EFFECTIVENESS OF DISASTER RISK COMMUNICATION: A CASE STUDY ON INFORMATION CAMPAIGN ABOUT FLOOD IN KOSI RIVER IN BIHAR

A THESIS SUBMITTED IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE DEGREE OF DOCTOR OF PHILOSOPHY

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CERTIFICATE

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I **SWETA RANI**, hereby declare that the subject matter of this thesis is the record of work done by me, that the contents of this thesis did not form basis of the award of any previous degree to me or to do the best of my knowledge to anybody else, and that the thesis has not been submitted by me for any research degree in any other University/Institute.

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(SWETA RANI)

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1.	DM	Disaster Management
2.	BSDMA	Bihar State Disaster Management Authority
3.	NDMA	National Disaster Management Authority
4.	NIDM	National Institute of Disaster Management
5.	NDRF	National Disaster Response Force
6.	DMA	Disaster Management Authority
7.	DRM	Disaster Risk Management
8.	DRR	Disaster Risk Resilience
9.	ECS	Emergency Communication System
10.	EWS	Early Warning System
11.	EMS	Emergency Medical Service
12.	DRRM	Disaster Risk Reduction and Management
13.	SFM	Sendai Framework Monitor
14.	EOP	Emergency Operations Plan
15.	NFPA	National Fire Protection Association
16.	CERT	Community Emergency Response Team
17.	DART	Disaster Assistance Response Team
18.	ENS	Emergency Notification System
19.	DRC	Disaster Recovery Centre
20.	DCN	Disaster Communication Network

Chapter – One

Introduction

Disaster Risk Communication is a key component of effective disaster mitigation strategies. It involves delivering information in a timely and efficient manner to communities at risk from natural hazards, allowing individuals to take actions to prepare for, respond to and recover from hydro- meteorological events. Hydrometeorological hazards result from extreme weather and climate events like floods, droughts, hurricanes, tornadoes, landslides, and mudslides. They represent a significant portion of natural hazards and affect regions worldwide, though the frequency, intensity, and vulnerability to specific hazards vary across different areas (Wu et al., 2016).

Since last five decades, Kosi brings devasted flood to the Supaul and other Kosi regions. History has it that the Kosi River, often termed the "Sorrow of Bihar," every year floods have caused common harm in the regions, basically due to the fact that of its peculiar patterns of flooding that are unpredictably erratic in nature (BSDMA, 2010). Due to the potential threat of catastrophic floods in the Kosi River basin, risk communication needs to be precise and effective. For centuries, Kosi regions have suffered from massive loss of both lives and property and livelihood owing to floods. Given already significant technological advances and growing interest in the role of information in disaster preparedness, the question of how best to communicate still seems vital as a resilient and responding population emerge.

1.1 Defining Disaster

When we think of the word "Disaster," natural hazards like earthquakes, hurricanes, floods, and droughts often come to mind. However, it's important to define a disaster based on its human consequences rather than the underlying phenomenon that triggered it. A more precise definition of a disaster would be an event that leads to widespread severe damage, injuries, or significant loss of life or property, overwhelming a community's ability to cope and resulting in severe societal disruption. While some developed nations might be as susceptible to disasters as

less affluent ones, the citizens of wealthier nations aren't as vulnerable. They experience fewer casualties, and their environment is less prone to collapse.

In broad terms, a disaster can be described as an event that leads to casualties, property loss, infrastructure damage, disruption of essential services, and harm to people's means of livelihood. These impacts occur on a scale that exceeds the affected community's ability to manage on its own. Disasters can wipe out years of investment in the development process, and they necessitate significant efforts in reconstruction and rehabilitation. A more specific definition of a disaster could be an event that occurs within a specific timeframe and geographical area, posing a substantial threat to a society or a relatively self-sufficient subdivision of a society. This threat results in significant, unforeseen consequences due to the breakdown of previously accepted precautions (Bharwad, 2010).

Disasters have been a part of human existence for as long as recorded history and likely even longer. These disasters can take various forms, such as natural occurrences like droughts, floods, cyclones, earthquakes, and man-made tragedies like the Bhopal gas leak, communal riots, refugee crises, and various accidents. Regardless of their nature, disasters are events that abruptly disrupt the normal functioning of society, often resulting in significant loss of life and property. When a disaster strikes, the available social and economic resources are typically insufficient to restore normalcy to society. Natural disasters do not recognize political boundaries and are indifferent to social or economic considerations. They transcend borders, impacting both developing and developed nations alike. Their indiscriminate nature means that vulnerable populations often bear the brunt of their consequences. For instance, developing countries tend to experience more severe losses in terms of human lives, the hardships endured by their populations, and the percentage of their Gross National Product (GNP) that is lost due to these natural disasters (Rayalwar, 2009).

In the realm of developing regions, Asia stands out as particularly susceptible to the impact of natural disasters. Over the span of two decades, from 1994 to 2013, the Asian continent witness to a staggering 2,778 natural calamities, resulting in a tragic

loss of nearly 841,000 lives and affecting an additional 3.8 billion people. Among the sub-regions within Asia, South Asia emerges as the most vulnerable to these devastating events. Over a period extending from 1971 to 2009, South Asia grappled with a substantial total of 1,017 natural disasters, which left approximately 2 billion individuals grappling with their consequences and sadly claimed the lives of almost 800,000 people (Parida, 2018).

There are many different kinds of disasters, each with a unique character and scope of effects that can have a significant influence on a community. These include significant accidents, epidemics, earthquakes, volcanic eruptions, tsunamis, hurricanes, typhoons, tropical cyclones, floods, landslides, bushfires (wildfires), droughts, and civil unrest. Certain natural disasters, such as landslides, avalanches, earthquakes, and hailstorms, happen unexpectedly and without warning. In a similar vein, cyclones and floods may provide some prior warning but happen quickly (Zibulewsky, 2001).

A natural disaster's ability to endanger human life and property can be used to divide it into major and minor categories. Significant damage can result from major disasters, including earthquakes, volcanic eruptions, droughts, floods, and cyclones. Less severe damage is usually caused by minor calamities like hailstorms, avalanches, landslides, and small-scale fires. Even though these incidents frequently happen without warning, preventative actions can be taken, such as enhancing awareness and readiness in communities that are at risk and putting in place civil defense measures in times of conflict.

As demonstrated by earthquakes, the effects of disasters, especially those involving land movement or fracture, can be severe and abrupt. It is recommended that residents residing in locations susceptible to earthquakes prioritized building that is seismically resistant, evaluate the topography, and install safety mechanisms for infrastructure such as utility lines and dams. Following a disaster, attempts to respond often entail giving out emergency medical care, carrying out rescue missions, evaluating needs and damage, providing relief, resuming vital services, and assisting with rehabilitation and reconstruction.

Underwater earthquakes can produce tsunamis, whose surges have the power to completely destroy entire coastal regions. But of all the natural calamities, floods have the capacity to cause the most harm to civilization and the environment. Floods are caused by excessive precipitation and are characterized by the overflow of water into river channels. They have the potential to cause extensive damage. Monitoring river levels, organising emergency responses, and putting policies in place to lessen the effects of floods on infrastructure and communities are all necessary for managing them (Balasubramanian, 2014).

The National Institute of Disaster Management, under the Ministry of Home Affairs, Government of India, highlighted in 2013 that India experiences natural disasters with almost regular frequency. This assertion is supported by a series of significant highly destructing disasters over the years:

2001 Bhuj Earthquake: This devastating earthquake struck the Bhuj region in Gujarat, causing widespread destruction and loss of life.

2004 Tsunami: The Indian Ocean tsunami in 2004 resulted from a massive undersea earthquake near Sumatra, affecting the coastal regions of several countries, including India.

Earthquakes in Jammu and Kashmir (2005) and Sikkim (2011): These earthquakes had significant impacts on the respective regions.

Flash floods in Uttarakhand (2013): Flash floods and landslides in Uttarakhand led to a significant humanitarian crisis and loss of life.

Floods in Jammu and Kashmir (2014): Widespread floods affected Jammu and Kashmir, causing considerable damage.

Floods in Urban Areas of Chennai (2015): Chennai faced severe flooding due to heavy rains, affecting urban areas.

Floods in Kerala (2018): Kerala experienced devastating floods that resulted from heavy monsoon rains.

Cyclone 'Fani' in Odisha (2019): Cyclone 'Fani' was an extremely severe cyclonic storm that made landfall in Odisha, causing extensive damage.

Floods in Kolhapur and Sangli: These floods affected parts of Maharashtra. **Floods in Bihar and Assam:** Bihar and Assam witnessed recurring floods, impacting communities and agriculture.

Cyclones 'Amphan' in West Bengal and 'Nisarga' in Maharashtra (2020): Cyclone 'Amphan' struck West Bengal and Bangladesh, while 'Nisarga' affected Maharashtra.

These incidents demonstrate the diverse range of natural disasters that India faces, including earthquakes, tsunamis, floods, and cyclones. The frequency and severity of such disasters underscore the importance of disaster preparedness, mitigation efforts, and effective response measures to minimize their impact on communities and infrastructure (Krishna, 2021).

The disasters can be divided into two categories: those with unknown occurrences and those with severe effects. The level of destruction and loss (including fatalities, economic losses, and other adverse effects on people) is referred to as severity, and it depends on the size, intensity, frequency, geographic spread, and duration of the catastrophe. The inability to predict an event based on past experience and the rapid beginning is characteristics of uncertainty. These traits have a big impact on supply chain and logistics issues and unpredictability, which make up the majority of humanitarian operations (R, 2019).

While natural disasters like floods, earthquakes, and cyclones cannot always be prevented, man-made disasters can occasionally be avoided. However, these risks can be successfully reduced to stop them from worsening into disasters by mitigation measures and careful planning of development projects in high-risk locations.

Effective mitigation requires a comprehensive strategy that incorporates three essential strategies:

- Incorporating mitigation strategies throughout every project involving development.

- Collaborating with pertinent Central Ministries, Departments, and States to initiate mitigation projects at the federal level in high-priority locations through the National Disaster Management Authority (NDMA).

- Supporting and assisting State-level mitigation initiatives that adhere to set standards.

- Furthermore, it is critical to acknowledge and utilize indigenous knowledge on coping strategies and disaster communication as it is applied by different States (*NPDM-101209[1].2022*).

1.2 Disaster Risk Communication

Effective communication, during and immediately after a disaster is a vital component of response and recovery efforts. It serves as the crucial link connecting affected individuals, families, and communities with first responders, support networks, and loved ones. Furthermore, reliable and accessible communication and information systems are essential for enhancing a community's resilience. The role of communication technology has long been recognized as integral to disaster communication & planning. While communication technology can be applied across all four distinct phases of disaster planning— mitigation, preparedness, response, and recovery—historically, its primary application has been in the response and recovery phases. However, the emergence of new communication and information technologies over the past two decades has opened up greater possibilities for integrating different communication systems. One notable development is the increasing interoperability of various communication systems, including the internet, mobile phones, fax, email, radio, and television. This growing interoperability means that the potential for applying communication technologies in disaster mitigation and

prevention is expanding (Dehghani et al., 2022).

Communication through preparedness planning is essential to mitigate the risk and ensuing damage when facing a disaster. This research is conducted within the five blocks of the Supaul district of Bihar state, taking into account that the area is situated on the bank of the river Kosi, which pose a significant flood hazard. The primary focus of this study centers on the preparedness phase, which involves proactive measures to anticipate disasters through well-organized activities. Given the inherent unpredictability of disasters, communication stands as the cornerstone for reducing uncertainty. In the context of disaster mitigation, communication serves as the gateway to vital information needed for prevention, preparation, and mitigation efforts by facilitating the dissemination of disaster-related information. The pivotal component in responding to disasters is the development of an effective communication strategy, which plays a crucial role in coordinating information well in advance of a disaster event (Vinance et al., 2021).

1.3 Operational Definitions

The term "Disaster Communication," as explored in this study, refers to the planning of communication processes during the disaster preparedness phase. It encompasses the coordination between various stakeholders, including the community, government agencies, donors, and non-governmental organizations. A well-structured and accountable communication system assumes a pivotal role in disaster mitigation efforts, as emphasized by Ali, Nguyen, Vien, and Shah in 2015. The level of advancement of an area can be gauged by its capacity to independently manage disasters and effectively collaborate between the community and local disaster communication agencies. In light of these considerations, this study places significant on conducting a more comprehensive analysis of disaster communication planning undertaken by the Regional Disaster Communication Agency. This analysis is undertaken as part of efforts to mitigate potential flood hazards in the Kosi area, particularly within the blocks of Supaul district.

