucial for reducing the loss of lives of both humans and animals. During various flood disasters in the country NDRF and SDRF of the respective states have proved their mettle in rescue and relief operations. For example in 2017 floods in Bihar and Assam the rescue and relief operations conducted by NDRF gained wide appreciation for their commendable work. The DMA provision related to inspection of the construction in any area by the respective authorities can check the unauthorized expansion of housing in the flood zone and riverbed, and provide guidelines for technically sound architecture of the construction in places where flood is recurrent. Suitable building codes can be devised for flood prone areas.

In case of critical infrastructure like schools, hospitals, and other buildings, the DMA proposes for sound construction so that during the flood disaster they can be used for the storage of relief material, and shelter as well as after the disaster is over, the early resumption of critical services like education and healthcare. ‘The provision of shelter, food, drinking water and essential provisions, healthcare and services’⁵³ is very important during flood disaster. The food and drinking water for not only humans, but the animals too is very important, and many state governments have taken step for creation of fodder banks.

With all the provisions of mitigation, preparedness, rescue and rehabilitation given due importance in the DMA, all the efforts would come to naught if the beneficiaries are assumed as the passive recipients. The DMA, therefore, talks about building resilience of the community too by generating awareness and conducting training programmes for them with the help and support of local authorities, government and NGOs. The above mentioned provisions of DMA though do not talk about flood disaster specifically but nevertheless provide important guidelines, which if followed before and after the floods, can help in containing the loss of life and damage to property.

3.5 Conclusion

Present chapter has discussed national and international efforts to reduce disaster risk and the theoretical aspects of disaster and development. It has tried to demonstrate

⁵³ Ibid.

how disasters, if not managed properly can push people towards poverty. It has traced the changing meaning of disasters from ‘an act of god’ to multiple failings of human induced development. The human kind has neglected the delicate balance and synergy with its ecology which has resulted into catastrophe like that was witnessed during Uttarakhand floods of 2013 and Tsunami of 2004. A disaster not only destroys the existing ecological balance between human and environment for centuries, it also severely impedes the capacity of people to respond effectively.

The role of government is, to constantly endeavor for disaster risk reduction through legislative and administrative measures. A disaster shows whether the institutions of government have worked properly or not. Floods have caused massive destruction around the world and the climate change has only exacerbated this problem with its increased frequency and severity. In such circumstances the DM Act 2005 has many provisions to deal with the flood disaster in a comprehensive manner. The provisions of the act suggest for suitable measures to be taken at state, district and community level for better preparedness. Community is at the core of preparedness for disaster management, and community resilience can be a long term plan for government to reduce the disaster risk. Rather than taking routine ad hoc measures community resilience speaks of continuous engagement of people in disaster management.

Chapter 4

Floods in Kosi Basin and Bihar Government's Flood Control Strategy

"To plan is to produce a scheme for future action, about specified results, at specified cost in a specified period of time. It is a deliberate attempt to influence, exploit, bring about and control the nature, direction, extent, speed and effects of change. It may even attempt deliberately to create change. It is a carefully, controlled and coordinated activity."

— Cyril L. Hudson

4.1 Introduction

Many regions across the world are prone to different forms of hazards due to various geophysical and hydro-climatological conditions. They have challenged human existence and prosperity by frequently striking the geographies resulting into loss of life and destruction. From the ancient civilizations human beings have managed to live with them by adopting different coping strategies. These strategies have changed according to discovery of new knowledge, inventions and methods employed to use them. A country like Japan which is one of the most disaster-prone countries of the world has been able to withstand the onslaught of disaster with impressive result. Others like Bangladesh and India have been less successful in effectively managing them. The success of strategies employed by government becomes more important in countries like Bangladesh and India because of widespread poverty prevailing in these regions.

Bihar is one of the most underdeveloped states of India which gets ravaged by floods almost each year. Because of wide spread poverty in the state the impact of floods are more severe on the population of the state, particularly on more vulnerable sections among them. The current chapter discusses the vulnerability of the state to flood disaster and its strategy for flood management.

4.2 Bihar and its vulnerability to floods

Bihar is the 3rd most populous state of the country. It is home to more than ten crore of people, among whom more than 3.6 crore live below the poverty line. Bihar is a low income state with per capita income in the state being less than one-third of the national average. Per Capita Net State Domestic Product (at 2011-12 prices) of Bihar is Rs. 26,693 compared to Rs. 82,269 of all India. The state has the lowest share of salaried jobs in the country with the lowest participation of women in jobs. The disparity within the state is also very prominent with large part of the state scoring very low in socio-economic indicators. Since 2005, the state has witnessed faster poverty reduction, almost matching the national average. However the current level of growth needs to be sustained for many decades to catch up with other states.

The following table tries to illustrate the relative backwardness of the state compared to all India level:⁵⁴

	Bihar (2012)	India (2012)
Poverty Ratio	34	22
Gini Co-efficient	0.22	0.32
Labour Force Participation	45	56
Male	77	80
Female	9	31
Workers by sector		
Agriculture	62	49
Industries	16	24
Services	22	27
Health (2013)		
MMR	208	167
IMR	42	40
Literacy Rate (adults)	58	70
Electrification (% households)	31	80

⁵⁴ According to a report by World Bank.

Available at: <http://documents.worldbank.org/curated/en/908411467992055870/Bihar-Indicators-at-a-glance> (accessed: 20.12.2017)

Drinking Water on Premises (% households)	73	56
Open Defecation (% households)	68	44
Road Density (km/million population)	1306	3231

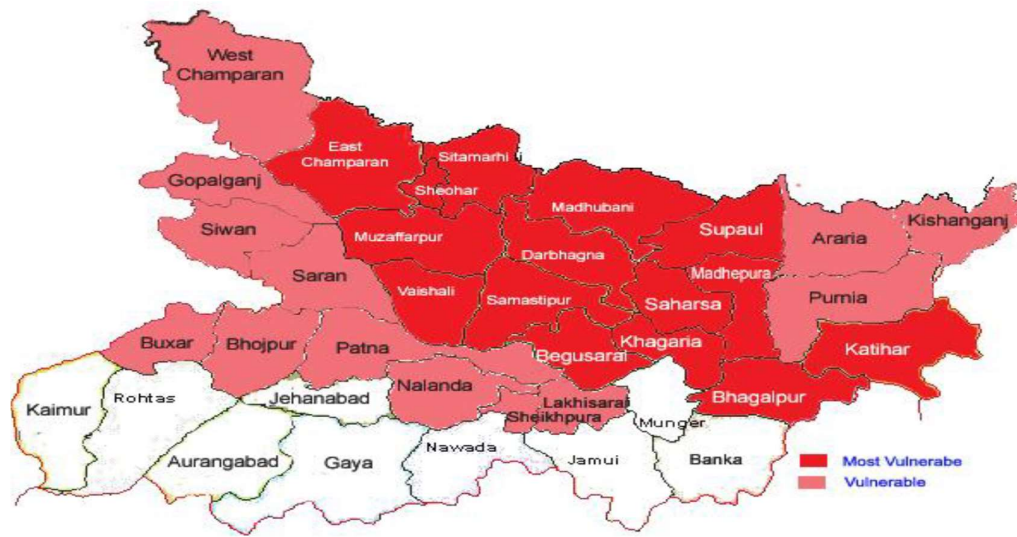
4.2.1 Bihar and Floods

The region of North Bihar is notorious for floods world over, with a review by Kale (1997) suggesting that this part of the state has witnessed the highest number of floods during the previous three decades. There are also indications of increasing spread and severity of floods in the region due to threats like climate change (Thomas and Lopez, 2015). Bihar is India's one of the most flood prone state, with 76% of the population in north Bihar living under recurrent threat of flood devastation.⁵⁵

According to the report of RashtriyaBarhAyog (1980) Bihar accounts for 16.5% of the total flood-prone area in the country and of all the population affected by floods in country 22.1% live in Bihar. Twenty eight out of thirty eight districts of the state are flood-prone, amongst which fifteen districts are severely flood-prone..

⁵⁵ According to FMIS, Flood Management Information System (FMIS) has been developed by Bihar government with the collaboration of World Bank and works under Water Resource Development of the State. This is a dedicated place where all the information and statistics related to floods in the state can be found. Available at: <http://fmis.bih.nic.in/history.html>

The flood map of Bihar:⁵⁶



The most flood vulnerable districts are: Begusarai, Bhagalpur, Darbhanga, East Champaran, Katihar, Khagaria, Madhepura, Madhubani, Muzaffarpur, Saharsa, Samastipur, Sheohar, Sutamarhi, Supaul, and Vaishali and the vulnerable districts are: Araria, Buxar, Bhojpur, Gopalganj, Kishanganj, Lakhisarai, Nalanda, Patna, Purnia, Saran, Siwan, and West Champaran.⁵⁷ The floods create a lot of hardship in the region in the form of loss and damage to lives and property. The region which already scores poorly among different socio-economic indicators is frequently faced with razing of its infrastructure, loss of productive assets and standing crops due to flood waters. The floods of 2017 in Bihar affected 2371 panchayat under 187 blocks of 19 districts causing death of 514 people.⁵⁸ Around 1.71 crore people were hit by these floods, with almost 8.50 lakh people losing their home, in which Araria district accounted alone for 2.2 lakh homeless people. The deaths caused due to these floods were highest in last decade.

The state of Bihar is mainly agriculture based and is endowed with many perennial rivers and fertile soil. It is mostly irrigated by the tributaries of river Ganga which

⁵⁶ Developed with inputs from Department of Disaster Management (DMD), Government of Bihar. Available at: page no.x. <http://bsdma.org/images/global/SDMP.pdf> (accessed: 14.10.2017)

⁵⁷ [According to Bihar State Disaster Management Plan \(BSDMP\), page.x.](#)

⁵⁸ A report by Global Facility for Disaster Risk Reduction (GFDRR). This is a global partnership program administered by World Bank Group. Available at: https://www.gfdr.org/sites/gfdr/files/publication/GFDRR_India_PDNA_2010_EN.pdf (accessed: 04.09.2018)

runs from west to east and divides the state in almost two equal parts. The major rivers joining Ganga from left bank are Gandak, Kosi, Ghaghra, Kamla-Balan, and Bagmati and from right bank Punpune, Sone, Gumani and Mohane. The rivers which join Ganga from left bank originate from the Himalayan Mountains. They create one of the most flood-vulnerable regions of the country due to various geographical and hydrological reasons. They cross a long distance in Nepal from where they originate, and enter into plains of Bihar. During the monsoon period when there is heavy rainfall in the catchment area in Nepal and the rivers are full in their capacity, they frequently breach their banks and cause massive floods in the plains of north Bihar.

These rivers have large hill catchment area and steep gradient in Nepal due to which they carry a huge amount of water with them when they enter the flat topography of state.⁵⁹ This results in meandering of the river and due to small scope of drainage the rivers frequently erode their banks. They also carry with them heavy silt deposits due to erosion of mountains, which keeps on accumulating on the river bed and results in overflow of the river during rainfall in the catchment area. In the catchment area of Kosi in Nepal the soil is loose and there are huge landslides due to which siltation is enormous. The loss and damage caused due to floods in the state in last two decades has been shown in the table.