Reliability takes center stage in the design of disaster communication systems, particularly considering the heightened need for these systems in remote and often inaccessible areas, such as deep seas and mountain tops. In these environments, where people may frequently disappear during activities like trekking, and accidents like avalanches and landslides are common, the paramount concern is that communication systems must remain in working condition at all times. To address this challenge, wide area networks utilizing satellite signals are often recommended. The continuous advancement of communication technology has led to the introduction of numerous user-friendly communication gadgets. The establishment of communication with remote areas has historically been a significant challenge. However, the advent of satellite communication has largely resolved the issue of connectivity to remote and far- flung regions. Satellite communication offers the capability to cover vast national and international areas using one or multiple satellites.

Communication technology has undeniably transformed our world into a global village. It allows us to witness events like storms ravaging the US in real- time on our television sets. Our lives are safeguarded by the timely forecasts of calamities provided by meteorological departments. Internet technology enables us to maintain close contact with loved ones who reside miles away. In cases of accidents involving those close to us, we receive immediate notifications. In today's landscape, wireless communication modules are highly popular, leveraging satellite signals for communication. We would recommend considering portable Motorola VHF models for local communications and Codan NGT SRx for long-distance communications. Experts also strongly recommend a Portable Repeater system VHF that can be deployed from a vehicle, facilitating communication within the disaster-affected area (Choi et al., 2016).

1.4 Flood in India

Floods are undeniably among the most recurrent and frequent natural disasters worldwide. Their persistent occurrence has resulted in significant economic losses and human suffering, surpassing the impact of many other natural disasters. India, too, has been consistently plagued by numerous flood events, leading to substantial loss of life and economic hardship. Alarmingly, the incidence of floods in India has been on the rise at an accelerating rate. The causes behind these devastating floods are multifaceted and can include factors such as climate change, cloud bursting, tsunamis, and inadequate river planning, including silting of waterways. Regardless of the specific triggers, the scale of devastation, both in terms of human lives and economic impact, continues to escalate. India has well-structured and organized disaster risk resilience programs and policies in place in the form of National Policy on Disaster (Mitra & Shaw, 2023). However, the effective administration and implementation of these initiatives demand enhanced efficiency.

India ranks second in the world behind China and is responsible for one-fifth of all flood-related deaths worldwide, making it one of the worst-affected nations. Approximately 12.5% of India's total land area, or 40 million hectares, are susceptible to flooding. In India, floods are a common yearly occurrence, especially in the country's east and northeast. Floods seriously harm people and property and interrupt infrastructure. Every year, 7.56 million hectares of land are impacted by flooding, of which 3.55 million hectares are agricultural land. Each year, floods have taken 94,772 livestock life and 1595 human lives on average. Floods alone cause full or partial damage to 1.2 million dwellings (NIDM, 2013).

Over the past decade, floods have emerged as the primary contributor to loss of life and economic damage, surpassing other types of disasters in their impact. Addressing the growing challenge of floods in India necessitates a multi-faceted approach that encompasses disaster preparedness, mitigation, and response. It also requires on-going adaptation to changing environmental conditions, reinforcing the importance of proactive measures to mitigate the impact of these recurrent and increasingly severe flood events (Tripathi, 2015a).

India is particularly vulnerable to floods because of its monsoon climate and the vast network of rivers that run through the country. The nation's long coastline also makes it vulnerable to cyclonic disruptions. Significant initiatives are being carried out to address these issues as part of the **Prime Minister's 10-point agenda for disaster risk reduction** (Press Information Bureau, 2023) Organizations responsible for disaster risk resilience at the state and federal levels are actively working to prepare for, respond to, and recover from floods as well as to mitigate their effects through the use of both structural and non-structural solutions. These programs are essential for reducing the possibility of disasters and encouraging sustainable development.

Experiences with disasters in India highlight the necessity of ongoing data collection on areas impacted by flooding, the identification of hotspots, and the strategic planning and implementation of projects aimed at reducing the effects of flooding. To provide a thorough understanding of flood severity and regional flooding dynamics, the establishment of a Flood Affected Area Atlas is crucial as a complement to event-based spatial flood inundation maps. For making well- informed decisions, this information is an essential resource (Wani, 2022).

Many states are devastated by floods, but Bihar is particularly hard hit, with39.76 lakh hectares of land impacted, affecting 38 districts mostly as a result of the Ganga and Kosi rivers overflowing. Uttar Pradesh experiences similar difficulties, with the Ganga River system floods causing 26.62 lakh hectares of damage annually across 72 districts. Over 35 districts and 24.56 lakh hectares of damaged land, Assam faces near-annual flooding from the Brahmaputra and Barak rivers. These three states collectively cover 60% of the nation's total flooded area. Because of their position, coastal regions like West Bengal, Andhra Pradesh, Tamil Nadu, and Odisha are especially susceptible to flooding (Tripathi, 2015b).

Flooding and the related risks have been occurring more frequently in India recently. This could be due to various factors, such as variations in the pattern of rainfall, an

increase in the frequency of extreme events, changes in land use, and development in flood-prone areas due to socioeconomic pressures. It has recently come to light that the hydrological system is being significantly impacted by climate change, which also raises the danger and vulnerability to flooding puts more and more people's lives, property, the environment, and socioeconomic status at risk. Water bodies, their ecosystems, and the land within their catchments are closely interconnected with downstream coastal and marine waters. Together, they form a hydrological system that is affected by any changes in water or land use upstream.

Bihar's geoclimatic characteristics and other contributing variables make it extremely susceptible to floods. In terms of the percentage of land that is vulnerable to flooding, the State has the highest rate of flooding in the nation. The State's overall area at risk of flooding is around 68.80 lakh hectares, representing 17.2 percent of the nation's total flood-prone territory and 73.06 percent of the State's total geographical area. Devastating floods have recently struck the State. In the plains of North Bihar, the Southwest Monsoon rains have become synonymous with floods, bringing widespread destruction, immense human suffering, and significant loss of life and property (NIDM, 2013).

The floods that occurred in Bihar from July to September of 2007, during the South West Monsoon, served as a sobering reminder of the widespread destruction and disruption caused by floods and provide another well-known picture of the State's susceptibility to recurring flooding. The 2007 floods were unlike any other in terms of their ferocity, unpredictability, and unseasonally. There had been unheard-of twenty days of nonstop rain, 300–400% more than usual for the second part of July. This happened once more in August, and the issue was made worse by intense rains in Nepal's upper catchment areas.

One of the states in the nation most vulnerable to disasters is Bihar. The state frequently experiences a variety of calamities, including heat waves, cold waves, river erosion, earthquakes, droughts, fire incidents, and more. Floods are the most frequent natural calamity and a yearly occurrence in Bihar, causing significant loss of life and property. Apart from flooding, the State's susceptibility to earthquakes poses

a persistent risk. The population's vulnerability to these natural hazards has been further exacerbated by factors such as excessive building density and poor construction quality, settlement in sensitive locations, and inadequate or non-existent investment in mitigation and preparedness measures. These calamities over the years have not only caused significant property and human devastation, but they have also negatively affected the economy of the country (NIDM, 2013).

1.5 Kosi Flood in Bihar

Bihar has a transitional climate, economy, and culture since it is positioned halfway between the humid West Bengal in the east and the subhumid Uttar Pradesh in the west. Its borders are to the north and south, respectively, with Nepal and Jharkhand. The Ganga River, which flows through the center of the Bihar plain from west to east, splits it in half unevenly. Thus, the State is among the worst flood-affected regions in the world due to its very geographical location as well as the hydrometeorology, hydrology, geomorphology, and topography that are prevalent in the area. Hydrometeorology is a field that combines meteorology and hydrology, focusing on the exchange of water and energy between the land surface and the lower atmosphere. Hydrology studies the movement and distribution of water on Earth and other planets, including the water cycle. Geomorphology is the scientific discipline that describes and classifies Earth's topographic features (Alcántara-Ayala, 2010).

1.6 Origin of Kosi River

The Kosi, also known as Kausika in Rig-Veda (The Rig Veda is the oldest of the four Vedas, an ancient religious text written in Sanskrit, originating in India between 1800 and 1100 BCE), is located in northern India's Nepal and Bihar. It is one of the Ganges' principal tributaries. The Arun River, which flows mostly through Tibet, is one of the Kosi's main tributaries. The river Kausiki is referenced in the epic "Mahabharata." Both the southern and northern Himalayan slopes of Nepal and the Tibet Autonomous Region are drained by the Kosi River. For its seven upper tributaries, the Kosi River is also known as Saptakoshi, starting at a significant

confluence of rivers north of the Chatra Gorge. These include the Arun River, the Sun Kosi from Tibet, and the Tamur Kosi, who are native to the Kanchenjunga region in the east. From east to west, the Sun Kosi is tributary to the Dudh Kosi, Bhote Kosi, Tamba Kosi, and Indravati Kosi. The Saptakoshi enters northern Bihar and splits several distributaries before entering the Ganges in the Katihar district, close to Kursela (IWAI, 2019).

With a length of 720 km (450 mi), the Kosi River drains 74,500 km³ (28,800 sq mi) in Tibet, Nepal, and Bihar. It has been suggested by a number of writers that the river has moved around 133 km (83 mi) in a westward direction over the past 200 years. However, an analysis of 28 historical maps from 1760 to 1960 showed that there had been a long-term, modest eastward shift that was erratic. and oscillatory in nature. The Yarlung Tsangpo River to the north, the Gandaki to the west, and the Mahananda to the east are all separated from the river basin by ridges that encircle it. Major tributaries of the river join around 48 km (30 mi) north of the boundary between India and Nepal. The river has created a megafan beneath the Siwaliks that is approximately 15,000 km2 (5,800 sq mi) in size and splits into more than twelve different channels, each of which has a different route because of flooding. Along with smaller tributaries like Bhutahi Balan, the three main tributaries of Kosi in India are Kamala, Bagmati (Kareh), and Budhi Gandak (IWAI, 2019).

Major rivers like the Ghaghra, Gandak, Bagmati, Kamla-Balan, Kosi, and Mahananda, which all meet the powerful Ganga on its left bank, crisscross the whole region of North Bihar. These rivers all have their source in the Himalayas in Nepal. The vegetative cover in Nepal's catchment areas has been gradually eroding due to increased deforestation brought on by the reclamation of areas for habitation and the acquisition of fuel for domestic needs. As a result, rivers now hold far less sediment, and their carrying capacity gradually declines. In North Bihar, these elements work together with persistently high rainfall to cause flooding. The trend indicates that the Bihar Plains have seen an increase in the severity and frequency of floods throughout time, resulting in damage to infrastructure, crops, and human settlements as well as suffering from human misery (*Bihar State Planning Board, 2010*, n.d.).

The Kosi River, located in the northern plains of Bihar, poses a persistent and daunting challenge due to its frequent and prolonged flood hazards. Notable factors include a notably high variability in discharge, coupled with a substantial sediment flux originating from the uplifting hinterland. Annual peak discharges frequently surpass the mean annual flood levels, resulting in extensive inundation of the low-lying alluvial plains year after year. The river's behavior is marked by avulsions, sudden changes in its course, which stem from a specific nodal point. Remarkably, the average avulsion frequency in the Kosi River has been documented as approximately 24 years, one of the lowest globally when compared to the Mississippi River, which has an average avulsion frequency of approximately 1400 years. The presence of numerous pale channels visible on satellite imagery of the Kosi basin serves as evidence of the river's migratory nature.