⁵⁹ Available at: <http://nidm.gov.in/PDF/pubs/Bihar%20Flood%202007.pdf> (accessed: 25.10.2017)

The following table shows the extent of damage and loss in Bihar due to floods 1995-2016⁶⁰

year	No of affected districts	No of affected villages	Loss of life		Total area affected (In Lakh ha.)	Crop damaged (Rs Lakh)	Houses damaged (Total)	Public property damaged (In Lakh)
			Human	Animal				
2016	31	5527	458	538	43.3	51977.4	69102	11648.8
2015	8	237	27	1	0.12	0.00	518	3.00
2014	20	2018	158	34	39	17640	169501	1823
2013	20	4810	253	6480	23.60	22280.43	169501	1823
2012	11	277	15	0	1.07	300	473	162.2
2011	25	3577	249	183	38.197	10295.7	851	153.67
2010	09	679	32	0	1.992	311.92	6868	169.2
2009	16	1546	97	2	11.05	2182.57	7674	530.1
2008	18	2585	434	878	8.8242	3420.25	297916	9771.96
2007	22	18832	1287	2423	18.833	7683782	784328	64241.52
2006	14	959	36	31	1.81	706.63	18637	8456.17
2005	12	1464	58	4	4.60	1164.50	5538	305
2004	20	9346	885	3272	27.00	52205.64	929773	103049.60
2003	24	5077	251	108	15.08	6266.13	45262	1035.16
2002	25	8318	489	1450	19.69	51149.61	419014	40892.19
2001	22	6405	231	565	11.95	26721.79	222074	18353.78
2000	33	12351	336	2568	8.05	8303.70	343091	3780.66
1999	24	5057	243	136	8.45	24203.88	91813	5409.99
1998	28	8347	381	187	25.12	36696.68	199611	9284.04
1997	26	7043	163	151	14.71	5737.66	174379	2038.09
1996	29	6417	222	171	11.89	7169.29	116194	1035.70
1995	26	8233	291	3742	9.26	19514.32	297765	2183.57

The above table presents the enormity of the problem that the state has witnesses in the past due to floods. It is a continuous challenge for the state, which it has to face almost each year.

⁶⁰ Available at: <http://disastermgmt.bih.nic.in/Statistics/Statistics.htm>

4.3 Kosi: A Never Ending Challenge

Kosi River, also called the “sorrow of Bihar” is notorious for frequent and rapid avulsions of its course. The annual floods from Kosi affects around 21, 000sq km of land which is mostly the fertile belt of Nepal and Bihar. Thus it has huge impact on the agriculture of the state on which majority of people are dependent for their livelihood. It originates at an altitude of around 7000 meter at mean sea level in the Himalayas in Nepal where it is also called Saptkosi. It is 720 kilometers long which drains an area of about 74, 500 sq km in which 11, 410 sq km lies in India. One noteworthy feature of the River is its change of course since historical times. It has moved by about 130 kilometers westward since last 200 year (Mishra 1997). It has caused massive destruction in the past and is a perennial challenge for the policy planners and disaster management authorities to deal with the massive floods that it creates in the north-eastern Bihar. It enters into India near Hanuman Nagar in Nepal in the district of Supaul. There have been around 30 major floods in the districts of Supaul, Saharsa, Khagaria, Bhagalpur, and Katihar in the last 30 years in Kosi Basin.⁶¹ The Kosi region is very densely populated due to high fertility of soil and the abundant groundwater presence. The people are engaged in subsistence farming even within the floodplains of the river due to annual deposit of fertile loam in the area. This makes the situation more peculiar because the high density of population results in more casualties during floods.

After the devastating floods of 1953 caused by Kosi River the Indian government proposed to undertake a joint study with the government of Nepal to find a lasting solution to the problem. An Indo-Nepalese Co-ordination Committee was made to suggest the measures for taming the river. In 1953 itself the water and power ministries of government of India started the studies to undertake actions for flood management in this river basin. Both the nations agreed upon undertaking the structural measures to tame the river and started Kosi Project in 1954.

The Project envisaged- the construction of embankments on both side of the river to hold the river in one current, the construction of a barrage in Nepal in Bhim Nagar on Indo-Nepal border, digging of canals in Nepal and north Bihar on both side of the river Kosi, and construction of a dam for hydro-electric purpose and checking of

⁶¹ Along The Kosi- Through a Narrow Path, *down to earth*, published on 11th Jan 2017. Available at: <https://www.youtube.com/watch?v=hPdsqnOtyCw> (accessed on 20th Dec 2017)

floodwater. The proposed dam has not been built yet and the government of Bihar and Nepal hold consultations in this matter regularly. But even after these structural measures adopted by the government the floods and subsequent misery caused by the river remain the same (Mishra, 2008). Due to heavy siltation within the embankments the channel capacity has been reduced, and this has exacerbated the frequency and severity of the floods for infrastructure related issues.⁶² The embankments have seen many breaches in the past. But the 2008 breach in the eastern afflux bund near Kusaha in Nepal was very devastating. It turned four Panchayats of Nepal constituting the population of around 30,000 into a watery graveyard. In Bihar total eight districts were affected, among which the most affected were Supaul, Saharsa, Madhepura, Araria and Purnia.

4.3.1 2008 Kosi Breach

The flood caused by River Kosi in 2008 was unprecedented in many respects. This region had not seen the flood of such magnitude in last fifty years. Almost 3700 sq km of five districts of the state constituting its 30% area was totally inundated. It affected a total of 993 villages. The official estimate shows that approximately 3.3 million people were affected. In the rescue operations close to one million people were evacuated straining the state capacity to manage the disaster at such a large scale. The relief camps organized by the state had at peak around 440,000 people living in it. It wiped out almost all the infrastructure of the affected districts, uprooting the roads, destroying the culverts, and affecting the schools and hospitals thereby and emergency services too. The communication through roads totally collapsed and the relief work had to be provided through boats or helicopters.

4.3.2 Damage due to Kosi 2008 flood

The north-eastern region of Bihar is mainly dependent on agriculture with more than ninety percent of the working population directly or indirectly engaged in this activity.⁶³ Agriculture sector witnessed the major devastation due to these floods. Due to sand casting a major part of the land in flooded area became uncultivable,

⁶²According to a report by GFDRR.

Available at: https://www.gfdr.org/sites/gfdr/files/publication/GFDRR_India_PDNA_2010_EN.pdf (03.04.2018)

⁶³According to Economic Survey of Bihar 2007-08. Available at: <http://finance.bih.nic.in/Old-Budgets/Bud2008-09/Economic-Survey-2007-08.pdf> (accessed: 18.12.2017)

thousands of milch and draught animals perished instantly, and the standing crops of thousands of hectares were destroyed. The damage to major sectors was as follows:⁶⁴

- (1) Agriculture and livestock: approximately 2,73,000 acres of the arable land became uncultivable due to sand casting which impacted around five lakh farmers. The standing crops of 6,12,087 hectares were totally destroyed. Around 15,000 milk and draught animals including small ruminants got washed away in the flood waters putting a major impact on the livelihood particularly rural landless people. Among the districts Madhepura was hit the hardest followed by Supaul.
- (2) Housing: according to household survey conducted in 2007-08 at district level the proportion of population living in 'pukka' houses is very low in affected districts. The issue of landlessness is also very significant in this region. Their houses are vulnerable to flood waters and this was witnessed in 2008 too when around 2.36 lakh houses were damaged.
- (3) Roads and culverts: approximately 1830 km of roads were fully or partially damaged which constituted 78.9% of the total road in affected districts. Eleven hundred culverts and bridges were got destroyed. The impact on rural roads was much severe as the majority of these roads were unpaved. Madhepura saw the maximum damage of roads and according to an estimate by the World Bank 680 crore rupees would be required in this district alone for the construction of roads and bridges.
- (4) Water resources: due to floods the Eastern Kosi Canal was severally damaged and in Kosi Irrigation Command Area the secondary and tertiary irrigation infrastructure was also affected. The floods also caused heavy siltation of the canal and damage to hydraulic and other structures.
- (5) Livelihood: in affected districts approximately ninety percent people depended on agriculture and related activities. Due to siltation and water logging in the fields and damage to crops and livestock their productive capacity was badly affected. The state government estimated at that time that the long term impact on economy of the affected districts was much more due to loss of productive capacity in primary sector.

⁶⁴A report by GFDRR.

Available at: https://www.gfdr.org/sites/gfdr/files/publication/GFDRR_India_PDNA_2010_EN.pdf (accessed: 25.03.2018)

(6) Social sector: the school and health care infrastructure was also damaged with Madhepura and Supaul being hit the hardest. Due to floods food deficiency and water-borne diseases also affected the people with household expenditure on health witnessing rise after the floods

4.4 Flood Affected Districts of North-East Bihar

Five districts which witnessed the massive destruction (Supaul, Saharsa, Madhepura, Araria and Purnia) during 2008 Kosi floods, have a large number of people belonging to vulnerable communities whose human and economic development indicators are very low and have relatively low coping capacity.⁶⁵ Even before the floods of 2008 these five districts were among the poorest performers and least developed in the state.⁶⁶ In these districts the level of urbanization is less and in rural areas the proportion of pukka houses is also low resulting into more fatality during floods. These districts have higher work participation rate than the state average which implies the prevalence of depressed wages and widespread poverty. The outmigration from these districts is also very high. People migrate to other parts of the country for employment and higher wages, and invest the saving in their livelihood only to witness it getting washed away in floods. Dignpal Singh, former Member of Parliament narrates how the relatively affluent families become poor overnight and the labour of years gets washed away due to floods in this region.⁶⁷ Due to floods the pre-existing vulnerabilities of groups like children, women, orphans, widows, the elderly, adolescent girls, and socially disadvantaged groups gets accentuated.⁶⁸ The socio-psycho impacts like psychological trauma, homelessness, poor health, and fear of dwelling in damaged houses⁶⁹ also pose a challenge for the disaster management authorities.

⁶⁵According to GFDRR.

Available at: https://www.gfdr.org/sites/gfdr/files/publication/GFDRR_India_PDNA_2010_EN.pdf (accessed: 30.01.2018)

⁶⁶ Ibid.

⁶⁷Available at: <https://www.jagran.com/news/national-jagran-special-on-bihar-flood-and-nepals-water-management-16577126.html> (accessed: 15.09.2017)

⁶⁸ Available at: https://www.gfdr.org/sites/gfdr/files/publication/GFDRR_India_PDNA_2010_EN.pdf (accessed: 12.06.2018)

⁶⁹ Ibid.

The condition of infrastructure in these five districts is also very poor. The penetration of rural road network is extremely low with majority of villages not having paved roads (Census 2001). A report by World Food Programme (WFP) had included three of these districts (Araria, Madhepura, and Purnia) as priority districts for food security intervention on the basis of food security index.⁷⁰ The health care infrastructure in these districts is also insufficient compared to other districts of the state. The Primary Health Centre (PHC) availability ratio is 0.65 for these districts which is very low.