The Kosi River's lateral migration and widespread flooding have been wreaking havoc. The river has a tendency to flow sideways because of its steep gradient and significant silt load. As a result, the river has migrated laterally by roughly 150 kilometers in 200 years. The Kosi River's lateral migration of 150 kilometers is measured on a **geographical or cartographic scale**, typically using tools like topographic maps, satellite imagery, and geospatial technologies such as GPS or GIS (Geographic Information Systems). These tools help track and quantify the river's shifting course over time across a large region. Across the river, embankments were built five to sixteen kilometers apart to regulate flooding and monitor lateral displacement. Flooding remains a hazard in this area even though the river's lateral shift within the embankments has been limited as a result. Due to the growing amount of human interference in the flood plain, Bihar's river flooding problem is becoming more and more severe. It must be realized that, rather than creating structural safeguards along dynamic rivers like the Kosi, minimizing the danger and damage from floods may be a more sensible approach to flood planning (Ganugula & Sinha, 2005).

Furthermore, the Kosi River typically exhibits a braided pattern and has formed an extensive alluvial fan due to the substantial sediment supply originating from the

Himalayas and a generally aggradation regime. The situation is further complicated by two factors: (a) the region experiences exceptionally high rainfall in the catchment area, ranging from 1200 to 2000 mm in most parts, as reported by Sinha and Friend in 1994, and (b) the high seismic activity in the hinterland leads to landslides and significant sediment production, which ultimately contributes to the filling of the river basin (Sinha et al., 2008).

The Supaul district in Bihar is among the most severely flood-affected areas, yet it faces significant inadequacies in disaster risk resilience facilities and planning. Out of the 11 blocks within the district, a staggering 5 blocks experience annual flooding. The history of flood-related challenges in Supaul dates back to 1934, and the situation remains persistent. This study sheds light on various aspects of the Kosi flood and disaster risk communication in Supaul district. Over the past six decades, floods have emerged as substantial natural hazards in this region. The Kosi River stands out as one of the most sediment- laden rivers, carrying approximately 80 million cubic meters of sediment annually. This sediment load is a result of factors such as cloudburst, the Asian monsoon, mass wasting events, and landslides in the Himalayan region (Kumar, 2019)

The Kosi River's repeated migrations have led to extensive damage through overbank flooding and inundation. As it rushes down from the hills, it carries vast amounts of sand, depositing this sediment layer over the land surface. This process has detrimental effects, including the destruction of fertile agricultural tracts, clogging of wells, and the displacement of villagers from their homes. Ultimately, it transforms the once-productive landscape into a desolate expanse of sand and swamps.

1.7 Why Kosi is the Sorrow of Bihar

In terms of the percentage of land vulnerable to floods, Bihar is now the most flood-prone region in the nation following the State's split. The State's overall area at risk of flooding is 68.80 lakh hectares, or 17.2 percent of the nation's total area at risk and 73.06 percent of its total geographical area. The northern plains of Bihar are the most severely affected by flooding. This is due to the fact that nearly all of the State's

major rivers originate in Nepal and flow into Bihar. These rivers often enter the State on plains, but their bed slopes are very steep in Nepal. The silt carried by the flow of these rivers becomes deposited at this location due to an abrupt reduction in bed slope (Bansal, 2020).

1.8 Physical Factors

Bihar is one of the most severely affected areas in the world by flooding because to its position in conjunction with hydrometeorology, hydrology, geomorphology and terrain. It has a monsoon climate with an average annual rainfall of 1200 mm and is located in a tropical to subtropical zone. The Ganga, which flows from west to east across the state of Bihar, is regarded as its lifeline. The Ganga is joined by numerous rivers from both the north and the south. The Ganga's primary tributaries are Ghaghara, Gandak, and Kosi. Known as "the sorrow of Bihar," the widest river, Kosi, regularly alters its path, wreaking havoc. The Ganga has tributaries on its right bank, including the Sone, Punpun, Mohane, and Gumani rivers. (NIDM, 2013).

Bihar has three distinct seasons- winter from October to February, summer from March to mid –June and the monsoon from mid-June to September. Hot westerly winds begin in March and last until May. The temperature begins to rise in March, and the months of April and May are characterized by great heat and dryness. The monsoon sets in by around the middle of June, bringing in its wake a quick fall in the temperature and widespread rains ending in September. The State receives most of its rainfall from south West monsoon from June to September. The average rainfall is 1200 mm and ranges from 1000 mm to 2000 mm. this coupled with water brought by river originating from Nepal result in flooding of the Bihar plains (Department of Social Justice and Empowerment - Government of India, 2010).

1.9 Social and Economic Factor:

As per the 2011 Census, Bihar, covering an area of approximately 94,163 sq km, had a population of 10,38,04,637 persons. Before the bifurcation that led to the creation of Jharkhand, Bihar was the second most populous state in India, accounting for slightly more than 10% of the country's population, following Uttar Pradesh. After

the division, Bihar's rank among Indian states in terms of population dropped to third, with Uttar Pradesh and Maharashtra taking the first and second positions, respectively. The total number of literate persons in Bihar as per the 2011 Census was 54,390,254, with males significantly outnumbering females. The literacy rate stood at 61.8% overall—71.2% for males and 51.5% females—indicating a persistent gender disparity in education (*Provisional Population Bihar, 2011).*

According to the 2011 Census, 89% of Bihar's population lives in rural areas, making the state mostly an agricultural state. The Gangetic River traverses the state's lush, alluvial plains, which are situated in the Gangetic Valley. This agricultural richness stretches over the state from west to east, from the southern Ganges regions to the northern Himalayan foothills. Rice, bajra, maize, jowar, sugarcane, tur, potatoes, and pulses are among the main agricultural products produced in Bihar's lush soils, which are also used to cultivate Rabi and Kharif crops. Because of the state's abundant farmland and verdant orchards, agriculture plays a major role in the state's economy (*Provisional Population Bihar, 2011)*. Sugarcane, potatoes, tobacco, oil seeds, onions, jute, and mesta are the principal cash crops. Food grains produced in the State during the months of Kharif and Rabi account for 64% and 36%, respectively, of the overall production. Mangoes, bananas, jack fruit, and litchis are the main fruits. This is one of the very few places outside of China where litchi is produced in large quantities. Bihar is India's poorest State, with high rates of infant mortality and illiteracy notwithstanding its agricultural bounty.

Bihar is richly endowed with water resources, both the ground water resource and the surface water resource. Not only by rainfall but it has considerable water supply from the rivers which flow within the territory of the State. Ganga is the main river which is joined by tributaries with their sources in the Himalayas. Some of them are Saryu (Ghaghra), Gandak, Budhi Gandak, Bagmati, Kamla- Balan and Mahananda (*Bihar Report 2022-23. Doc*, n.d.). There are some other rivers that start from the plateau area and meet in the Ganges or its tributries after flowing towards north. Some of them are Sone, Uttari Koyal, Punpun, Panchane and Karmnasha. These rivers make the water available for irrigation purpose and also help in generating the hydro-

thermal energy for the State. Apart from this they provide a medium for water transport, provide fishes for fishery industry and enrich the natural resources of state in many other ways (*Bihar Chamber of Commerce*, n.d.).

1.9.1 Unemployment

Approximately 16.4% of Indians were reported to be multidimensionally poor as of 2021. This showed a significantly smaller proportion of India's population living in multidimensional poverty. A little more than 55% of Indians were living in extreme poverty in 2016. 1.3 billion of the 5.9 billion people who live in these countries are multidimensionally poor, according to the global multidimensional poverty index 2022, which covered 109 developing nations (Rathore, 2024). In Bihar, the poverty rate is over 41.4 percent, compared to the national average of 27.5 percent. Bihar is among the poorest States of India due to its extremely bad economic situation and persistently high absolute poverty rate. The poverty rates in rural areas (42.1%) and urban areas (34.6%) are both much higher than the national average. North Bihar is substantially poorer than South Bihar, with rural poverty varying greatly throughout the State's sectors and areas. (*State-Wise Percentage of Population Below Poverty Line by Social Groups, 2004-05 | Department of Social Justice and Empowerment - Government of India*, n.d.)

1.9.2 Poverty

In comparison to the national average, unemployment is extremely high in rural Bihar. For the rural poor in Bihar, out-migration is an essential survival tactic. In India, Bihar has the highest gross inter-state out-migration rate. Almost 40% of Bihar's rural labour is employed for pay in agriculture. Approximately 70% of jobs in Bihar are related to agriculture and cultivation. In rural Bihar, there are currently extremely few job options outside of agriculture (NIDM, 2013).

The poor are much more likely to be wage laborers in agriculture or to be part- time non-farm laborers than to be cultivators with regular non-farm employment. Numerous professions that fall under the category of self-employment could be just as vulnerable as casual work, particularly for the underprivileged. Low-

quality livestock—goats rather than cows and buffaloes— is typically owned by the poor and households from disadvantaged social backgrounds. Social and caste traits are linked to opportunities and limitations within the State. One powerful predictor of poverty in the State is caste identification. The SC/ST people in Bihar are said to be much poorer than Muslims and other backward castes, and around three times poorer than the upper castes(NIDM, 2013).

The main goal of societal assessments is to ascertain which groups of people—by virtue of their age, income, education, experiences, and capabilities—are more susceptible to a certain hazard or set of related hazards. Vulnerability is increased in high-density locations where the population is below the poverty line due to increased physical exposure. The State's population's income is analyzed since it is one of the most significant indicators of poverty and the vulnerability that results from it.

1.10 Pattern of Flood in Kosi- A Familiar Annual Tragedy

Flooding is an annual occurrence in Bihar, as we have seen. Hardly a year goes by in the State that does not experience flooding. The past fifty to sixty years have seen a number of significant floods in the state (National Geographical Journal of India, 2018).

Major flooding in Bihar's history:

1954 Waterfalls: The 1954 floods in North Bihar were so destructive. As a result of this flood, 7.61 million people (out of 18.393 million) were living in North Bihar; only 2.46 MH of land were damaged. This flood affected 8119 of the 21,107 villages in North Bihar. It caused the destruction of around 1,79,451 houses, the loss of standing crops on over 15.96 lakh hectares, and 33 fatalities (BSDMA, 2010).

In 1944, cattle had also perished in the same flood. The cumulative effect of the floods was estimated to have cost Rs 50 Crores.

1974 Floods: The flood of this year affected the districts of Munger and Santhal Parganas, as well as the area south of the Ganga, over 3.182 MH. 16.39 million people were impacted by the loss of 1.751 million MH of crops. In addition to demolishing 5,16,353 dwellings, this flood took the lives of 288 livestock and 80 persons. In total, an estimated Rs. 354.59 crores were lost.

1987 Floods: The 20th century's worst flood was this one, according to records. Rainfall began on August 11 and remained virtually nonstop until August 19. Despite the deployment of 13 helicopters and 58 Army boats, food packets could not be dropped in the districts of Madhubani, Darbhanga, Samastipur, and Khagaria devastated by flooding for around three weeks. Up until the end of October, blocks like Beldaur and Alauli were abandoned. The fact that the floodwaters inundated Madhubani's Jhanjharpur Sub-division even after Diwali indicates the seriousness of the five spells that the floods repeated (BSDMA, 2010).

2004 Floods: This year's flood was spread over 20 districts of North Bihar with an area over 2.772 MH and affected population of 21.3 million. This flood had engulfed 9346 villages, destroyed crops over an area of 1.399 MH and swept away 9, 29,773 houses killing 885 persons.

2007 Floods: The South West Monsoon floods that hit Bihar in July and September of 2007 serve as a sobering reminder of the state's susceptibility to repeated flooding and the enormous devastation these occurrences may bring about. The floods of 2007 are regarded as unprecedented because of their severity, unpredictability, timing outside of the season, wide geographic coverage, multiple occurrences, and extended length(BSDMA, 2010).

Although flooding has long been a major problem for Bihar, the floods of 2007 were remarkable in terms of their scope, intensity, and regularity. A significant factor in the state's low ranking on the national development index is also thought to be this calamity. The impoverished were disproportionately impacted, as is the case with any crises, underscoring the state's growing poverty and inequality. The government's attempts to manage floods have failed, as seen by the frequent floods, which raises

questions about the efficacy of the current approaches. There is growing evidence that these tactics require a thorough evaluation immediately.

Over 20 million people and 0.60 million animals in Bihar were affected by the floods in 2007. With 0.17 million hectares of agricultural land and 0.07 million hectares of non-agricultural land, the affected area was roughly 0.18 million hectares. It was estimated that crop losses alone cost about 300 million rupees. The population's misery was exacerbated by the floodwaters' serious risk to public health. They made it extremely difficult for them to obtain medical attention (NIDM, 2013).

1.11 Dam Constructions on Kosi

A major multipurpose project called the Saptakosi High Dam is being considered for building on the Saptakoshi River in Nepal, sometimes referred to as the Kosi River in India. This large-scale project is intended to meet a number of urgent needs in the northern Bihar region of India as well as Nepal. Its main goal is to reduce the destructive floods that frequently occur in northern Bihar and southeast Nepal, giving these vulnerable communities much-needed relief. The dam will also be a significant hydropower source, capable of producing up to 3,000 MW of electricity. The project is anticipated to improve irrigation capacities, which would support agricultural productivity and water distribution in the area in addition to controlling flooding and producing energy. All things considered; the Sapta Kosi High Dam is an essential piece of infrastructure (National Geographical Journal of India, 2018).

1.12 Role of Traditional and Social Media and Natural Disaster in India

The traditional and social media serves as a vital link between the public and emergency organizations, playing a crucial role in the dissemination of essential information before, during, and after disasters. Its contributions to disaster risk communication are multifaceted:

Educating the Public: The traditional and social media educates the public about various aspects of disasters, including their nature, risks, and preparedness measures. This information empowers individuals and communities to make informed decisions

and take necessary precautions.

Warning of Hazards: Through timely reporting, the traditional and social media warns the public of impending hazards such as severe weather events, earthquakes, or tsunamis. These warnings provide crucial lead time for people to evacuate or prepare for the disaster.

Information Gathering and Transmission: During a disaster, the traditional and social media gathers and transmits real-time information about affected areas. This includes updates on the extent of damage, casualties, and evolving situations, helping both responders and the public stay informed.

Alerting Stakeholders: The traditional and social media serves as a communication channel to alert government officials, relief organizations, and the public about specific needs and urgent requirements in disaster-affected areas. This facilitates a coordinated response.

Facilitating Discussions: The traditional and social media platforms facilitate discussions and conversations about disaster preparedness and responses. These discussions contribute to continuous improvement in disaster risk resilience strategies and practices.

To enhance the effectiveness of the traditional and social media in these roles, establishing and maintaining direct and effective working relationships between the media and disaster organizations is essential.

In the realm of disaster communication, the need for "right information at the right time" has remained unchanged for centuries. People require advance warnings before disasters strike and, in the aftermath, access to critical data such as casualty figures, damage assessments, required supplies and skills, and the most effective means of delivering assistance. Numerous examples highlight the life-saving impact of public education and the rapid dissemination of early warnings. For instance, improved warning systems in Bangladesh led to significantly fewer casualties in cyclones compared to earlier decades. Conversely, instances where an alert and warning

system was absent have resulted in high casualty rates and extensive property damage. Events like the Bhopal gas leak, the 1999 super cyclone in Orissa, and the 2004 Indian Ocean tsunami in India underscore the importance of timely alerts and warnings in saving lives and mitigating disaster-related impacts (Dave, 2013.)

1.13 Public Awareness Campaign and Disaster

Public awareness stands as a cornerstone in the arsenal of innovative tools and best practices within the realm of disaster planning and communication, serving as a powerful instrument for achieving disaster risk reduction. It empowers communities by imparting an acute understanding of the challenges that impact their environment, thereby enhancing their resilience. A public awareness campaign is a meticulously orchestrated communication endeavor that leverages various media outlets and messaging strategies. Its primary objective is to elicit specific responses from a substantial number of individuals within a defined timeframe. In a broader context, as described by Rose (2005), public awareness campaigns serve as a means to rally collective will and concerted efforts for the betterment of the public. The extensive goal of public awareness initiatives is to acquaint vulnerable communities with the perils they face and to equip them with the knowledge of actionable steps that can mitigate these risks (Joyce et al., 2013).

Government intervention is indispensable when it comes to mitigating the human mortality and economic losses caused by disasters. In India, there is no standardized guideline for designating any natural disaster as a 'national disaster.' Instead, the Indian Government assesses each situation individually, determining whether to declare a natural disaster as 'national' based on its severity and magnitude. The Government of India also extends disaster assistance to affected states, contingent upon the scale of damages incurred, the number of people affected or killed, and the respective state government's capacity to manage the crisis and offer financial aid to those affected. While effective governance can significantly reduce the impact of disasters, it cannot entirely prevent their occurrence. Minimizing the impact of disasters represents a paramount challenge faced by governments worldwide. Nations with robust institutions and effective governance structures have, on the

whole, recorded fewer disaster-related fatalities and reduced economic losses (Parida, 2018).

Public awareness and public education in the realm of disaster reduction are dedicated to translating available human knowledge into tangible, community-specific actions aimed at mitigating disaster risks. These initiatives galvanize individuals through clear and concise messages, underpinned by comprehensive information. Notably, raising awareness about hazards alone does not guarantee that people will adopt risk-reduction measures. Research has identified that individuals are more inclined to take action when they meet certain criteria:

Understanding Specific Actions: People need to know precisely which actions they can take to reduce their personal risks.

Belief in Effectiveness: They must be convinced that these actions will effectively mitigate the risks they face.

Self-Efficacy: Individuals should have confidence in their ability to carry out these tasks successfully.

These research findings provide valuable insights for the effective design of public education campaigns. Some established facts include:

Stimulating Information Seeking: People need to be encouraged to seek information actively.

Validation through Consensus: Individuals seek validation and consensus from various sources, such as friends, experts, public authorities, respected community leaders, as well as media platforms like radio, television, and websites, before taking action.

Social Influence: People tend to follow what they perceive others are doing, emphasizing the importance of highlighting positive local examples rather than solely focusing on threats.

Pro-social Epidemics: Initiatives are often kick started by individuals categorized as connectors (bringing people together), information specialists (experts), and salespeople (persuaders).

Effective Messaging: Memorable lessons are often conveyed through stories that are simple, unexpected, concrete, credible, and emotionally resonant.

Behavioral Change Process: The process of behavior change typically evolves from contemplation to planning, then to action, and finally to maintenance.

The target audiences for public awareness and public education efforts radiate outward like ripples in a pond. At the core are those individuals who are already actively engaged in efforts to enhance safety and resilience, including enthusiastic staff and volunteers. However, even this core group can benefit from expanding its reach and impact (Uvais, 2020).

1.14 Disaster Act 2005 and Public Policy

In India, a comprehensive framework for disaster preparedness and response at several levels of governance is outlined in the Disaster Management Act of 2005 (India Code, 2005). It requires all levels of government, including local authorities, to develop and implement disaster communication strategies. The act creates NDMA, which is headed by the prime minister, at the federal level. In a similar vein, Chief ministers direct the work of State Disaster Management Authorities, and District Magistrates supervise District Disaster Management Authorities.

In collaboration with pertinent ministries and department heads, the NDMA functions as the main coordinating organization, formulating plans and policies. A National Institute of Disaster Management is also to be established, with the act's duties including research, staff development, and public awareness campaigns. Essential relief supplies, including food, water, shelter, and medical attention, is guaranteed by provisions of the legislation. Financial aid in the form of loans and

grants is also covered. Rapid and efficient catastrophe response is facilitated by a collaborative strategy combining many government ministries (Guru, 2022).

In addition, the legislation suggests creating a specialized group called the National Disaster Response Force (NDRF) (*Response Force | NDM India*, n.d.) to deal with serious disaster scenarios and supports the appointment of experts in managing disaster to advisory positions. The Prime Minister is in charge of implementing the NDMA through executive orders until the legislation is being fully implemented.

Sets of information related to catastrophes usually offer comprehensive analyses of the effects of the events on people and the economy, with a focus on losses to items that are insured. Economic costs can be evaluated in monetary terms, but the human cost is typically calculated in terms of lost lives, lost life years, and disability-adjusted life years. It is not simple to translate these human repercussions into monetary ones. Still, it is extremely important for disaster, acting as a vital instrument for more than just helping to make decisions about policy (Kharb et al., 2022)

1.15 Statements of the Problem

According to the Bihar Disaster Management Authority (BSDMA), an alarming 73.63% of the entire geographical area in North Bihar is susceptible to flooding (NRSC, 2020). This recurring issue of flooding wreaks havoc on crops, infrastructure, and human lives, resulting in substantial economic and human losses that could be mitigated through effective communication and information strategies. Despite the potential for preventive measures, Bihar continues to endure significant losses each year due to these destructive floods. It is imperative to take fundamental and well-planned steps to reduce the severity and manage the adverse effects of this recurring natural calamity.

While Bihar possesses abundant resources, it continues to grapple with devastating flood-related losses annually. Surprisingly, very few of the communication practices implemented have undergone rigorous evaluation to assess their impact on enhancing social capabilities. The art of crafting effective messages plays a pivotal role in

communicating with and mobilizing individuals trapped in disaster situations. Remarkably, there is a dearth of studies focused on message design, especially concerning disasters like the Kosi floods.

Hence, the primary objective of this study is to introduce a conceptual framework for risk communication in the context of community disaster preparedness. This framework aims to serve as a foundation for the development of a comprehensive communication plan for future disaster resilience efforts, informed by a meticulous review of existing literature and the collection of primary data.

What makes this study significant is the striking lack of empirical research that evaluates the effectiveness of formal risk communication initiatives by the government. These evaluations are crucial both in terms of assessing the alignment of communication efforts with their intended purposes and in terms of gauging their contribution to various social capacities, including knowledge, attitudes/motivation, social and organizational aspects, and psychological factors. By shedding light on these critical issues, this study aspires to bridge the gap between theory and practice in the realm of disaster communication, ultimately aiming to enhance disaster preparedness and response strategies.

1.16 Objectives of the study

The objectives of the study are as:

I. To map various instances of communication by the government during the Kosi flood.

II. To ascertain the communication plan designed by the government authorities to mitigate the impact of Kosi flood.

III. To assess the effectiveness of risk communication by eliciting response from affected population of Kosi flood.

IV. To identify, appraise and synthesize the effects of risk disaster communication interventions during of the disaster cycle in Kosi flood disaster.

V. To create a possible communication plan for disaster risk resilience in future regarding Kosi flood.

1.17 Research Questions

The Research Questions of the study are: -

I. What are the instances of communication by the government during the Kosi flood to risk communication practices? What kinds of communication plan are being designed by the government authorities to mitigate the impact of Kosi flood?

II. How does the communication interventions work during four stages of the disaster cycle in Kosi flood disaster (mitigation and prevention, preparedness, response, and recovery?

III. What are the specific tools contributing in particular situations especially in Kosi flood areas and how can the quality of implementation be assured?

IV. How can public dialogue on regional risk communication are integrated into wider public discourse, closer to people's life?

V. How and what kind of possible communication plan can be created as preventive majors for such disaster in future?

1.18 Theoretical Frame Work

A theoretical framework is crucial in research, especially in areas like disaster risk communication. Related theories serve as guiding principles that help researchers understand and interpret phenomena, such as how people perceive and respond to disaster risk communication messages. Disaster Risk communication involves the exchange of information regarding risks or hazards, typically from government organizations to the general public. Its primary objective is to foster an informed audience that is engaged, interested, and oriented toward solutions. This stands in contrast to the common approach of merely alleviating public concern.