The following table shows some of the human and economic development indicators of five districts affected by Kosi flood in 2008:⁷¹

Indicator	Madhepura	Araria	Saharsa	Supaul	Purnia	Bihar
District-wise per capita GDDP(2011-12) in Rupees (Ranking in state)	8609 (36th rank)	8776 (35th rank)	12197 (11th rank)	8492 (37th rank)	10099 (26th rank)	14574
Per capita consumption of energy (KWH)	235	207	282	264	382	258
Urbanization	4.4	6.0	8.2	4.7	10.5	11.3
Density of population	1116	992	1125	919	1014	1106
Decadal growth rate of population	31.1	30.2	26.0	28.6	28.3	25.07

⁷⁰ Ibid.

⁷¹ Economic Survey Bihar 2016-17. Available at: <http://finance.bih.nic.in/Reports/Economic-Survey-2017-EN.pdf> (19.03.2017)

Sex ratio	911	921	906	929	921	918
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Drez and Khera (2012) have conducted a study of regional patterns of human and child deprivation in India on the basis of district-wise data. The study is based on three indicators namely child mortality, adult female literacy rate, and the proportion of households with a low standard of living.⁷² According to their findings they place north-eastern Bihar among those regions of the country which perform very poorly on almost all the indicators. They term these regions as the ‘regions of deprivation’ which require suitable policy interventions by the state on a priority level.

On the basis of District Level Household Survey (DLHS-3, 2007-08) and provisional data from Census 2011 the Population Foundation of India (PFI) has developed some indicators to assess the overall development of 601 districts taken from 34 states of the country. These indices primarily focus on the reproductive and child health in these districts. Socio-Demographic Development Index (SDDI) uses six district DLHS-3 indicators and four Census-based indicators, whereas Social Development Index (SDI) demonstrates the extent of social development/disparities. The findings for the five districts are presented below which show their dismal performance in the social development indicators.

Ranking of these five districts (Madhepura, Saharsa, Supaul, Araria, and Purnia) in composite indicators in the state:⁷³

	Madhepura	Saharsa	Supaul	Araria	Purnia
SDDI Rank at state level	35th	31st	22nd	30th	33rd
SDI Rank at state level	36th	33rd	23rd	34th	35th

⁷²Dreze, Jean, and ReetikaKhera. "Regional patterns of human and child deprivation in India." *Economic and Political Weekly*(2012): 42-49.

⁷³ Available at: <http://populationfoundation.in/files/fileattached/Fileattached-1480404731-Ranking-of-District-in-Bihar-and-Jharkhand.pdf> (accessed: 04.07.2017)

Inside the embankments the condition of those living is very harsh, with few amenities provided by the government. After the construction of embankments in both sides of the river which is five to twelve kilometers wide, there were around two hundred villages which were trapped inside. The government promised to rehabilitate them at the earliest but till today this promise has remained on the paper only. While some villages were relocated, others remained inside it facing crisis during monsoon period and floods. The connectivity in these villages is possible only through boats because government does not recognize many of these habitations and consider them illegal. Due to floods these villages keep on being displaced from one place to another within the embankment. Some villages have been relocated 10-15 times during this period. Since these villages mainly depend on agriculture, their fate always hangs on the waters of Kosi. Inside embankments there is huge scarcity of drinking water and emergency services. The dwellings are non-permanent structures to minimize the loss from destruction. RajendraJha of KosiSevaSadan depicts a very negative picture inside the embankments.⁷⁴ Due to water logging, sand casting, and siltation inside the embankments there is uncertainty of agricultural production in the region and people are forced to live in misery.

4.5 Bihar's Mitigation Plan for Floods

Prevention and mitigation for an imminent disaster is different than preparedness in the sense that the former processes are hazard and development specific but the later is people and area specific.⁷⁵ The mitigation plan should include ways and methods which directly help in minimizing the damage done by a disaster. In a landlocked state like Bihar the dominant reason of flood is either heavy rains in the catchment area of a river or excessive discharge released from a reservoir. These floods result in excessive erosion of the river banks or the breach in embankment. The mitigation measures then, in a place like Bihar should include the smooth passage of river water through regular desiltation of its bed and storing the excess water from the rivers in various storage structures like ponds, reservoirs, rivulets etc so that it can be utilized

⁷⁴ "Along the Kosi Through a Narrow Path".

Down to Earth. Available at: <https://www.youtube.com/watch?v=hPdsqnOtyCw> (accessed: 20-12-2017)

⁷⁵ According to BSDMP. Available at: <http://bsdma.org/images/global/SDMP.pdf> (accessed: 03.03.2018)

for irrigation and other purposes.⁷⁶ But the state's mitigation plans have been mostly centered on inundation and erosion. De-siltation has not been taken as an integral part because of requirement of huge sum of money and technology.⁷⁷ The chief minister of Bihar has only recently talked about the Ganga Silt Management Policy for smooth drainage of the rivers.⁷⁸

The National Flood Policy 1954 has recommended the measures to be taken for flood control in the country. It has divided the flood mitigation measures into three broader categories: immediate, short-term and long-term. The immediate measures include the collection of data, protection of selected town, and the construction of embankments in the most-vulnerable areas; the short-term measures include the construction of embankments, raising of villages and channel improvement of the rivers; and the long-term measures include the construction of storage, reservoirs on the tributaries of the river etc.⁷⁹ The state government has resorted to mainly the construction of embankments, whose length is getting added every year and anti-erosion works. It has failed to take long-term mitigation measures even after suggestion of different committees (CAG report 2012).

The non-structural measures for flood management like flood proofing, flood forecast and warning, flood insurance are not at advanced stage in the state, though many initiatives have been taken. National Remote Sensing Centre (NRSC) of ISRO has prepared the flood hazard map of whole state and individual districts. International Centre for Integrated Mountain Development (ICIMOD) with collaboration with Japan Aerospace Exploration agency (JAXA) has developed a district-level mapping of flood-prone area for 33 districts of the state with the support of Australian government. These maps have the capacity to illustrate village-level inundation and will help the disaster management authorities in supporting community-level risk-reduction activities.⁸⁰ This map can go a long way in helping the state government agencies in flood forecasting and warning in cloudy days too. The website Flood Management Information system (FMIS) has been developed by the state government which provides flood forecasting and warning on a real time basis. Central Water

⁷⁶ Ibid.

⁷⁷ Ibid.

⁷⁸ <https://timesofindia.indiatimes.com/city/patna/nitish-for-ganga-silt-management-policy/articleshow/58829028.cms> (accessed: 10.05.2018)

⁷⁹ BSDMP. Available at: <http://bsdma.org/images/global/SDMP.pdf> (accessed: 04.03.2018)

⁸⁰ Ibid.

Commission (CWC) is the premier organization in the country which issues flood alert in the country and it has installed thirty two monitoring stations in the state for this purpose. The information and communication technology is also very useful in providing the real time information directly to concerned authorities and people living in flood-prone area. This can prevent the precious loss of life and damage caused by the floods in the state.

4.5.1 Flood control strategy to tame Kosi

Bihar is endowed with many rivers flowing perennially, irrigating its vast swath of fertile land and providing it with rich agricultural production. The deposits brought by the rivers consisting of silt, clay and sand make the soil very fertile for cultivation and this is the reason the state is agriculturally very prosperous. But the nature of rivers meeting Ganga from left bank is very unpredictable due to their large catchment area in Nepal. Heavy rains in the Himalayan Kingdom causes massive floods in the north Bihar, where almost 76% of the area is flood-prone.⁸¹ In the southern Bihar floods are normally caused by excessive discharge from the reservoirs. The government has taken many structural as well as non-structural measures to tame these mighty rivers and stop them from robbing people's life, livelihood and their possession to a possible extent.⁸²

To stop or minimize the damage caused by floods structural and non-structural measures are adopted by the governments. The structural measures include the construction of dams and reservoirs, embankments, floodwalls, flood levees, the construction of Natural Detention Basin, channel improvement, diversion of flood water, anti-erosion works, drainage improvement, catchment area treatment etc.⁸³ Non-structural measures for flood management include the flood plain zoning, flood forecasting and warning, flood proofing, regulation of reservoirs, flood insurance etc.⁸⁴

Indian government as well as Bihar government has traditionally relied on the structural measures for flood management in the country, with Nehru once comparing

⁸¹ Flood Information Management System (FMIS), WRD Government of Bihar. Available at: <http://fmis.bih.nic.in/history.html> (accessed: 01.02.2018)

⁸² Bihar State Disaster Management Authority (BSDMA). Available at: <http://bsdma.org/images/global/SDMP.pdf> (accessed: 15.02.2018)

⁸³ According to National Remote Sensing Centre (NRSC), an arm of ISRO. Available at: <https://nrsc.gov.in/disaster/flood/bihar/biharflood.html> (accessed: 20.02.2018)

⁸⁴ Ibid.

the large dams as the temples of modern India.⁸⁵ For flood management in Kosi River the government has mainly resorted to the structural measures though the non-structural measures are increasingly being inducted in recent decades. The Kosi project started in 1954 envisaged the construction of embankments, barrage, a dam and digging of canals. It was thought that the construction of the dam in Nepal would be able to hold the excessive discharge during heavy rainfall in catchment area, and the embankments downstream would hold the river in one course and prevent the floods in adjoining area. The construction of canal on both sides of the barrage was supposed to regulate the flow of water and help in irrigation in Kosi basin. The Department of Water Resources (WRD) of the government of Bihar is the main agency which looks at the flood control measures in the state. In Bihar state the general flood protection strategy consists of the construction and maintenance of embankments, revetment in selected portion of river banks, land spurs etc (WRD, Bihar).⁸⁶ It has constructed 3745 km length of embankments, which has brought around 36.46 lakh ha area under protection.⁸⁷ The length of Kosi River in India is 260 km, and the length of embankments in Kosi Basin (which also includes Adhwara group of rivers) is 637.41 km.⁸⁸

4.5.2 Kosi embankments: a necessary evil?

One of the largest tributaries of Ganga, Kosi River originates in Nepal, which is joined by many rivers like Tamur, Arun, Sun Kosi, Indravati, TambaKosi, DudhKosi etc. In Nepal it is known as SaptKosi due to confluence of seven rivers in route. It crosses India near the barrage of Bhimnagar, and enters Supaul district of Bihar. It has within its drainage basin some important cities of Bihar like Purnia, Katihar, and Supaul. It also passes through districts of Saharsa, Khagaria and Bhagalpur. The drainage basin of the river is very large and it covers a large area of north-east Bihar.

Kosi is infamous for changing its course and causing devastating floods in the region. But after the construction of the barrage in Nepal, and embankments on both sides of the river in Indian and Nepal side the nature of debate has shifted from its merely being a state issue. The catchment area of Kosi is very large in Nepal and the

⁸⁵ Available at: <https://www.financialexpress.com/archive/templesofmodernindia/90143/> (accessed: 09.06.2018)

⁸⁶ According to Department of Water Resources (WRD), Government of Bihar. Available at: <http://wrд.bih.nic.in/> (accessed: 12.04.2018)

⁸⁷ Ibid.