Whether the communication pertains to a prescription drug recall, a natural disaster, or a terrorist event, disaster risk communication aims to enhance understanding, enabling individuals to make informed decisions and bridge the gap between experts or officials and the general population. Risk communication theory (Gu, 2022) distinguishes itself from crisis communication & planning, which focuses on identifying warning signs of potential risks. communication & planning serves as a tool for crisis prevention, whereas risk communication serves as a tool for crisis communication. In the context of disaster risk communication, several theories play a vital role:

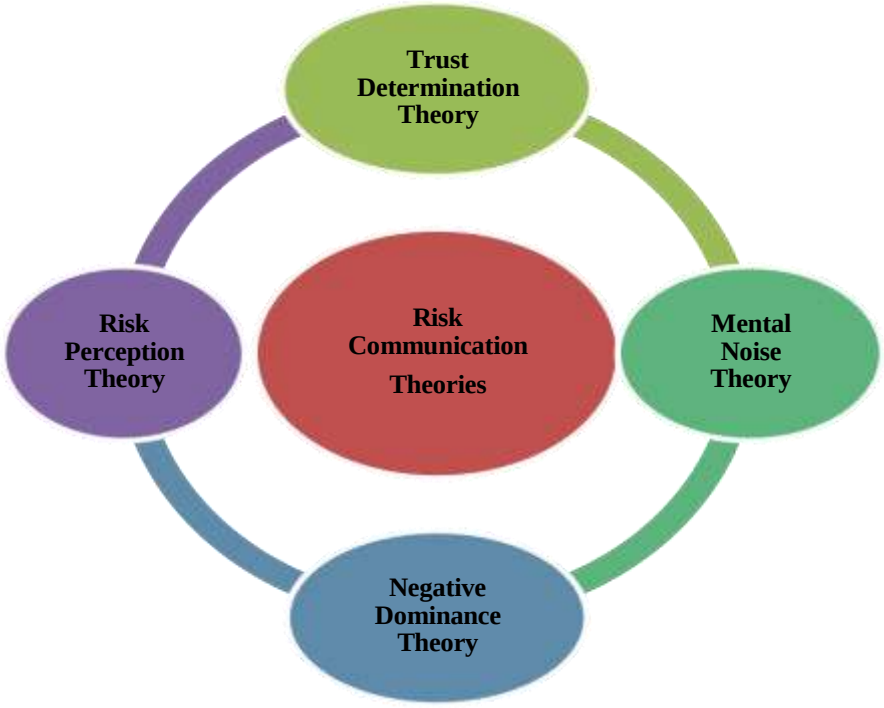
Trust Determination Theory: This theory suggests that individuals who are angry or skeptical are less likely to trust the source of information establishing public trust gradually becomes crucial in effective risk communication.

Mental Noise Theory: According to this theory, messages are harder for individuals experiencing distress to process and remember. Therefore, concise, repetitive, and visually aided messaging is recommended to enhance comprehension and retention.

Negative Dominance Theory: Stressful situations can lead individuals to perceive everything in a negative light. Thus, it's advised to minimize the use of negative terms in communication to prevent amplifying negative emotions.

Risk Perception Theory: This theory posits that individuals are more concerned about risks that feel imposed, uncontrollable, or associated with adverse outcomes. Understanding this theory helps in tailoring risk communication messages to address specific concerns and perceptions of the public.

By understanding and incorporating these theories into research and practice, one can develop effective strategies for communicating risk and enhancing public understanding and preparedness. Theoretical frameworks provide a systematic approach for analyzing and addressing complex issues, ultimately contributing to the advancement of knowledge and the development of practical solutions in disaster risk communication.



(Figure 1.1: The Four Risk Communication Theories)

1.19 Significance of the Study

The significance of this study is to create a workable conceptual framework for risk communication in the context of community catastrophe preparedness. It is anticipated that this framework will serve as the basis for developing a thorough communication strategy for upcoming disaster risk resilience initiatives. This study aims to offer significant insights that can improve the efficacy of disaster response tactics. It is informed by a thorough analysis of the body of existing literature and the collection of original data.

It is worth noting that there is a scarcity of empirical research that evaluates the outcomes of formal risk communication initiatives undertaken by government entities. Specifically, there is limited examination of how such communication efforts fulfil their intended purposes and contribute to enhancing various social capacities, knowledge, attitudes/motivation, social and organizational aspects, as well as psychological factors. This study seeks to address this gap by assessing the effectiveness and impact of government-led risk communication

initiatives.

The findings from this research endeavor will be instrumental in crafting a robust and adaptable communication plan for disaster risk resilience in the future. By bridging the gap between theory and practice, this study aims to enhance disaster preparedness and response strategies.

The chosen research area for this study is the Supaul district in Bihar. This district, formerly a part of Saharsa, has a significant population, as per the 2011 India census, comprising 2,228,397 individuals, with 1,157,815 men and 1,070,582 women. Specifically, the study will focus on five blocks within Supaul: Kishanpur, Supaul, Basantpur, Raghopur, and Pratapganj. These blocks have been selected due to their vulnerability to flooding, making those pertinent areas for the investigation of disaster risk communication and planning.

1.20 Scope of the Study

The scope of this study focuses on evaluating the effectiveness of disaster risk communication strategies employed during information campaigns related to floods in the Kosi River region of Bihar. This study assesses how well these communication efforts have reached and influenced the target population, particularly in terms of enhancing their awareness, preparedness, and response to flood risks. The study has been confined to the flood-prone areas of the Kosi River basin in Bihar, particularly focusing on the Supaul district. An analysis conducted on various communication channels used during the information campaigns, including mass media (radio, television), social media, print media, and grassroots methods such as community meetings and posters

The study evaluates the content of the disaster risk communication messages, assessing their clarity, relevance, and cultural appropriateness for the target population. The study measures the impact of the communication campaigns on public awareness, behavioural changes, and preparedness levels, utilizing both quantitative and qualitative methods. The study will also examine the roles of various stakeholders, including government agencies, NGOs, and local leaders, in the

dissemination and effectiveness of disaster risk communication. This research aims to provide insights into the strengths and weaknesses of current disaster risk communication strategies in the Kosi River region, offering recommendations for enhancing the effectiveness of future information campaigns.

1.21 Research Design

This study used a mixed methods approach to provide a thorough review of disaster risk communication strategies in the districts affected by the Kosi River floods. Mixed methods research combines the breadth and generalizability of quantitative procedures with the depth and context of qualitative approaches to provide a more thorough grasp of complex research problems.

By combining these approaches, the study hopes to capture the nuanced, complicated human experiences related to catastrophe communication and offer statistical insights that may be applied to a larger population. Supaul district in the Indian state of Bihar is the subject of this study, which is situated in the Mithila area. Supaul is one of the districts in India most prone to flooding because of its proximity to the Kosi River. Five of its eleven blocks—Kishanpur, Supaul, Basantpur, Raghopur, and Pratapganj—have been severely impacted by yearly flooding. These blocks were specifically chosen for this inquiry because of their continuous susceptibility to flood dangers.

By combining text analysis, in-depth interviews, and surveys, the study suggests using a mixed methods approach to thoroughly investigate disaster risk communication in Supaul. The study will look at the messages that officials and government entities use to raise awareness of floods. This analysis aims to provide insight into the planning and execution of government communication strategies before to, during, and after floods. In- depth interviews will be conducted with five block development officers selected from each of the blocks. The communication strategies employed by public officials to mitigate the consequences of flooding have been comprehensively examined through qualitative technique. The interviews will be selected using a non-probability sampling technique called judgment sampling,

and narrative analysis will be employed to glean significant themes and insights from the data.

A survey of 385 residents of the five blocks have been carried out to assess the effectiveness of disaster risk communication from the viewpoint of the impacted community. The sample size will be estimated using the Cochran formula (Bulletin of the Gauhati & University Mathematics Association, 2012). By using area sampling, it will be ensured that the survey is representative of the flooded areas. To find trends in public knowledge and readiness, the survey data was analysed statistically with the help of SPSS tool. This strategy works especially well in Supaul's diversified and flood- prone geographic location. Purposive sampling will also be utilized to choose interview subjects in order to ensure alignment with the goals of the study.

1.22 Supaul (Bihar) – An Introduction

Supaul district is located in the centre of Bihar and spans 2,420 square km. It is in a prominent region in the Koshi division. Supaul town is at the centre and acts as the district's administrative center. Supaul district is surrounded by a variety of landforms. To the north, it borders Nepal, while to the south, it borders Saharsa district. It borders the district of Araria to the east, and it merges with the Madhubani district to the west. The district is a thriving community that embodies the essence of Bihar's past, with a rich cultural tapestry (*Supaul.2013*). Supaul district has great historical significance and hopeful future of Bihar, given its strategic location and diversified topography. Supaul district, which lies in the centre of Bihar, is a tribute to the rich tapestry of history and culture. This district has a distinguished history that dates back to the Vedic period. Supaul has played a significant role in Mithilanchal, a region rich in mythology and history, over the millennia. Hindu mythology states that this region was formerly known as Matsya Kshetra, signifying its connection to fishing. Supaul included the old democracies of Apadnigam and Angutaran from the Buddhist period in the history books (*DistrictsOfIndia- Socio-Economic Statistical Data of Supaul District, Bihar*, n.d.).

Formerly part of the Mithila Region's Saharsa area, Supaul rose to prominence when Indo-Aryan settlers founded the renowned Mithila Kingdom, also known as the Kingdom of the Videhas. Alongside Kuru and Pancala, this kingdom, which flourished in the late Vedic period, became an important centre of politics and culture. When Supaul was separated from Saharsa district on March 14, 1991, Bihar's map began to show it as an autonomous entity. Supaul, which is located near the border between India and Nepal, represents a fusion of modernism and tradition and acts as a bridge between the two countries(*Bihar Report-2023*).

Bihar's legacy and tenacity are best embodied in the Supaul district. With more over two million residents, its demographics show that many religious and linguistic traditions live peacefully. Although Supaul's economy is still primarily depends on agriculture, the region is now home to growing furniture and plywood industries. The district continues to advance in spite of obstacles programmes like the Backward Regions Grant Fund Programme. When we consider its history, Supaul remains a symbol of the perseverance of its people and the hope for a better future.

1.23 Government Initiative to Combat Disaster

Bihar used information-driven strategies to combat floods and lessen their effects. Because of its physical location and the existence of significant rivers like the Ganges, Gandak, and Kosi, the state frequently experienced floods. The state decided to manage floods using a river basin approach, which emphasizes the comprehensive planning of rivers and their catchment areas (*Combating Flood with Information Driven Actions, Bihar | NFS*, n.d.). Numerous perennial and non-perennial rivers characterize the terrain of Bihar; among them, those that originate in Nepal are noted for carrying heavy amounts of silt, which are subsequently deposited on the plains of Bihar. The three to four months of monsoon, when river flows can increase by up to 50 times and cause floods in Bihar, receive the majority of the region's rainfall. The Bihar Government categorizes floods in the state into four groups, which are as follows:

Class I: Flash floods: they are floods brought on by rain in Nepal that have a short (8-hour) lead time and quickly recede the floodwaters;

Class II: River floods: a 24-hour warning period and a week or longer for the floodwaters to recede;

Class III: Over 24-hour lead time and entire monsoon season drainage congestion at river confluence (i.e., three months till floodwaters recede).

Class IV: Area that is consistently wet.

Therefore, it is estimated that 73.63% of North Bihar's land area is vulnerable to flooding. Of the 38 districts, 28 experience flooding, with 15 districts seeing the worst effects. This results in significant losses of property, life, farmlands, and infrastructure. Nearly 500,000 farmers were impacted by the 2008 Kosi floods, which destroyed approximately 350,000 acres of paddy, 18,000 acres of maize, and 240,000 acres of other (BSDMA, 2000.).

Extreme flooding in the Kosi River basin demands resilient and well- functioning risk communication efforts. The Upper Lesotho Highlands is a historical center of flooding, claiming large numbers of lives and causing many great damages to property and livelihoods from flood events. Communication remains a critical component in determining how resilient and responsive affected communities will be, regardless of technological advances or increasing awareness around disaster preparedness (Niti Aayog, 2021).

The Flood Management Improvement Support Centre (FMISC) was established under the supervision of the Chief Engineer, Planning and Monitoring, in the Water Resources Department (WRD), Government of Bihar, to develop and manage the Flood planning and communication Information System with technical assistance from the World Bank. Major functions of FMISC are:

- For the FMISC to be prepared for operation before each flooding season.

- Operate and release schedules for information products as planned.
- Use FMIS to meet emergency data needs
- In order to facilitate the effective operation, follow-up on spreading
- To learn from feedback and the throwing deep end experiences of every single flood season to improve FMISC.

1.24 Organization of Chapters

This research study on the effectiveness of disaster risk communication, focusing on an information campaign about floods in the Kosi River in Bihar, is presented in five chapters. The description of each chapter is as follows:

Chapter 1: Introduction

This chapter provides an overview of the research topic, setting the stage for the study. It outlines the significance of disaster risk communication, the specific challenges posed by flooding in the Kosi River region, and the objectives and scope of the research. The introduction also highlights the importance of effective communication strategies in mitigating flood impacts and enhancing community resilience.