⁸⁸ Ibid.

hydrology and terrain of the area is such that even after the construction of barrage and the canals on both side of the barrage, the huge amount of water and large quantity of silt carried along with it always pose a danger to its structures. When the prescribed load on the barrage rises, and it starts threatening the upstream part of Nepal, it releases the water. It is common practice among the local news media to blame the fury of floods on Nepal. Seldom do they question the flood control policy of government which is primarily embankment-centric, and doesn't visualize any alternative model.

Some grass root organizations like D K Mishra led BarhMuktiAbhiyan⁸⁹ and D K Singh led KosiMuktiSangharshSamiti⁹⁰, which work with the communities affected by floods release the reports of human suffering caused by the government policy. The plight of people entrapped within the embankments has always been raised in the state and union legislature but the government has always evaded the question of their proper resettlement and rehabilitation. Their misery continues with each passing year and they are forced to live like nomads within their own territory. Neither they get the government services nor can their children attend regular schools because of frequent relocation of the village. They are forced to migrate to other places for livelihood and subsequent exploitation. Their mainstay which is agriculture is totally dependent on the vagaries of rains in Nepal. The standing crops are destroyed and their land gets filled with sand which makes it unsuitable for cultivation.

4.5.3 An evaluation of Flood Control Measures

The performance audit report by of the works done by WRD during different Five Year Plan period by CAG demonstrates various loopholes and deficiencies in the work and strategy adopted by the government of Bihar for flood control. The audit of the Eleventh Plan period indicate that despite the increase in plan allocation WRD did not execute the long term plans for flood management in the state (CAG Report, 2012). The Department only resorted to short term measures, which too were riddled with many deficiencies. For long term flood management in the north Bihar, Ganga

⁸⁹BarhMuktiAbhiyan is an NGO, convened by Dinesh Kumar Mishra which organizes local communities of flood prone areas and work like a movement to challenge the current flood control policy of the country.

⁹⁰KosiMuktiSangharshSamiti is an organization based in Supaul which is headed by D K Singh. Through its activities it has tried to raise the issue of 'victims of embankment'. Available at: <https://www.jstor.org/stable/pdf/40278181.pdf?refreqid=excelsior%3A19d21111eeda72fe3efc9c1e7e7c495d>. p 6.

Flood Control Committee (GFCC), 1972 has suggested the Department for making Detailed Project Reports for the construction of dam in upstream region of Kosi in Nepal, inter-linking of rivers, and creation of Detention Basin. But these were not completed even during the 11th Plan period. This shows the lax attitude of the Department in a state which witnesses so much destruction due to floods almost every year. The Department had also failed to utilize 11-40% funds allocated to it due to various deficiencies in its execution and was able to construct only 61.47 km embankment against the target of 1535 km (ibid).

Though there has been excessive reliance on the construction of embankments for flood control in the state, this approach has been questioned by many within the government as well as outside the government (Mishra, 1998, 2009; NIDM, 2007). The construction of an embankment disturbs the drainage pattern in the area and creates other problems (NIDM, 2007). The rain water between embankments of two rivers gets trapped and cause water logging. In fact the large area of land is facing this problem alongside the embankments of Kosi River.⁹¹ The natural drainage of the river basins has severally hampered and according to WRD 8.32 lakh hectare area of north Bihar is water logged.

A fact finding report on 2008 Kosi floods by prominent experts in hydrology and floods indicate that though the government has built more than three thousand kilometer of embankments in the state, the flood propensity has increased by 2.5 times during the same time period (Mishra et al. 2008). Moreover there has been talk of massive corruption in the whole process of the construction and management of embankments which is a big business for engineer, contractor, bureaucrat, and politician and these groups have a vested interest in keeping the levees in place (Rorabacher 2008). The nexus between them has been raised many times in the state legislature but nothing much has changed over years (Mishra 1997). Mishra (2004) says that the annual floods bring with it the government relief works and huge amount of money is poured through different channels which works as the 'fourth crop' in the region, which is to be cut each year.

⁹¹ Available at: <https://www.youtube.com/watch?v=hPdsqnOtyCw> (accessed: 09.12.2017)

4.6 Bihar State Disaster Management Authority (BSDMA)

National Disaster Management Act, 2005 (DMA) is the principle legal document related to disaster management in the country which provides a broad framework through which the structure and the function of various authorities related to disaster management at central, state, and district levels has been derived. At state level it talks about the constitution of State Disaster Management Authority (SDMA)⁹² and at district level District Disaster Management Authority (DDMA)⁹³. Accordingly Bihar State Disaster Management Authority (BSDMA) was constituted in 2007. The major roles and responsibilities of the BSDMA include the laying down of the policies on disaster management, approving the state disaster management plan, approving the state government's department's plans and providing the guidelines about their integrated working during disasters, laying down the guidelines which should be followed to draw the district disaster management plan by district authorities, etc.

State Disaster Management Authority of Bihar has been very active in formulating and updating policies related to Disaster Management in the state. It is the first state of the country to prepare a Roadmap for Disaster Risk Reduction 2015-2030 inculcating the broader principles of Sendai Framework. It organizes regular workshops and seminars, disaster safety weeks, etc to promote awareness and a culture of preparedness among various departments and general population. It organizes flood safety week in the first week of June each year in flood prone districts.

This year a conference in Patna was organized on the subject of floods in cities. From this year the government has instructed the schools across the state to observe each Saturday as 'Safe Saturday' and train the students in disaster management at their schools⁹⁴. It organizes training sessions for teachers, government officials, engineers, elected representatives and others in the capital city of Patna and also in district headquarters and blocks of flood-prone districts. It regularly publishes the booklets and advisories related to various disasters, so that the awareness could be spread among the masses. In the year 2018 it has published advisories on safety from hot loo

⁹² Section 14 (1) of Disaster Management Act. 2005.

⁹³ Section 25 (1) of Disaster Management Act. 2005.

⁹⁴ Available at: <http://www.dnaindia.com/india/report-safety-comes-first-bihar-schools-set-to-have-safe-saturday-for-students-2560631> (accessed: 03.04.2018)

winds, fire, lightening, and precautions to be taken during celebration of DusseheraPuja,etc.

4.6.1 BSDMP and other institutions to deal with disaster in Bihar

Bihar State Disaster Management Plan (BSDMP) has been prepared with extensive consultations among expert groups from various disciplines. The document talks extensively about the roles and responsibilities of various state departments and state and district authorities in the management of various kinds of disasters in its different phases viz. prevention and mitigation, preparedness, rescue and relief, and rehabilitation. The Department of Disaster Management (DDM) is the nodal department for disaster management in the state, which co-ordinates the works of other departments related to disaster management at all levels: state, district and communities.⁹⁵ Its functions are spread out from co-ordination with state departments, to dealing with specialized institutions like BSDMA, Bihar State Disaster Response Force (BSDRF), National Disaster Response Force (NDRF)), Bihar State Institute of Disaster Management (BSIDM), SDMA/DDMA, and involvement with multilateral agencies, professional bodies, NGOs, armed forces, corporate houses, and media⁹⁶. The department also follows-up with the repair and maintenance of embankments with Water Resource Department (WRD) of the state.

The floods in the state are the pressing issue which affects the major part of the state and hence the institutional mechanism to deal with flood has been laid down in a systematic manner in the BSDMP The plan talks about the involvement of twenty six out of forty four departments of the state government in disaster management activities due to their nature of work.⁹⁷ It mentions the roles and responsibilities of each department regarding their nature of involvement pre and post disaster management. Apart from the state departments BSIDM has also been included in the plan. The state has constituted Bihar State Disaster Response Force on the lines of NDRF which is mandated to work in relief and rescue works during disasters.

The prevention, mitigation and preparedness of flood related risk is the primary responsibility of Water Resource Department (WRD) of the state, which implements

⁹⁵ According to BSDMP. Available at: <http://bsdma.org/images/global/SDMP.pdf> (accessed: 17.12.2017)

⁹⁶ Ibid.

⁹⁷ Available at: <http://bsdma.org/images/global/SDMP.pdf> (accessed:17.12.2017)

and monitors all the construction work done on the river banks like construction and maintenance of embankments, levees, soil-erosion works and other engineering works related to river management.⁹⁸ It has also been tasked with developing Early Warning Systems (EWS) to provide timely information about the impending floods in the concerned locality, developing FMIS for all river basins in the state, and GIS mapping of the flood-prone areas.

4.7 Media Coverage of Floods in Bihar: The Reality and Visibility

Bihar is one of the worst flood affected states of the country, and it has always garnered the attention of national as well as local media because of it. The unprecedented floods of 2008 due to breach in Kosi bund and its huge impact on the people of both countries Nepal and India were widely reported in the international media with some even suggesting the underreporting of deaths by the respective governments.⁹⁹ Almost every year the recurrent and wide spread floods and the devastation and misery caused by it get enough coverage during debates and discussions in electronic media too.

In the news studio politicians, experts, civil society members, and people's representatives of local movements are frequently seen debating the issue of perennial floods, the inconvenience and the large scale displacement of entrapped population, the relief and rescue efforts by government machinery and the role of government in managing the floods. The columns in local as well as national newspapers remain full with description of the scale and enormity of floods in the state during monsoon period. Starting from the beginning of June when the rains start in the catchment area of Nepal with the arrival of monsoon, the reports and news related to floods in northern Bihar start pouring in through different media. Even in a drought year when the rains were less than normal in Bihar in 2016, the floods in the state were caused by the mismanagement of a barrage and dam in West Bengal and Madhya Pradesh.¹⁰⁰

⁹⁸ Available at: <http://wrd.bih.nic.in/> (accessed: 06.12.2017)

⁹⁹ Available at: <https://www.nytimes.com/2008/08/30/world/asia/30india.html?ref=world> (accessed: 15.12.2017)

¹⁰⁰ Available at: <https://timesofindia.indiatimes.com/india/Poor-dam-management-responsible-for-Bihar-flood/articleshow/53835622.cms> (05.05.2018)

Sometimes even irrational thoughts have also been promoted to garner attention of media, like attributing the breach of embankment to rats and foxes¹⁰¹.

4.8 Conclusion

The flood management in Kosi basin has remained a herculean task for all three stakeholders India, Bihar and Nepal. The structural measures adopted by the policymakers to control the floods of Kosi through construction of Barrage, levees, embankments etc. have not been able to reduce the damage caused by it. Even after taking these steps, different studies point to increasing vulnerability of the region, like what happened in 2008 floods. The drainage pattern of whole Kosi region has undergone drastic change due to these measures, and this has affected the agricultural practices, and flow of different channels in the region. For example, the region has now started to experience the drought too, because of less flow of water in the distributaries of Kosi due to construction of embankments. The misery within the embankments, where around 300 villages and 12 lakh people are still living, also hangs on balance. No solution seems to be in sight for them.

These all strategies point to the limitation of government policies to control the flood disaster from structural measures, even though the state government has shied away from taking more investment intensive and long term flood control measures as suggested by National Commission on Floods. With limitations of controlling the flood waters through structural measures, the emphasis on non-structural measures like preparedness at the community level and mitigation measures in the region becomes of paramount importance. The current paradigm of disaster management, which puts more emphasis on moving beyond techno-centric approach and empowering the community for the impending disaster, then become more significant to be employed. The next chapter discusses the measures that the government has taken to make the community more resilient to face the flood disaster, by conducting field survey in two flood affected districts of the state. It presents the detailed findings of the field survey conducted in the district of Madhepura and Supaul.