Chapter 2: Literature Review

The literature review chapter delves into existing research and theoretical frameworks related to disaster risk communication. It examines global and regional studies on flood communication strategies, the role of various communication channels, and the effectiveness of different approaches in raising awareness and preparedness among vulnerable communities. This chapter provides a foundation for understanding the current state of knowledge and identifying gaps that this study aims to address.

Chapter 3: Methodology

This chapter outlines the research design and methodology used in the study. It describes the research approach, data collection methods, and analytical techniques employed to evaluate the effectiveness of the flood information campaign in the Kosi River region. The methodology chapter also discusses the selection of study areas, sampling procedures, and tools used for data analysis, ensuring the research's reliability and validity.

Chapter 4: Data Analysis and Findings

In this chapter, the collected data is systematically analyzed to assess the effectiveness of the disaster risk communication campaign. The analysis includes both quantitative and qualitative data, highlighting key findings related to the reach, comprehension, and impact of the information disseminated. This chapter presents the results in a structured manner, using charts, graphs, and tables to illustrate the key trends and insights derived from the data.

Chapter 5: Major Findings, Discussion, Conclusion, Suggestions, Scope for Further Research and Limitation of the study

The final chapter summarizes the main findings of the study, discussing their implications for disaster risk communication strategies in flood-prone regions. It provides a comprehensive conclusion that reflects on the research objectives and questions. This chapter also explores the practical implications of the findings for policymakers, community organizations, and other stakeholders. Additionally, it outlines the limitations of the study and suggests areas for future research to further enhance disaster risk communication and community resilience.

Chapter – Two

Review of Literature

The review of the literature is one of the important parts of a research study. It aids in developing a research framework and a detailed investigation of the study theme. It limits the research's focus and chooses the line of enquiry that will yield the best results. Review of literature on the subject of research from peer-reviewed journals, books, reports, conference proceedings, websites, and the like. It offers broader and deeper perspectives on the subject of interest, as well as information on the different methodologies used, the data used, the software used, sampling techniques, and assessment techniques. This chapter summarizes the research that has been done in the areas of Kosi flood exposure, information campaign, adaptive capacity as well as the communication strategy.

India has experienced devastating natural disasters like droughts, floods, cyclones, earthquakes, landslides, etc. before. As a result, millions of people each year are impacted in various ways. Due to the geographical diversity of the Indian subcontinent, different climatic reactions are sometimes triggered, resulting in natural calamities like floods, cyclones, Tsunamis, earthquakes, and so forth. Depending on various geomorphic factors like soil type, climate, etc., different areas are more susceptible to specific types of disaster. Socially, a disaster has a significant social impact on many people, and it has varying degrees of impact on the entire community. At this point, it's crucial to understand that certain groups of people are more susceptible to disasters due to a variety of factors (Adame & Miller, 2015).

This includes providing special care and attention to women, children, the elderly, and people with disabilities after a disaster. The possibility of loss of life, injury, or destruction and damage as a result of a disaster in a certain period of time is referred to as disaster risk. Applied to risk, disaster communication has been defined broadly as a social process of information ex-change between any entities in society on any form of risk that can be individual, social, political, environmental

that is purposeful or non-purposeful (Awange, 2018).

India is primarily a tropical nation that straddles the Equator, the Tropic of Cancer, and the Tropic of Capricorn. Natural disasters frequently occur in the Indian peninsula as a result of its distinctive geographical diversity and meteorological conditions. The eastern and western coastlines are affected by natural disasters like cyclones, while the sub-Himalayan regions and the Western Ghats are at risk of landslides. India, a nation with many rivers, experiences floods on an estimated 40 million hectares each year, and 68% of its agricultural land is vulnerable to drought. 59% of the country is earthquake-prone due to its topography. Numerous natural disasters have struck the nation during the past 20 years, impacting both local communities and overall development efforts. This has gradually brought to light the nation's fundamental weaknesses in catastrophe preparedness and mitigation (Das et al., 2019).

The communication in such situations aims to provide information to the public about the effects of the disaster, and how it may affect the existence and survival of the people. The study aims to identify knowledge gaps or evidence that would benefit society and the nation to prevent the communication gap in disaster and to identify lessons from the literature that will help inform the design of future research based on risk or crisis communication. Additionally, the study focuses to estimate the effects of various types of disaster risk communication (Dixit et al., 2018).

Public awareness about catastrophes is a critical function of effective disaster communication. Teaching the basics, classifying disasters, identifying high-risk locations, and stressing preparedness, mitigation, and response tactics are all part of this. It also includes post-disaster phases such as reconstruction, rehabilitation, and the creation of long-term or contingency plans to reduce risks in the future. In order for communities to respond to crisis situations promptly and accurately, communication is essential to the dissemination of reliable information. Effective communication relies on being precise, thorough, and easy to understand. It also encourages recipients to modify their attitudes, both verbally and nonverbally (Khumairoh et al., 2021).

2.1 Understanding ‘Disasters’

The definitions of ‘Disaster’ vary widely depending on the field of study and requirements; hence there is currently no shared understanding of the phrase (*ICT and Disaster Risk Reduction*, 2022). A disaster is an occurrence that often happens abruptly and unexpectedly, disrupting people or things in its path severely, killing or seriously injuring the populace, destroying or losing community property, and/or seriously harming the environment. A crisis like this disrupts daily routines, leads to anguish, helplessness, and misfortune, has an impact on the socioeconomic structure of a country or region, and/or changes the environment to the point where outside support and rapid action are required.

According to Disaster management Act, "Disaster is defined as a catastrophe, mishap, calamity, or grave occurrence in any area that results in a significant loss of life or human suffering, damage to and destruction of property, damage to, or degradation of the environment, and is of a nature or magnitude that is beyond the capacity of the affected community to cope" (*DM Act 2005 | NDMA, GoI*, n.d.).

Disaster is "a process or event involving a combination of a potentially destructive agent(s) from the natural and/or technological environment and a population in a socially and technologically generated situation of environmental vulnerability," (World Health Organization, 2002).

The operational definition used in this chapter is one offered by (Wisner, 2003) who state that "A disaster occurs when a significant number of vulnerable people experience a hazard and suffer severe damage and/or disruption of their livelihood system in such a way that recovery is unlikely without external aid. The definition of a disaster provided by the WHO (Emergency and Humanitarian Action Department), says that a disaster is "Any event that results in damage, ecological disruption, human life loss, or deterioration of health and health services on a scale sufficient to warrant an extraordinary response from outside the affected community area" (World Health Organization, 2002).

2.2 Natural Disaster in India: An Exposure

India is one the most vulnerable nations to natural disasters. Depending on the region's vulnerability, various types of natural disasters, such as floods, droughts, earthquakes, cyclones, landslides, and volcanoes, etc., strike. River floods are the most frequent and frequently disastrous of all the natural calamities that the nation experiences. According to a Press Trust of India survey, India comes in after China as the country with the most natural disasters worldwide. Unplanned urbanization and the unwillingness to address the threat posed by global climate change have been identified as the root causes of this. India came in second with 16 natural disasters, behind China with 22 natural disasters (PTI, 2021).

It is widely accepted that the Indian subcontinent is in a zone that is quite vulnerable to disasters and that it frequently experiences different kinds of catastrophes. There were approximately 402 disasters in the 100 years between 1900 and 2000, and 354 incidents in the two decades that followed. (2001–21). These catastrophes have historically affected each of these. Disaster-proneness is determined using scientific data on climatic elements and other geological formations along with the likelihood that such disasters will occur. The vulnerability has been identified by BMTPC and the Ministry of Home Affairs of the Government of India. Nearly 83,000 individuals have died and 100 crore people have been affected by these calamities in the roughly 20 years since 2001. According to estimates from the State Bank of India, the losses amount to a staggering Rs. 13 lakh crores, or 6% of the GDP, when adjusted for current values. The Indian Parliament has reported about the damages brought on by hydro-meteorological disaster under an unmarked question (Awange, 2018; Deshpande, 2022).

Risk is determined by the interplay of Hazard and Vulnerability. India stands out as one of the world's most hazard-prone nations. Vulnerability within India is exacerbated by factors such as population growth, poverty, rapid urbanization, environmental degradation, and a lack of access to disaster-related information.

While we cannot entirely eliminate hazards, we have the ability to reduce vulnerability through mitigation and preparedness measures. In light of these considerations, there are several key aspects of Disaster Communication in India that merit discussion. India has taken a significant step by introducing disaster communication education in middle and high schools. The current generation of students in these schools is poised to bring about a significant revolution in community-based disaster communication, a proven approach to disaster resilience. It is hoped that India will emerge as a global leader in this field.

Additionally, considering the imposition of a legal duty on citizens to provide assistance during disasters (Disaster response) could further position India as a frontrunner in this domain. The enactment of the Disaster Management Act of 2005 and the training provided by the (NIDM) in collaboration with the Disaster Planning and communication Cells of State Administrative Training Institutes are vital steps toward bolstering India's resilience against disasters. Effective implementation of Disaster communication requires seamless coordination among different government departments and stakeholders (Patil, 2012).

2.3 Floods in India

Floods have been a common occurrence since the beginning of time. Floods are the most frequent natural calamity, not just in India but throughout the world, including South Asia. India's flooding issue is primarily limited to the northeastern and Indo-Gangetic plains provinces. On occasion, floods are also brought on by the rivers of central India. Floods are mostly caused by excessive rainfall, poor river capacity to handle high flood discharge, inadequate drainage to quickly transport rainwater to streams and rivers, storm surges, and man-made elements such dam collapse and other control work failures like reservoirs. Floods can also be brought on by ice jams or landslides obstructing streams, debris flows, backwater, and cyclones. Most often, flooding is caused by excessive rain mixed with streams' low carrying capacities, which causes the banks to overflow (Minakshi, 2012).

Floods in India have become more severe and intense due to climate change, especially in recent years (Dar, 2021). Around 75% of the annual rainfall spills during a short time (June-September), leading to greater river discharge and causing substantial spatial and temporal changes in rainfall that lead to flooding (Wilby & Keenan, 2012).

India is one of the nation's most vulnerable to flooding in the world, along with Bangladesh. Floods significantly outnumber meteorological, climatological, and geophysical disasters in terms of the number of affected persons. Due to population growth and the ensuing expansion of low-lying flood prone areas, the tangible and intangible damages caused by floods are rising at an alarming rate every year (White, 1990). On an annual basis, the affected cropland ranges from 3.5 million hectares during mild floods to 10 million hectares during high floods. The area that has historically experienced flooding has fluctuated, spanning from 0.5 million hectares in 2006 to 17.5 million hectares in 1978. Over 33 million people have been affected by floods on average between 1953 and 2009, and over 2000 people have died as a result (Kumar, 2021).

The primary factors contributing to floods in India encompass relentless monsoon rainfall, diminished river channel capacity to handle high water flows, riverbank erosion, channel bed siltation, inadequate natural drainage systems in flood-prone regions, cloudbursts, and various other meteorological elements. In recent decades, rapid urbanization and shifts in land use have introduced a new challenge: urban floods. India has witnessed several devastating floods over the years, with notable occurrences including the Mumbai flood in 2005, Bihar floods in 2007 and 2008, Assam flood in 2012, Uttarakhand flood in 2013, Jammu & Kashmir floods in 2014, Chennai flood in 2015, and the Kerala flood in 2018, all of which are regarded as severe (Mohanty et al., 2020).

The complexity of India's flood situation makes flood planning a challenging endeavor. Since gaining independence, the Government of India (GoI) has implemented various measures to reduce the occurrence of floods and mitigate their impact. Notably, the GoI has established numerous committees, task forces, and

working groups, and has formulated policies offering guidance on water resource planning, including flood control.

One such initiative was the formation of the Rashtriya Barh Aayogh (RBA) in 1976, tasked with mapping flood-prone areas across states. The RBA submitted its report in March 1980, with recommendations disseminated as guidelines and instructions for implementation to all states, union territories, and ministries in September 1981. However, only Assam and Uttar Pradesh validated the RBA- assessed flood-prone areas, as bureaucratic challenges prevented its implementation in other states. The creation of a comprehensive flood atlas was hindered, as neither the Central Water Commission nor the Ganga Flood Control Commission could conduct test checks in the areas marked on the RBA flood map. Passive flood planning projects also faced hurdles in proper execution due to limited financial resources, project execution challenges, and insufficient monitoring of dam functionality and benefits evaluation (Mohanty et al., 2020).

To enhance flood resilience, the current disaster risk resilience system should acknowledge the significance of community involvement and non-structural measures. Several socio-economic factors have hindered active community participation in India. Issues such as a diverse social structure marked by ethnic diversity, religious differences, and disparities often limit equal participation on a common platform. Additionally, residents in racially fragmented areas tend to participate less, and community participation rates tend to be higher in societies with similar or higher income groups. Gender disparity also inhibits women's involvement in flood planning activities, resulting in the loss of their potential as valuable human resources and sources of knowledge.

2.4 Kosi River: The Sorrow of Bihar

The Kosi is one of North Bihar's most vivid rivers. The Kosi begins its voyage in the Himalayan range at a height of around 7000 meters, and Nepal and Tibet make up its upper catchment. A portion of the Kosi watershed contains the highest summits of the Everest and Kanchanjunga ranges. Because of its seven tributaries, including the

Indravati, Sun Kosi, Tamba Kosi, Likshu Koshi, Doodh Koshi, Arun Kosi, and Tamar Kosi, the Kosi is also known as the Sapta (seven) Kosi in Nepal. The Kosi area is very populous. The Kosi basin's residents' primary vocations evolved into farming and livestock raising (Wilby & Keenan, 2012b).

The Kosi basin offers arable soil suitable for farming, lush pastures for livestock, and an endless pool of potable water that is only fifteen feet below the surface. Because of this, the people who endured the agony brought on by Kosi for thousands of years did not emigrate. The Kosi basin grows a minimum of three different types of crops. The Kosi region's residents have sufficient traditional knowledge of pisciculture. The Kosi basin also has a variety of fruits and vegetables. Amazing traditional knowledge of boat steering and managing floods is held by the locals. The almost 400 villages located in the area between the two embankments are home to 15 lakh people. There are various crops grown. The knowledge that individuals have regarding flood planning and communication and control is the cause of this. These folks are knowledgeable about the flood scenario and the Kosi River's behavior. Most settlements have residences that are high on the embankments due to the water situation. They think that the water would flow over the embankments if it were to enter their dwellings (Casavant, 2022).

Kosi is one of the Ganga's biggest tributaries. It is a trans-boundary river that runs through both Nepal and India and is known as Koshi in Nepal. The ridges that separate the river basin from the Brahmaputra in the north, the Gandaki in the west, the Mahananda in the east, and the Ganga in the south all encircle it. The Kosi River's channel has changed over 120 kilometers from east to west over the past 250 years. The other river is the Gandak. The Mahabharata epic refers to this river as Kausiki. It travels 50 kilometers across Nepal before entering the north Bihar plains near Bhimnagar. After travelling 260 kilometers more, it merges into the Ganges near Kursela. The river flows 729 kilometers from its source to where it meets the Ganga. Northeast Bihar is home to the Kosi River and eastern Mithila, an alluvial cone 180 km long and 150 km wide, with evidence of lateral channel shifting of more than 120 km over the past 250 years through more than 12 different channels

(Dar, 2021).

The Kosi River in the north Bihar areas of eastern India exhibits high geographical and temporal variability in terms of flood amplitude and frequency. The river is particularly prone to flooding, according to data from all three stations, Barahkshetra, Birpur, and Baltara. The flood magnitude is typically higher at the upstream station, Barahkshetra. Relationships between discharge and sediment match the river's flooding characteristics. The Kosi River has a significant sediment flux, especially in its drainage component, which is typically a result of severe bank erosion and regional overland flow. Using hydrological, geomorphological, and demographic data, a multi-parametric technique was used to create a map of flood risk. In order to lessen short- and long-term damages and to raise awareness among the scientists about the possible need for such initiatives should be included in nonstructural flood planning and communication strategies (Sinha et al., 2008).

2.5 Brief History of Breach of Embankment

On August 18, 2008, the eastern Kosi embankment broke at Kusaha, Nepal, uprooting thousands of homes and causing lakhs of people to perish in this unnatural and human-made flood. This location is 12.90 kilometers on the Kosi north of Birpur Barrage. This fracture in the Kosi embankment was the first of its sort to affect residents on either side of the Nepal-India border. Yet this was not the first time it had happened. Many breaches have occurred in the past. It had previously occurred in Dalwa (Nepal), Jamalpur (Darbhanga), Bhatania (Supaul), Bahuarawa (Saharsa), Hempur (Saharsa), 1984, and Joginia (Nepal) in 1963, 1968, 1971, and 1991, respectively. The Kushaha deluge was not going to be the last instance of the embankment failing, therefore all the pain that the people experienced after the breach there had to be dealt with their itself (*Disasters and Emergencies*, 2020).

Before the dissection, the area had more than 50 years of protection from frequent flooding. Following the completion of the embankments in 1959, the area east of the river was developed with roads, irrigation canals, railroads, and other constructions, many of which have impeded the natural drainage of old river courses and divided

the area into a number of enclosed basins. The Kosi in the upper length has started to flow in a braided pattern after the barrage, which was constructed as a river gradient control measure, caused sediment deposition in the upstream portions. Knowing the Kosi River system will be helpful before we look into what caused the breach. The largest in Nepal is the Sapta Kosi River, which translates to "seven rivers." It drains the country's eastern region, particularly the Kosi basin, which is the region east of Gosainsthan (north of Kathmandu) and west of Kanchenjungha (Mishra, 2008a).

The Kosi catchment has distinct characteristics. The Tibetan plateau, the high Himalaya, the midland hills, the Mahabharat Lekh (range), the Chure (Siwalik range), and the Terai are among the six geological and climatic belts that make up the watershed, which can be seen from above. These belts' altitudes range from more than 8,000 m to just 95 msl (mean sea level). As seen from above, the catchment spans about 150 km from north to south. To the east of the Sapta Kosi River, the Chure and the Mahabharat Lekh merge. Within the Kosi watershed are 36 glaciers and 296 glacial lakes, along with eight peaks higher than 8,000 meters, including Sagarmatha. The Kosi River and its principal tributaries interact with the Himalayan region's geological structures to create this particular scenery (*Kosi Embankment Breach in Nepal*, 2009).

Over three million people residing in north and east Bihar have been devastated by the overflowing Kosi as of the end of August. Enhancing assistance activities was the immediate priority, followed by helping the displaced who were not able to find employment until the 2009 kharif season. The people of Bihar have been impacted by official indifference towards the Kosi embankments since the early 1960s. However, a blame game is currently underway. This occasion clearly shows that the state government neglected its obligations to fix upstream barrages prior to the 2008 monsoon (Mishra, 2008b).

2.6 The Kosi Disaster: An Exposure to Vulnerability

India is one of the worst floods- affected countries in the world and accounts for one fifth of global death count due to floods. Bihar is India’s most flood-prone State,

with 76 percent of the population, in the North Bihar living under the recurring threat of flood devastation. (Sinha et al., 2008) has mentioned in his case study on Kosi flood in 2008, The Kosi flood disaster of 2008 in Bihar and Nepal highlights two key issues relating to flood control. The key reasons for the failure of flood planning and communication in the Kosi, through stakeholder interviews and observations in the aftermath of the flood (Kumar, 2019).

The challenges Kosi in North Bihar and how the embankment in Nepal shifted eastward**.** In 2008 Kosi flood, it breached the embankment in Kushaha (Nepal) and shifted 108 km eastwards. The massive Kosi River floods of August 2017 caused unprecedented loss to lives, livelihoods, infrastructure and property in north-eastern Bihar. Although flooding has been a common occurrence in some areas of the state, the floods of 2008 were unusual (Shrestha et al., 2010).

The damage caused by the flood is of the tune of about rupees hundred crore every year. The floods in the Kosi region of Bihar are among the worst. One of the biggest tributaries of the Ganga is the trans- boundary river known as the Kosi that runs through both India and Nepal. The eastern and western Kosi embankments as well as a dam in Nepal were constructed in the late 1950s to help control the huge Kosi. Even without any breach in the embankments there are recurrent floods in the Kosi basin. The Kosi is known for changing its courses (Jha, 2021).

Previously, the Kosi was running east of Purnia, but over the last 200 years, it has changed course and is now on the border of the Darbhanga and Madhubani districts. The Kosi burst its embankments and its course and about 1,000 villages in five districts Supaul, Araria, Madhepura, Purnia and Saharsa were affected, involving three million people, of whom about one million were evacuated. Due to flood, the state has been facing the repetition of the loss almost every year (Thapa, 2021).

Bihar has been troubled by a number of hazards. These hazards occurred between September 1931 and September 2014, and further. Several rivers with catchments in the steep, geologically active Himalayas flow the plains of Bihar that border Nepal. The remaining 35% of the catchment area of these rivers is in the plains of Bihar,

with approximately 65 percent of the catchment area falling under Nepal and Tibet. In the lower regions of Bihar, the rivers Kosi, Gandak, Burli, Baghmathi, Kamala Balan, Mahananda, and Adharwa discharge large amounts of debris and water that originate in Nepal and Tibet. North Bihar's plains have reportedly experienced the most flooding over the past 30 years, according to a study (Kale, 1997).

The North Bihar plain has specific geophysical characteristics that make it one of the most flood-prone regions in the nation. The State is divided in half by the Ganga, which flows from west to east. The Ganga, which serves as the master drain, has several tributaries that drain the alluvial plains to the north, including the Ghagra, Gandak, Burhi Gandak, Bagmati, Adhwara group of rivers, Kamla, Kosi, and Mahananda. These rivers meander over the plains of North Bihar after rising in the Himalayan Mountain range of Nepal (NIDM, 2013).

The rivers that originate in Nepal, span the entire Gangetic plain. These rivers are infamous for modifying their paths, creating deltas, and interfering with the development of land. Numerous physical elements, including topography, hydrology, hydrometeorology, and geomorphology, interact to cause flooding in the plains of North Bihar. Nonetheless, floods in North Bihar are not a separate natural occurrence. Rather, they are a series of interconnected natural events and processes, like the year-round rain wash of mountains that causes sediment to be dispersed in the lower reaches of rivers through spills, ground water conditions, storages in bodies of water, surface detentions, water logging, drainage deforestation, concentrated rainfall, etc.

2.7 Demographic and Socio-Economic Aspects

Supaul, Saharsa, Madhepura, and Khagaria are the four districts in Bihar that are covered by a portion of the Kosi River basin. As these districts are located in the lower sections of the river basin, they are severely affected by flooding every year. With a 62 percent literacy rate, these districts have the highest population density (1106 people per Km2). The majority of the population works in farming and related industries. The land provides the cultivators, agricultural workers, and domestic

employees with their source of income. The livelihood possibilities of the inhabitants have been affected by the frequent occurrence of flood in these districts, and primarily the poor and marginalized suffer the most both during and after a flood (Mishra, 2008) Hence, a portion of the Kosi River basin, the Supaul district of Bihar was chosen for this study's purposes.

The Supaul district of Bihar, which was formerly a part of the Saharsa, was chosen as the study's research region. Supaul has a population of 2,228,397 people as per the 2011 India census, with 1,157,815 men and 1,070,582 women (*Supaul District Census Handbook 2011 | Supaul District, Government of Bihar | India*, 2018). Due to the fact that these five Supaul blocks are in the district's flood-affected area, they were chosen as the study's focus areas: Kishanpur, Supaul, Basantpur, Raghopur, and Pratapganj.

Block	**Population**
Kishanpur	167,669
Supaul	294,761
Basantpur	182,075
Raghopur	215,643
Pratapganj	106,884
Total population	967,032

(Table 2.1: Population of the five blocks)

Among the total population of Supaul, 19% of people live in urban areas. 735 people live per square km. The primary industry in this district is agriculture, and paddy is the principal crop. The Kosi River flows across the western portion of the district and is regarded as the source of grief for the entire state of Bihar, not just for Kosi region.