¹⁰¹ Available at: <https://www.livehindustan.com/bihar/story-rat-are-the-cause-of-bihar-flood-1432805.html> (accessed: 13.06.2018)

Chapter 5

Field Survey in Supaul and Madhepura

5.1 Introduction

District Madhepura and District Supaul of Bihar are situated in the *drainage basin*¹⁰² of River Kosi. Both share their border with each other, and culturally come under the region of Mithilanchal. They used to be the part of Saharsa district as its subdivisions, and later were made separate districts. These are flood prone districts and face the onslaught of river Kosi almost each year. River Kosi and its distributaries have a significant impact on the culture, lifestyle, living pattern, and livelihoods of people of this region. Although the region is rich with fertile alluvial soil due to drainage of Kosi River, the sand casting and siltation due to floods make the land difficult to cultivate. These districts are also home to a staggering proportion of people living under multiple deprivations, low human development indicators and low urbanization.

These districts are economically very poor, and the government has the challenge to address the problem of poverty and floods simultaneously to improve the conditions of people living here. The earlier chapter had discussed the flood control strategy of the Government of Bihar, which had some limitations. This chapter discusses the community resilience building measures, which have been an essential part of disaster management strategy of the government, in these two districts through field survey.

The chapter first gives a short description of general as well as hazard profile of both the districts. Then it proceeds to the findings of the survey which was spread over twelve villages of four blocks in these two districts.

5.2 A Brief Profile of Supaul District

Supaul district has been carved out of Supaul and Birpur sub-divisions of the former Saharsa district. It lies in the northeastern region of the state of Bihar. This district shares its boundary with Nepal in north, from where the mighty river Kosi enters into the plains after traversing a huge distance in the Himalayan State. Traditionally being

¹⁰² A *drainage basin* consists of the land area of a main stream and its tributaries. It includes those areas too whose rainfall drain out in the main stream.

part of Mithilanchal since Vedic period, the whole region of Supaul has been mentioned as MatasyaKshetra (fishery area) in the Hindu mythology. During the ancient period it has been ruled by many powerful kingdoms like Magadha, Nanda, Sunga, Maurya, Mithila etc.

The district of Supaul is a part of river Kosi division. It is spread over an area of 2,410 sq km. Headquarter of the district is situated in Supaul town. For the administrative purpose it has been divided into 4 Subdivisions and 11 Community Development Blocks (CDP). It has 3 statutory towns and 551 villages. In various demographic indicators the district has dismal performance compared to majority of other districts of the state.

According to district Census of Supaul it has a literacy rate of 57.67% which is below the state average of 61.8%. The percentage of urban population is very low at 4.47% compared to the whole state of 11.29%. The share of marginal workers among the total workforce is higher with respect to state average. Among workers the highest proportion is of the agricultural labours who account for 63.15% of the total workforce. During season of different agricultural activities like sowing, and harvesting of crops in the north Indian states of Punjab and Haryana people from this region migrate in massive numbers. A large number of people also migrate from the region in search of employment in different cities, which is significantly informal and short-term nature.

The geography of Supaul is predominantly influenced by the river Kosi and its tributaries and distributaries. The major tributaries of river Kosi in the district are Sursar, Mirchaiya, Kali, Tilawe, TilyugaChhaimara, etc. The district gets ravaged by floods almost each year. During monsoon season almost all the rivers including river Kosi starts flowing over full of their capacity and a large portion of the district gets submerged under water. It also receives plenty of rainfall during monsoons. The average rainfall of the district is 1344 mm which is above the state average. The type of soil found here is alluvial which is very fertile in nature. It has a very suitable agro-climatic condition for growing of cereals, horticulture, and vegetables. Though the area under agriculture use in the district is around 1,658 sq km, the problem of water logging makes large swath of land unusable. People have lately shifted to the cultivation of maize, and jute which gives good economic return. The cultivation of

maze is also a compulsion in those places where the fields remain submerged for longer duration of time and people are not able to show kharif crops.

5.2.1 Hazard profile of Supaul district

The whole district of Supaul is vulnerable to natural disasters like flood, cyclone, earthquake, fire, and sometimes draughts too. But in terms of frequency and severity of climatological and hydro-meteorological risk, it is perennially damaged by flood events due to presence of river Kosi. The whole district also falls under the seismic zone V. The devastating earthquake of 2015 whose epicenter was in Nepal had affected Supaul too. The high velocity cyclonic storms are also common during summer season which are locally called *KalBaisakhi* or Norwester. According to the vulnerability Atlas of India Supaul district is 100 percent prone to wind of high velocity (-47 m/s).

The district has been endowed with many rich water bodies, which consists of glacial rivers, ground water, rain-fed rivulets and Tals¹⁰³. According to an estimate around 0.421 lakh hectare area of the district is affected annually. The statistics related to hydro-meteorological events like flood and extreme rainfall over the past 100 years demonstrate the considerable change in its frequency and intensity.¹⁰⁴ Thirty six panchayat of six blocks are severally flood prone in the district. River Kosi Barrage of Nepal is close to the northern boundary of the district. Due to vicinity of the barrage the people living here remain fearful and alert during the monsoon and remain attentive to warnings and advisories by the engineers of the Project whenever there is rise of the water level in the barrage.

¹⁰³*Tal* is the low lying area of fields of Bihar which remain submerged during the monsoon, and are famous for the cultivation of pulses. They also act as the natural storage for excess water during rains.

¹⁰⁴ Ibid.

Impact of flood and damage in Supaul:¹⁰⁵

Year	No of affected blocks	No of affected Panchayat	Population affected (in Lakh)	Livestock affected (in Lakh)	Area affected (in Hectare)	Houses damaged
2005	02	98	0.61	0.14	.004	445
2006	03	09	0.03	0.01	0	819
2007	06	61	2.30	0	0.12	11671
2008	05	86	7.50	2.63	0.84	73300
2009	05	30	7.70	0	0.04	1914
2010	06	32	1.34	0.14	0.04	8808
2011	06	31	1.15	0.09	0.07	2962
2012	03	23	0.63	0.02	0.68	719
2013	06	33	1.20	0.07	2.00	2417
2014	06	28	1.10	0.03	0.06	924
2015	04	28	0.86	0.01	NA	220
2016	06	39	1.06	0.04	0.04	1701

The district administration has prepared the District Disaster Management Plan (DDMP) for effective management of its multi hazard vulnerability. It also publishes Supaul District Annual Flood Working Plan each year. The working plan mentions various steps that the district administration will take before and after the floods in the district, and the list of resources and manpower to execute this plan. The plan follows the Standard Operating Procedure (SOP) made by BSDMA. It has made the list of block, panchayat, and village which are severely flood prone, and the list of vulnerable groups like pregnant women so that in case of crisis situation they can be provided relief on a priority basis. It mentions the group of manpower who will handle different operations before and after the flood like, the list of home guards and engineers for the safety of embankment, sailors for operating the boats, doctors, paramedics, and veterinarians for meeting the health emergency, and people from

¹⁰⁵ Available at: <http://disastermgmt.bih.nic.in/> (accessed: 12.06.2018)

various departments of the government to take the particular measures in their respective field.

5.3 A Brief Profile of Madhepura District

Madhepura has been part of the great history of North Indian Kingdoms. It was once part of the mighty Mauryan Empire. A Mauryan pillar has been found in Uda-Kishanganj which substantiates this fact. It has been ruled by Kingdoms of Sunga, Kanva, Anga, and Kushans in different periods of ancient history. The region has also witnessed the rule of famous Gupta Empire. The district comes within the terrain which is badly hit by the unpredictable fluctuations of river Kosi, which has washed away most of the historical sites and the remnants of erstwhile rich history. SingheshwarSthan, located at the distance of eight kilometers from the town of Madhepura has an ancient Shiva temple which holds a very important place in Hindu mythology. Traditionally Madhepura has remained the part of Mithila kingdom and Maithili is widely spoken along with Hindi.

The district is part of river Kosi division, which is an administrative unit consisting of two more districts of Saharsa and Supaul. It is a land locked district which is situated in the north eastern part of the state. The administrative headquarter of the district is in the town of Madhepura which is also the largest statutory town of the district. It was carved out of Saharsa as a separate district in 1981. It now consists of two subdivisions and thirteen Community Development Blocks (CDB). It has one Census town SingheshwarSthan, one Municipal Corporation Madhepura, one Nagar PanchayatMurliganj, and 170 panchayat.

According to census 2011 Madhepura has a population of more than 20 lakh. The district has seen the highest decadal growth rate of population during the decade of 2001-11. The literacy level is low at 52.25% compared to state average of 61.8%. Female literacy is very low at 41.42% only. The ratio of urban population is also low at 4.42%. Agriculture is the major source of livelihood of the district with more than 85% of population engaged into this activity. Among the workforce of the district 62.26% are agricultural labours and only 2.10% household industry workers. The condition of industries and business in the district is a great cause of concern due to lack of proper development in the field of industry and agriculture.

Madhepura is situated in the flood plains of river Kosi and occupies a land area of 1,788 sq km. It has a rich younger alluvium deposits by River. River Kosi carries a huge amount of sand and silt during the floods in monsoon which remains left after the recession of flood. This has resulted into shifting of channels of river Kosi streams, known locally as *Dhars*¹⁰⁶. The district is also full of low lying areas called *Chaur*s which act as the natural water absorber during excess flow of water. Due to the construction of East River Kosi Command Area the facilities of irrigation has helped the agricultural production in the region but on the other hand the construction of embankment has made the rivers of Madhepura dry and shallow too. After the construction of embankment on river Kosi the natural flow of water in rivers of the district has been hampered and rivers like Tilabe, Sonh, Parwane, Barhari, Duas, Sursar, Baiwah, Loram, Harun, etc have become dry. The bed of these rivers have become shallow and even rainwater does not stay in their course. The district receives the average rainfall of 1230 mm.

5.3.1 Hazard profile of Madhepura district

Madhepura is regarded as one of the most disaster prone district of the state as disasters like draught, flood, cyclone, earthquake, landslide, high velocity cyclone etc. strike the district, according to the vulnerability of the area. It lies in the Seismic Zone V and IV which is considered as a very high damage risk zone (Seismic Zoning Map of India). Though 2015 earthquake of Nepal has not resulted into any loss of life in the district, it has damaged a lot of buildings and roads. People in the area still remember the devastating earthquake of 1934 which has caused extensive damage in the area. The district is also prone to high velocity cyclonic storm. In 2015, a cyclonic storm of 150-200km/hour hit the district and destroyed standing crops in thousands of hectares. Besides resulting in the loss of life of more than 40 people it affected thousands of people, including women and children.

But flood is the most frequently occurring disaster in the district. Here around 0.676 lakh hectare of area get affected annually due to the floods¹⁰⁷. Misfit channels (locally known as *Dhars*) flow across the district in a north-south direction, and cause floods in their adjacent places during the monsoon. *Chaur*s also get excessive water during

¹⁰⁶*Dhars* are ephemeral drainage channels of Kosi which take the form of full-fledged river during monsoon and submerge the adjoining area frequently.

¹⁰⁷ The report is available at: <http://bsdma.org/images/DDMP/Madhepura%20Inception%20report.pdf> (accessed: 05.03.2018)

the period and bring extreme hardship for people. The floods of 2008 had an impact on the lives of 14.02 lakh people and 2.01 lakh livestock, and it had also damaged around 1.30 lakh houses fully or partially.¹⁰⁸ Among the blocks Alamnagar and Chausa is severely flood prone and they witness flood almost every year. Besides flood the district is also hit by droughts. In some fateful year both flood and drought strike in the different parts of the district.

Impact of flood and damage in Madhepura:¹⁰⁹

Year	No of affected blocks	No of affected Panchayat	Population affected (in Lakh)	Livestock affected (in Lakh)	Area affected (in Hectare)	Houses damaged
2005	-	-	-	-	-	-
2006	1	2	-	-	-	-
2007	3	24	70	-	0.22	2100
2008	11	140	14.02	2.01	2.93	129460
2009	-	-	-	-	-	-
2010	3	7	-	-	0.00	25
2011	5	24	1.05	0.11	0.23	532
2012	-	-	-	-	-	-
2013	-	-	-	-	-	-
2014	2	12	-	-	1.18	-
2015	-	-	-	-	-	-
2016	5	12	0.89	0.08	0.02	295

DDMP of the district has not been finalized yet. The agency entrusted with making the Plan (Gorakhpur Environmental Action Group) had submitted the comprehensive draft of the plan to the government but the government has not yet given its final assent. The draft DDMP has been prepared very comprehensively enlisting the vulnerability from multi hazard of the district and the prevention and mitigation measures. It also mentions the complete list of resources and manpower at the

¹⁰⁸ According to the data taken from: <http://disastermgmt.bih.nic.in/> (accessed: 24.10.2017)

¹⁰⁹ Ibid.

disposal of government to be used before and after the occurrence of events. Next section gives the details of the survey findings.

5.4 Findings of the Survey

The findings of the survey have been presented below:

5.4.1 The Reason of Flooding

In the village of Muraut and Kapsasia which lie in Alamnagar block of Madhepura district, the people note that the main reason of flood was the non-construction of embankment on a small stretch of river Kosi up to Khagaria town. Due to this, the water inundates their village and their fields each year. In Chirauri and Morsanda the villagers said that this was the fate of the region to face the flood, and taming the river through the construction of embankment had only exaggerated the problem. They said that earlier the water from river Kosi used to come and recede quickly enriching the soil through fertile deposits, but now the area remains waterlogged for longer time period, and there is always the fear of breach in the embankment and repeat of incidents like that happened in 2008 Kusaha breach.

The people of Ghiwha, Teen Tangi, Bhagwatpur and Pariahi informed the researcher that the main reason of flood in their area was due to overflowing of the Sursar River. Sursar is among many streams that come out of river Kosi. Lachhmipur and Daparkha get inundated by Ghedariver, another stream of river Kosi. The fields of all the six villages surveyed in the district remain waterlogged for more than 2-3 months during monsoon period, sometimes water reaching in the households and shelter of cattle. Sursar and Gheda remain empty whole year except during monsoon. During the period of monsoon the people have to navigate through boats from one part of the village to another part in Bhagwatpur and Pariahi due to lack of bridge on the Sursar. Temporary bamboo bridges have been constructed by people in the village to cross-over in period of low water. The respondents of village Daparkha said that the construction of insufficient number of bridges and culverts on the recently constructed national highway close to the village was also responsible for floods in the village. Last year the floods had created a lot of difficulty for the people of this village and the villagers had to take shelter on the road along with their livestock in the open sky.

5.4.2 Drinking water facility

The region has abundant water resources due to presence of rivers, streams, and canals. The water table is also quite near to surface which makes its extraction from ground easy and affordable. The requirement of water for agricultural activities, drinking and other purposes is met by digging the tube wells and hand pumps. Though the water is abundant in the region, it has very high iron content due to which its consumption without treatment is unsafe. According to the report by Central Ground Water Board (CGWB) the iron content of the ground water in the River Kosi area has been found to be more than the permissible limit for consumption¹¹⁰. The quality of underground water in pre-monsoon and post-monsoon period also varies extensively. People reported that after the rains the water becomes too dirty to consume.

Safe drinking water was found to be a big issue in the survey. In some villages, people had to rely on packaged drinking water also. It questions the policy of the government as to how the only industry present in such remote village as Sonamukhi, which supplies water to Muraut, Kapsasia and other adjoining villages, is the water purifying industry. In Ghiwha the government had installed water tank with the investment of approximately forty lakh rupees but within a year it became unusable due to poor maintenance. The quality of water coming from the tank was also low. It had excessive iron presence. So the people in the villages slowly stopped using it. In some villages the government funded water facility is proposed. The government of Bihar has started a project of installing tap water in each home through “*HarGharJalYojana*¹¹¹” (water in each home). In flood prone regions, where the safe drinking water throughout year is an important issue.

As far as raising the base of the hand pumps installed by the government was concerned, a mixed picture emerged during the survey. The base of hand pumps had been raised only in half of the villages surveyed. In rest of the villages the government had not taken any action.

¹¹⁰ Available at: http://cgwb.gov.in/District_Profile/Bihar/Madhepura.pdf (accessed: 30.05.2017)

¹¹¹ It is the scheme launched by the Government of Bihar to provide drinking water facility to each home in the state.

5.4.3 Health care and sanitation

The state of Bihar has insufficient number of hospitals compared to its huge population. Though the state government has invested heavily on the expansion of health care infrastructure in the state since last decade, it is not sufficient to cater to such large and increasing population. The districts of Madhepura and Supaul too have the low number of PHC, APHC, and HSC compared to the large population living here¹¹². During survey it has emerged that the number of hospitals in the region are not sufficient to face the emergency situation like floods and its aftermath when there is increase in the incidence of diseases.

During floods, the cases of water borne diseases are widely reported, children being the most affected. Among the villages surveyed, the distance of the health care center is a big problem faced by the people. The medical attention to pregnant women, elderly, small children and physically challenged suffer due to distance from the hospitals. The annual Flood Disaster Plan of Supaul district mentions about the number of pregnant women in the villages which are severely flood prone.

The agricultural fields in the region remain water logged for more than 2-3 months causing large scale breeding of mosquitoes and various water-borne diseases. During floods the cases of snake-bite are also reported. The people interviewed complained that the local health care centers in most places do not work. Though in some villages the infrastructure, sometimes temporary, has been constructed, but there is no regular presence of doctors and auxiliaries. The villagers are mainly dependent on the hospital situated in block. The respondents were largely positive when asked about the presence of ambulance services, though the time taken to reach the village was more as they were situated at the far place in the block hospital. During floods, the people have to remain dependent on the boats for navigation and in case of health care emergencies too boats are the only hope as the main road connecting the villages to block hospital gets submerged most of the time. The villages which were situated on the National Highways (Bhagwatpur and Ghiwaha) had no such problem as the road remained navigable during floods too.

¹¹² District Census of Madhepura and Supaul

5.4.4 Shelter Home for People and Animals

In both the districts of Madhepura and Supaul the rate of urbanization is 4.4 percent and 4.7 percent respectively which is well below the state average of 11.3 percent.¹¹³ The overwhelming majority of population resides in the villages. In villages more than 80 percent of the houses are kuchha houses made of bamboo sticks and other materials which has been a traditional practice in the region. The floods of 2008 had wiped out many villages completely and the bamboo-made houses proved fatal for them. The roof of pukka houses could have worked as a shelter for them and their small livestock.

The government has constructed the flood shelter home in all the panchayats which were surveyed except one, although other issues were present in these shelter homes. Considering the ratio of population residing in the kuchha houses in a panchayat, the capacities of the shelter homes were much lesser. The elevation of many shelter homes were also not sufficient looking at the past levels of flood waters, villagers said. Only in Pilwaha Village the height of shelter home was sufficient, as it had been constructed as a two-storied building rather than the one-storied which was witnessed elsewhere. The distance of shelter home from the villages in a panchayat is also an issue. Last year when the village of Muraut was trapped into flood waters, the people had to be evacuated to shelter home by carrying them into boats.

For animals no shelter home has been constructed in the villages. In Ghiwaha people have filled a place with soil to a comfortable height for the protection of livestock in case of flood. The people from other villages said that when the water starts seeping into their houses they move their livestock on the embankment on either side of the canal which is the only safe place for them. In Teen Tangi and Daparkha people said that during floods they had to carry their livestock to the embankment of the canal and stay with them day and night, even during torrential rain to save their precious livelihood.

5.4.5 Construction of Food-Bank for people and Fodder-Bank for Animals

The government had promised to make fodder bank in each block in the aftermath of devastating floods of 1987. But the respondents said that those have not been constructed yet. Maze is one of the principal crops grown in the area, and people use

¹¹³ Ibid.

the branches of the harvest to feed their livestock. During flood when the fields remain water logged for prolonged time, they use it as fodder as green fodder is not available.

The respondents in the survey said that they made elaborate arrangements for the storage of food and fuel to be used or consumed during the floods. But during massive floods, like those witnessed in 2008 when the houses in many villages got submerged, they face extreme difficulty due to scarcity of food. So, it is essential to construct a food storage facility in the nearest places to habitations so that they can be transported to the villages. But during survey people said that they had no knowledge of such facility being available in their area or block except in Chhatapur and Triveniganj block.

The villagers of Chausa block said that there was an FCI go down in the block campus earlier but now it was no longer in use. During massive floods people have to be evacuated and moved to the safer places where government organizes relief camps and looks after their food and other requirements. The respondents said that during those periods there was no scarcity of food. The region has witnessed many floods in the past, but the people said that they had not witnessed any case of severe famines in the area. This was the result of people taking measures on their own to store the food for the crisis situation.

5.4.6 Early warning System (EWS)

An effective EWS can play a big role in saving lives and promote preparedness at the community level. The Flood Management Information System (FMIS) of the government of Bihar broadcasts daily flood bulletin and status of water in all major rivers in the state through its website. But the biggest challenge in front of disaster management authorities in state is to disseminate this information to community level in the language that can be easily understood. The DMA Act 2005 talks about setting up, maintaining, reviewing and upgrading mechanism for early warning system and the proper dissemination of information to public and especially vulnerable communities by the district authority.¹¹⁴ For this purpose the temples and mosques can be utilized by installing loud speakers on top of them, and ensuring their proper maintenance.

¹¹⁴ Disaster Management Act, 2005

In the villages surveyed, most of them had one or more than one temple/mosque and loudspeakers were also installed in them. But the villagers were not aware about any guideline from the public officials about their use as warning system. The people said that the information about the impending surge in the River Kosi and its streams mostly came from someone from the block office or district office through informal sources. The warning is also issued through news media and radio broadcast. If the level of water in Bhimnagar Barrage on River Kosi starts rising and needs to be released, the government of Nepal issues warning which is covered through various media like newspaper, television, radio, etc. After the start of the monsoon season, particularly after mid-June the people living in the region become cautious to take measures for their own safety and their livestock.

5.4.7 Training and awareness programmes

The National Disaster Management Act, 2005 talks about facilitating the training and awareness programmes for prevention of disaster or mitigation with the support of local authority, governmental and non-governmental organizations by the district authorities.¹¹⁵ People living in a flood-prone area already take many precautions and build their lives around traditional practices which will minimize the impact of floods in their lives. This traditional knowledge and wisdom coupled with the government support through training and awareness can build effective community resilience.

The Government of Bihar organizes training and awareness programme for panchayat level functionaries like Mukhiya, Ward Members etc who are supposed to disseminate this information in their respective constituencies. The government uses the service of school teachers also for this purpose. During survey it was found that there was general tendency among the elected representatives to evade from this duty. The people complained that no such awareness and training sessions had been taken by them. The panchayat representatives and teachers accepted this lapse on their part.

The people, in general, relied on their own traditional knowledge to deal with the floods. In many villages the training and awareness programmes were organized by the teams of NDRF and SDRF also. In pre-monsoon season the government deploys the NDRF team for precautionary measures which does a survey of the area and conducts training and awareness sessions. Some teams of NDRF and SDRF have been

¹¹⁵ Ibid.

permanently stationed in severely flood-prone area. A team of SDRF in Sonamukhi village in Alamnagar Block and a team of NDRF in Ganpatganj, Supaul have been permanently stationed. In a few villages people reported about the visit of NDRF and SDRF team and sensitize them about the preparedness in a crisis situation. A team of NDRF had visited the village of Ghiwaha few days ago and trained some local youth and conducted awareness programme in the village.

Apart from the teams of NDRF and SDRF, other functionaries of the state like Block Development Officer (BDO) and Commanding Officer (CO) of the area visit the region during the floods to monitor the situation and relief work. The functionaries of River KosiPunarwasYojana (KPY) also spread awareness among the masses about the health and hygiene of the people during flood.

5.4.8 Boats

During survey, the villagers of both the districts complained of the insufficient number of boats for communication during floods. During three to four months the fields and roads around the villages remain submerged for two to three months. This causes extreme hardship for people to communicate from one place to another place for normal day to day work and gather necessary household items. The villages have been connected to roads but during floods, sometimes the roads also get submerged under water, and in that case there is no option but to use boat for navigation.

In Muraut and Kapsasia the boat is the only medium of communication during three to four months. The respondents here were dependent on a few numbers of boats which were owned privately and were not sufficient for them. Due to less number of boats and more demand, we frequently hear the news of boat capsizing due to overloading. In fact, the incidents of boat capsizing start pouring in from different parts of North Bihar as soon as the level of water starts rising in the rivers. The District Disaster Management Plans of both the districts elaborately mentions about the number of boats and its operators in its manual, the people tell the different story. In Bhagwatpur village which is situated on the State Highway 76 the respondents said that when the Sursar River is filled with water they find it extremely hard to navigate to the other side of the stream due to lack of boats. People from Ghiwaha said that they had to travel a very long distance to reach Koriapatti, which is situated only four km away from the village, due to non-availability of boats.

A motorized boat had been provided in the severely flood-prone block of Alamnagar some years ago by NDRF, but due to poor maintenance it has become unusable now. The Disaster Management plan of both the districts talks about the name of person to whom the responsibility of maintenance of boats in the respective villages has been given. But it was found during survey that villagers were not aware about this. In Muraut owner of one of the private boats complained that even after providing the services of his boat during floods last year he had not received the compensation from the government. This type of incident discourages the private owners to lend their boat for rescue work.

5.4.9 Agriculture and livelihood

Agriculture is the mainstay of the population in the districts with more than 85% of population engaged in them directly or indirectly.¹¹⁶ In Madhepura, among the workforce the share of cultivators is 24.54% and those of agricultural labours is staggering 62.26%. In Supaul also the situation is the same with the proportion of cultivators being 23% where as those of agricultural labours being 63.15%. The workforce engaged in household industry works is 2.10% and 2.57% respectively for Madhepura and Supaul. Overdependence on agriculture and dismal growth of large, medium and small scale industries in the region¹¹⁷ (Ministry of MSME, Government of India) has resulted in large scale vulnerability of people, particularly the agricultural workforce who are compelled to migrate outside their home for livelihood. Though in general, the migration from villages to nearest urban place and larger towns like Patna has increased due to increase in construction activities and service sector, and traditional breakdown of patron-client relationship based Jajmani¹¹⁸ system, this advantage has eluded those living here because of low level

¹¹⁶District Census of Madhepura and Supaul.

¹¹⁷ According to: <http://dcmsme.gov.in/dips/2016-17/DIPS%20Madhepura%202016.pdf> (accessed: 20.04.2018); <http://dcmsme.gov.in/dips/2016-17/DIPS%20Supaul%202016.pdf> (accessed: 20.04.2018)

¹¹⁸*Jajmani* System is a caste based relationship in which several castes are under obligation to give standardized services to other castes. This inter-relationship among different castes has undergone tremendous change due to factors like breakdown of barter system and prevalence of currency as dominant form of exchange, urbanization, industrialization and development of easy mode of transport of Indian village is now witnessing

ofurbanization (Rodgers et al. 2013)¹¹⁹ . The people here out-migrate in large numbers to engage in agricultural and other activities in different states.

During survey respondents described about large-scale migration in the aftermath of massive floods of 2008. During the period of floods, when the agricultural fields are water logged people have no option but to seek livelihood outside the area. The repeat visit of area was done during June which is the season of paddy sowing in the states of Punjab and Haryana. People were seen migrating in large numbers in small groups. At the mercy of the labour contractors, who exploit them for their own benefit, they are amongst the most vulnerable communities of Bihar. They wait in inhuman conditions on the Saharsa railway station for days to board the train to north India. In October last year around one lakh labours migrated from Saharsa railway station by trains.¹²⁰ During survey respondents pointed about the migration of mainly marginalized communities (mostly *Mahadalits*) from the region. The migration for agricultural activities is mainly seasonal in nature (two or three times a year) whereas migration in cities like Delhi is for long term livelihood opportunities. The physical and emotional vulnerability of migrant's family members especially women and children can easily be understood (Rodgers et al. 2013).

5.4.10 Other Findings

Floods not only cause disruption in socio-economic activities of the region, but various other aspects of life too. During the floods schooling of the children was disrupted in many villages. In Muraut the villagers said that the school remained closed for around three months during the monsoon period because of water logging in its premises. In villages where the school premise was situated in the low lying area, due to water logging in the school the monsoon period worked as an extended 'summer holiday' for children. The respondents in Kapasia said the same thing. The literacy rate of Madhepura and Supaul are low compared to even the state standards (52.25% and 57.67% respectively). On the one hand the incentives for parents to send their children to school remain low due to fewer opportunities in the region, on the other prolonged break from school promotes casual attitude among the children for learning. Many well off respondents talked about sending their children to nearby

¹¹⁹Institute for Human Development. New Delhi, and Gerry Rodgers. *The challenge of inclusive development in rural Bihar*. Institute of Human Development, Manak Publications, 2013.

¹²⁰ Available at: <https://www.livehindustan.com/bihar/saharsa/story-one-lakh-workers-earning-other-state-a-week-from-saharsa-station-1587658.html> (accessed: 23.04.2018)

town for study, but majority of people showed their inability to do it. Children were frequently observed engaged in agricultural activities during survey. Although the state of Bihar has achieved around 88% enrollment at primary level, the dropout rate is also high.

General food supply in the region also gets affected during floods. Due to water logging in the fields the vegetable production in the locality gets affected. People talked about supply of vegetables from places as far as West Bengal during monsoon. Due to difficulty in transport and communication the essential items see the rise in their prices, particularly of perishable items. This affects the consumption pattern in the flood affected villages and subsequent impact on health and nutrition of people, particularly of women, children and aged people.

5.6 Conclusion

Living with floods has become the 'way of life' of people of this region since they have witnessed it from time immemorial. But the nature of preparation and measures taken before and after the floods has changed because the nature and character of floods have also undergone change. The people belonging to *Chauras* and areas close to *Dhars* said that earlier the flood did not stay for so long. The floodwaters used to come and go within weeks, but after the construction of embankments, the drainage pattern of River Kosi Basin has gone dramatic change. Now the region witnesses heavy water logging lasting for months. People have also changed their life pattern and coping behaviour according to that.

Though the sample size of the survey was not very large, as only twelve villages were covered, it has highlighted the level of involvement of government with community at various levels for disaster management activities. Overall findings of the survey can be divided into two groups. Under one group are those community resilience measures which the government has taken with serious attitude and under second group the measures the government those require more concerted efforts. Under first group are steps like preparation of District Disaster Management Plan (DDMP) and enlisting the duties and responsibilities of various officials and departments and providing the contact details of sailors, divers, doctors, engineers, anganwadi workers, etc. so that they can be contacted in case of emergency; construction of shelter homes; raising of platform of hand pumps; training to elected representative and school

teachers, etc. Under the second group are measures like installation of EWS, provision of sufficient number of boats and other forms of communication, training to local youth and local population (formation of *Gram Raksha Dal*¹²¹ as BSDMP envisage), the visit by local disaster management authorities to village, provision of safe drinking water and health care, etc.

In case of shelter homes, though the building was present in all the panchayat which were surveyed, its capacity was not sufficient and there were other issues related to them like the site of construction, their height etc, which demonstrates the negligence on the part of the authorities. People were not aware about any EWS in their village. They receive the information only through informal mode of communication. The connectivity of road to nearest block is important but those were found to be in bad condition. The height of the connecting roads, even those which have been constructed recently, were insufficient as they will remain submerge under water during floods. The iron triangle of contractor, bureaucracy and politician remain present in this region too, even though multiple lives are lost almost each year. In KhaonDiyara, a village under ItahariPanchayat, the government has built a bridge over the river of same name Khawan to connect it with the village PanditjiTola with the expenditure of crores of rupees. But the construction has been of sub-standard quality and it seems there was no supervision of the project. The river Khawan has taken many lives in the past, but the apathy of the government and local power equation remain only mute spectator to it.

The success of Disaster management depends on the extent of community participation in various stages of disaster like mitigation and preparedness, which in turn depends upon the extent of their awareness about the nature of hazards, the extent of risk they face and the degree of their vulnerability. This awareness results into the organized preparedness by the community. In the regions like northeastern Bihar which has seen the vagaries of flood regularly in their life, and faces multiple deprivations, it is the state whose primary duty is to apprise its citizens of the actual level of risk (through information sharing) they face due to floods and prepare them for organized behaviour before, during, and after the disaster. The Chief Minister of Bihar has also said on one occasion that the disaster affected people have the first

¹²¹*Gram Raksha Dal* is the group of volunteers selected from the village which is trained in disaster management activities (BSDMP)

right on the state's treasury.¹²² But this vision was lacking during the survey. The state institutions are taking various steps for community participation for disaster management, but these are not sufficient and more needs to be done.

¹²² According to chief minister of Bihar Nitish Kumar in his inaugural address of the First Bihar Conference on Disaster Risk Reduction (BCDRR), 13th-14th May 2015.

Chapter 6

Conclusion: Summary and Recommendations

During last eighty years (after the writings of Carr in 1932) the discourse on disaster has seen enormous change. From the early conception of disaster as an ‘act of god’ which cannot be prevented to the subsequent recognition of it being the complex interplay between social, economic, and political conditions created by man, it has travelled a long distance (Kemp 2003, and Furedi 2007). Now it is well recognized that disasters can be prevented through appropriate intervention by the state through various legislative and administrative measures at different levels of governance. Amita Singh (2018) says ‘The law of conservation is not weak. What makes it weak is the combination of the failure of state leadership, administrative and judicial corruption and ecological awareness. There are many factors which prevent sensitization, resonance and rigour in environmental governance.’ (Coastal Ballads and Conservation Ironic Understanding Implementation Slippages of the CRZ Law, 2018, p 74)

6.1 Summary

Introductory chapter gives an overview of the interconnectedness between floods and poverty, and provides a brief description of general and hazard profile of state of Bihar which faces the attack of floods almost each year. It then enumerates the research objectives, research questions, and hypothesis of the study.

The second chapter gives the details of research methodology which has been adopted for the study. A brief account of the field has also been given. Next the chapter deals with review of existing literature, which goes through literatures related to specific disaster in different parts of the world and tries to find out the reason behind the destruction that it entailed.

Disaster and development has close co-relation. As Sanderson (2000) points out “flood disaster turns back the development clock, destroying years of effort and labour and perpetuates poverty for those already poor” (p 92). The coping capacity of different class of people also varies because of the availability of resources at their disposal. Poor have less resources and hence less capacity to deal with disaster. The third chapter starts with a brief description about the losses incurred globally due to

flood disaster. Then going through the change in the meaning of disaster as a result of its association with different disciplines it discusses the gradual shift from techno-centric approach to community based approach for disaster management. It then deals with the theoretical framework which looks at the relationship between disaster and development. It looks at various literatures which try to establish the relationship between the socio-economic performance of a region to frequently occurring disasters. Then the efforts at the international levels in the field of disaster management have been traced historically beginning with the Rio Declaration (1992), to Sendai Framework for Disaster Risk Reduction (2015), and how these efforts have shaped the legal framework of disaster management in India. Explaining various provisions of Disaster Management Act 2005, and flood guidelines issued by NDMA (2008) its application for flood disaster management has been discussed next.

The severity of floods in Bihar can be realized from the fact that the disaster management authorities in the state start preparing for impending floods for next year just after the rescue and relief operations in the year has been finished¹²³. With massive poverty in the state, the burden of flood losses gets compounded each year. The northeastern districts of the state which are poor economically are the worst hit among those due to Kosi. The fourth chapter begins with explaining the vulnerability of the state to flood hazard and attempts to demonstrate the enormity of impact of floods on the overall economy of the region. Floods not only create the immediate loss and damage in the region, but severely impact the potential of different sectors of economy to perform in future years also by destroying the critical infrastructure, sand casting and siltation of land, destruction of schools and hospitals etc. which takes a lot of time to be rebuilt. Kosi River, which is infamous for changing its course, causes heavy destruction in the region. The flood of 2008 was one of the most devastating calamities for the state in decades that wiped out almost entire infrastructure of many districts. An analysis of damage done by 2008 floods has been done next. Five most affected districts by the floods which are Araria, Madhepura, Purnia, Saharsa and Supaul are also among the poorest districts of the state as shown by the data of various reports. They have frequently faced the onslaught of floods in the past and

¹²³ Vyas Ji, Vice-Chairman Bihar State Disaster Management authority (BSDMA) on the occasion of National Workshop on “Early Warning System and Community Resilience to Floods with Focus on Regional Cooperation and Institutional Coordination” held on 27 April, 2018. Special Centre for Disaster Research (SCDR), JNU.

continue to suffer from it each year. Then an evaluation of flood control strategy of the state government has been done after discussing various measures the government takes to control the floods. Next the role and responsibilities of disaster management architecture in the state has been discussed.

Bihar is the first state in the country to prepare a roadmap of DRR for the period 2015-30. Targeting the reduction in loss of life by 75% and the number of people affected by 50% by 2030 it emphasizes upon reducing disaster risk through building resilient villages, resilient livelihoods, resilient critical infrastructure and resilient cities. Community resilience is the bedrock of disaster management because it is basically related to attitude to life, mode of living and culture of concern.¹²⁴ Keeping this paradigm of disaster management in mind the fifth chapter discusses the findings of case study which has been carried out in two districts of northeastern Bihar to find the community resilience building measures in its villages. A focus group study was carried out in twelve villages in Madhepura and Supaul regarding the status of various measures that the government of Bihar has taken to empower people to deal with flood disaster. The chapter elaborates the detailed report of the study.

6.2 Observations

Major problems observed during the survey:

1. The lackadaisical attitude among the elected representatives and government officials at ground level. Not taking the resilience building measures as an integrated approach between implementing agencies of the government.

Though BSDMA has made an excellent disaster management plan, its implementation at the community level is lacking. District Disaster Management Plan of both the districts gives details of role and responsibilities of various agencies and the name and contact list of people who will carry out these roles, but people at the community level have, generally, no knowledge about them. Many elected representatives at the village and panchayat level like Mukhiya, Ward Member, etc. displayed casual attitude during survey. They had not disseminated the lessons from the training and awareness sessions that they had attended which was organized by BSDMA. For a region which

¹²⁴ Bihar State Disaster Management Plan (BSDMP). Available at: <http://bsdma.org/images/global/SDMP.pdf> (accessed: 03.06.2018)

witnesses the floods almost each year, the preparedness should be carried out at community level intensively during whole year, but it was only during floods that the machinery of the government gets into working mode. It seems the officials are still following the *rescue and relief* approach rather than making the communities more resilient to take care of themselves.

2. Poor construction and maintenance of existing structures, delay in projects etc.

The shelter homes and other buildings like Anganwadi Centre, School, and Primary Health Centre etc. are poorly maintained and will not be able to withstand if flood of the magnitude witnessed during 2008 comes. In some places the newly built roads are of insufficient height which is of no use during floods. Construction of some bridges is pending since many years perpetuating the difficulty of people. The roads, bridges, and culverts were constructed under Phase I of Bihar Kosi Flood Recovery Project (BKFRP)¹²⁵. Even the World Bank has shown its displeasure for slow pace of execution of the works¹²⁶.

3. The issue of cash compensation

If an area is declared flood or drought hit, the government provides cash component to farmers to cover the losses due to loss of agricultural production. But during survey it was observed that the issue of cash compensation is gaining larger attention among the people than other schemes related to mitigation plans of the government in the area. The short-term relief measure in the face of disaster is necessary but it should not become the primary measure of the government to deal with it.

6.3 Recommendations

In a region where the disaster is a common phenomenon and people are habituated to live with it, they develop a fatalistic attitude and blame the supernatural power and

¹²⁵ Bihar Kosi Flood Recovery Project was started in 2011 with the assistance of World Bank. The objective of the Project was to support flood recovery and risk reduction efforts in the region which were affected during 2008 Kosi floods. The Project had various components like construction of damaged houses, bridges, culverts; strengthening the capacity of flood management in the river basin; the livelihood enhancement opportunities to all those who were affected; and to improve the capacity of future emergency response. Available at: <https://reliefweb.int/report/india/india-bihar-kosi-flood-recovery-project-owner-driven-housing-reconstruction> (accessed: 15.02.2018)

¹²⁶ Available at: <https://timesofindia.indiatimes.com/city/patna/World-Bank-not-satisfied-with-work-on-Kosi-flood-recovery-project/articleshow/29785825.cms> (accessed: 20.02.2018)

their fate for the suffering. For them the government has to put an extra effort to make them aware and prepare to meet the crisis situation.

1. Bridging the gap between local and higher authorities: For this to happen the executive branch of government, which is represented by block level bureaucracy and its subordinate officials, needs to meet local people and impart the knowledge and necessary training of skills to mitigate the negative impacts of a disaster. This will be a learning experience for the officials too, as they can integrate the local wisdom and initiatives of people and integrate them into the policy for further application. This thing was completely lacking during the survey.

2. Dissemination of information: The government had organized the training and awareness camps for local elected representatives and school teachers, as well as among school children too. But this knowledge has not filtered down to the masses, the people who are the actual decision makers for their own safety and well-being during a disaster.

3. Taking care of vulnerable groups particularly of women and children: For example the issue of health and hygiene of people, particularly women and children are of utmost importance during floods. But the male members of the society, who are the actual decision makers, remain oblivious of their specific needs and requirements.

4. The issue of toilet construction in the districts of Madhepura and Supaul is of vital significance for the government, because in this region less than 30% homes have toilets. During floods especially women and children face a lot of problem. But the scheme of Open Defecation Free (ODF) village and panchayat has only recently been taken by the government as a movement involving government and non-government officials, and local people.

5. The policy making process has often shown *lack of co-ordination* in different branches of knowledge. A holistic approach of incorporating scientific, sociological and administrative knowledge has to be incorporated in policy making level. Disaster management is an emerging field of knowledge which is directly linked to the need of people.

6. Mapping of traditional practices to thwart flood harms and scientific studies on them.

8. Emergency resource allocation has to be more effective: during flood disaster time, the most immediate requirements have often been linked to immediate household needs, though, natural disaster does not discriminate between poor and well-off people, however, poor people are immediately affected, and therefore, in policy planning these specific imperatives could be more taken into the consideration.

9. Phased developmental strategies to tackle flood problem in tune with development of the region. In devising long term planning of area development such as moving through low urbanization to higher urbanization, most immediate problems such as open defecation which could be causes of epidemics during floods need to be prioritized.

10. Regionally North-east Bihar is not only among one of the most least developed areas in India but within the state itself. Therefore, the region under the study itself has to be studied specifically to find a way out of current precarious situations that has been existing since long time.

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Annexure

Questionnaires for Focus Group Interview

1. According to you what is the main reason for recurrent floods in the region?
2. Do you think that some work is happening on ground to prevent floods? What are those?
3. Who are the key persons and departments that come forward to take measures to prevent floods?
4. Whether any administrative officer comes to them to inform about various precautions to be taken before and after the floods?
5. Is there any Early Warning System (EWS) installed in your area? What is the status of loudspeaker installed in the temple/mosque? Are they used to issue early warning of floods?
6. Whether the shelter homes for people and animals have been constructed in the area? Whether they have suitable capacity according to the population of people and livestock?
7. Are there any FCI go downs in the area? If yes, are they flood-resistant? Is there any fodder-bank in the area?
8. What is the status of drinking water-facility, particularly during floods and post-flood months?
9. Is there any health care facility in the village? If yes, is it in a working condition (infrastructure, doctor, auxiliaries, etc.)? If no, what is the distance they have to travel to reach the nearest hospital?
10. What is the provision of boat in the locality? Has the government provided any boat in the village? Is the number of boat sufficient?
11. For how long flood waters remain in the area? After floods how much time does it take for them to 'bounce back' to normalcy?