Its tributaries include Tilyuga Chhaimra, Kali, Tilawe, Bhenga, Mirchaiya, and Sursar. Sand is the predominant soil type. It is basic in nature in some places and acidic in others. The Supaul district, which is currently under discussion, is located in the megafan the Kosi River produced in the northeast. The river changed its path from being near Purnea on the east to following the western border of the district Supaul on the west, where it has been trapped between the embankments. The river has generated a variety of depressions, chaurs and mauns in the Basin throughout its lateral movement of roughly 120 km over the duration of around two centuries, in addition to depositing coarse silt and sand in nearly the whole region (Sahu, 2011)

2.8 An Overview of the District

The Supaul district in Bihar has a total size of 2,420 sq km. The district's administrative center is in Supaul Town. The districts of Saharsa and Madhepura border the district of Supaul on the south, Araria on the east, and Madhubani on the west. Nepal constitutes the district's northern border. The principal town and administrative center of the district is Supaul. The former Saharsa District's supaul and Birpur sub-divisions were divided to form the Supaul district, which was established as a separate district. There are four subdivisions within the district: Nirmali, Birpur, Triveniganj, and Supaul. Throughout the district, there are 3 Statutory Towns and 551 Statutory Villages. Geographical considerations have had a significant impact on the district. The entire area was littered with mounds, and early explorers could find countless artifacts of historical relevance all over the place. Unfortunately, the area today is devoid of many ancient historical sites. There is no evidence of the fickle and destructive Kosi's whims during the past fifty years. Nonetheless, some significant historical artifacts or landmarks have been saved here and there to the efforts of some early Europeans, and it is on the basis of these that a connected account of the district's early history can be constructed (Census 2011, 2013).

2.9 General Overviews of the Blocks

A total of 4 Subdivisions, 11 Community Development Blocks and 551 villages constitute the present Supaul district. Out of 11 Blocks, 5 blocks have been chosen as the sample area.

Kishanpur

In Bihar's Supaul District, there is a Block called Kishanpur (India). The headquarters of the Kishanpur Block is in Kishanpur town under the Kosi Division. 17 Panchayats and 125 Villages make up Kishanpur. Kishanpur Block has a total population of 135,586 people, who reside in total 25,234 homes spread among 125 villages and 17 panchayats. There are 69,937 males and 65,649 females residing in the block (Census 2011, 2013).

Supaul

According to the 2011 Indian Census, there are 360,198 people living in the Supaul Block of the Supaul district. There are 172,385 females and 187,813 males among them. The Supaul Block's average sex ratio is 918. In Supau block, 18.2% of the population lives in urban areas and 81.8% does so in rural regions. Rural areas have a literacy rate of 57.1%, compared to urban areas' average of 71.4%. Moreover, the urban to rural sex ratio in the Supaul Block is 901 for urban areas and 922 for rural. Supaul Block's overall literacy rate is 59.77%. In Supaul Block, the female literacy rate is 38.68% and the male literacy rate is 57.5% (*Supaul District Census Handbook 2011 | Supaul District, Government of Bihar | India*, 2018)

Basantpur

In Basantpur Block, A total of 182,075 people, 94,277 men, and 87,798 women resides (*Supaul 2011 Census Pdf*, 2013). The predicted population of Basantpur in 2022 is 233,056. Out of 49,632 males and 31,935 females, there are 81,567 literate persons. A total of 60,226 workers relies on multiple skills, of which 42,973 are men and 17,253 are women. There are 10,252 cultivators who rely on agriculture, of which 9,161 are men and 1,091 are women. In Basantpur, agricultural labourers

number 21,375; 15,938 of them are men and 5,437 are women.

Raghopur

In this Block, there are a total of 215,643 residents, 111,153 of them are male and 104,490 females. The expected population of Raghopur in 2022 is 276 023. There are 100,401 literate people, 62,460 of them are men and 37,941 of whom are women. There are 84,284 total workers who rely on multiple skills, of which 53,366 are men and 30,918 are women. A total of 12,309 people depend on agriculture farming, of which 10,457 are males and 1,852 are women. In Raghopur, agricultural labour is performed by 22,925 persons (men are 16,636 and 6,289 are women).

Pratapganj

According to the 2011 Indian Census, there are 106,884 people residing in this Block in Pratapganj, of which 55,458 are men and 51,426 are women. In 2022, 136,812 people are anticipated to live in Pratapganj. There are 49,326 literate people, 30,449 of them are men and 18,877 of them are women. There are 41,375 workers overall who rely on multiple skills, of whom 26,317 are males and 15,058 are women. A total of 8,052 farmers, 6,927 of whom are males and 1,125 of whom are women, depend on agriculture cultivation. 14,675 people works in agricultural land as a labor in Pratapganj, men are 10,054 and 4,621 are women (*Supaul District Census Handbook 2011 | Supaul District, Government of Bihar | India*, 2018).

2.10 Mitigation, Prevention, Preparedness and Response

Mapped flood extent and assessed flood damages were used to improve the efficiency of flood disaster planning and communication. In this regard, the requirement for communicating catastrophe risk has increased at a time when nearly the entire world is dealing with climate change, natural disasters, and other pandemics; Disaster risk communication is a strategy for effectively reaching out to people who are under high risk or in a difficult situation. (Dixit et al., 2018).

Despite a more than 50-year history of flood disaster planning, monitoring and communication in the watershed, the river still causes significant amounts of misery

through massive floods. The flooding issue in the Kosi River basin has been explored in certain studies, which also give an in-depth investigation of flood hydrology. In some areas of the basin, the hydrological study is integrated with a GIS-based flood risk mapping. High sediment input from an uplifted hinterland and very high discharge fluctuation are typical hydrological features of the Kosi River (Sharma, 1997).

Natural hazard preparedness initiatives and campaigns are less successful than they could be. In spite of increased efforts in public hazard education and outreach, researches in this area consistently demonstrates that levels of preparedness for natural hazards are low across cultures. Although claiming to be aware of the risks, those who live in disaster-prone locations are not prepared. Due to their lack of readiness, they are more likely to experience the negative ripple effects that occur after a tragedy. While studies repeatedly demonstrate that simply presenting the public with information about risk and safety skills is insufficient to impact preparedness behaviors, the majority of natural disaster preparedness initiatives focus primarily on the distribution of information. However, these initiatives lack evaluation, making it impossible to determine their success. A mix of cognitive, emotional, and cultural elements, as well as messaging style, impact preparedness behaviors, according to research in the disciplines of social representations, disaster preparedness, and risk communication (Fuentes,2018).

2.11 Evolution of The National flood Commission in India

Frequent calamities in India in the form of lower invasions and famine were a recurring aspect of the colonial rule. On the advice of the famine committee, the British established the Department of Revenue, Agricultural and Trade in 1871. In 1981, a separate Department of Agriculture was established. In 1947, it was changed to Ministry of Agriculture. The assessment of crop damage and property loss as a result of natural disasters was added to its purview in 1969. The Department of Agriculture and Cooperation took over responsibility for issues linked to human life, relief from hunger and drought in 1974, when those issues had previously been handled by the Department of Food.

Floods and droughts were recognized as often affecting agriculture were handled by the disaster planning and communication center across the country. Following the UN precedent-setting floods of 1956, the Government of India (GOI) established a number of committees to investigate the issues with flooding in the county. High level Committee on Flood Control (1964), Ministerial Committee on Floods and Flood Relief (1972), Nation Flood Commission (1976), and others are only a few examples of committees. In India, there is a long history of government action in the form of relief efforts during years of famine and drought. This history dates back to the 19th century (Rashmi, 2015).

The complex dynamics of India's flood scenario makes managing the problem difficult. Since gaining its independence, the Government of India (GoI) has implemented a number of policies to lessen the likelihood of flooding and its possible effects. For instance, the Government of India (GoI) has established a number of committees, task forces, and working groups, as well as developed policies, which offered guiding principles for managing water resources, including flood control. These solutions used a normative approach, concentrating on different structural measures and emergency actions to reduce the effects of floods. Each state was required to create a set of emergency action plans (EAPs) and operating manuals (OPs) that would aid in maintaining a flood cushion and lessen damage following dam failure. For the purpose of mapping flood-prone areas throughout multiple states, Rashtriya Barh Aayogh (RBA) was established in 1976. It issued a report in March 1980, and the suggestions were sent to all the states, UTs, and ministries in September 1981 in the form of guidelines and instructions for implementation. The RBA recommendations could not be put into effect in other states due to bureaucratic problems; Assam and Uttar Pradesh were the only states to authenticate the statistics of flood-prone areas that were appraised by the RBA (Niti Aayog, 2021).

The existing flood planning and communication system must acknowledge the significance of taking community involvement and non-structural measures into consideration in order to build flood-resilient communities and lessen the

compounding risk. It is clearly undeniable that India's flood issue is complex. It was thought necessary to create a structure in which the centrally based organization acts at the heart and gives guidance to various additional state-level organizations in order to respond to such a varied distribution of flood threats across the length and breadth of the country. The states have the same freedom to create and carry out their programs as needed, even if the central-level organizations have been given the most power. The coherence between the two levels gives the hierarchy of the flood planning and communication system a dynamic feature in this way. Additionally, due to the unprecedented growth of flood-prone regions with each passing year for various climatic and anthropogenic reasons, these organizations continue to face difficulties in implementing their plans and policies for minimizing human and financial losses both during and after disasters strike.

2.12 Institutional Framework for Disaster Planning and Communication in India

The Legal-Institutional Framework under the Disaster Management Act 2005 outlines the structure of disaster prevention planning from the central to the local level, involving various government bodies.

Central Level

Central Government: Provides overarching disaster planning and policies. Ministry of Home Affairs (MHA - DM Cell) acts as the nodal ministry responsible for disaster management, coordinating with:

NDMA (National Disaster Management Authority): Oversees disaster planning at the national level.

NIDM (National Institute of Disaster Management): Focuses on capacity building, training, and research in disaster management.

NDRF (National Disaster Response Force): Provides specialized disaster response services.

State Level

State Government: Implements disaster planning policies within the state.

SDMA (State Disaster Management Authority): Executes disaster strategies at the state level, under the guidance of the NDMA.

State Executive Committee (SEC): Chaired by the Chief Secretary (CS) of the state, provides support to the SDMA.

District Level

District Administration: Implements disaster planning strategies at the district level.

DDMA (District Disaster Management Authority): Manages disaster-related activities within the district, under the SDMA.

DMD (Disaster Management Department): Coordinates disaster planning and communication efforts at the district level.

Local Level

Panchayat and Municipalities: Handle disaster planning and communication tasks at the grassroots level, interacting with communities.

This structured framework facilitates disaster planning and communication from a central to a local level, ensuring comprehensive coverage and coordinated efforts in mitigating and responding to disasters across India.

2.13 State Disaster Planning and Communication Authority

Despite being prone to multiple hazards, the state has been working to increase its catastrophe resilience. The Disaster planning and communication Department of the Government of Bihar and the Bihar State Disaster Management Authority (BSDMA) has been working jointly to develop awareness among various stakeholders and the affected population as well as their capabilities. In order to lower disaster risks and

their effects, the BSDMA has placed a focus on improving the system on both a structural and non-structural level. Among the Authority's key projects are Safety Weeks (Road Safety, Earthquake Safety, Fire Safety, and Flood Safety), stakeholder training, safe school programs, safe construction rules, a Free Earthquake Safety Clinic & Center, widespread distribution of IEC materials, etc. (*BIHAR STATE DISASTER MANAGEMENT AUTHORITY*, n.d.).

2.14 Disaster Communication Plans and Implementations

Dhar and Nandrgi (1998) analyzed floods in Indian rivers and came to the conclusion that three major regions of the country—northeast India, north India, central India are flood-prone regions during the monsoon months. Disaster communication is necessary for the mitigation, readiness, response, and recovery phases of a disaster to be successful. Giving the public, elected officials, community leaders, and the media accurate information reduces danger, saves lives and property, and hastens recovery. Government and media roles are changing as a result of new media like the Internet, email, blogs, text messages, and cell phone photos as well as the increased significance of first informers (Okere, 2004). First informers are often the initial source of news and emergency updates, delivering crucial information about weather conditions, natural disasters, and other emergencies.

2.15 Disaster Risk Communication

Using scientometrics techniques and visualization tools, a high-level analysis of the disaster risk communication research topic has been done by **(Susmayadi et al., 2014)**. The patterns in scientific categories are identified, together with output trends and regional patterns. An examination of the distribution of journals reveals the leading publications and the intellectual foundation of the field. A terms analysis yields thematic clusters and the historical evolution of focal themes, and a co-citation analysis sheds light on the development of research fronts and major papers. The findings show that the research volume increases dramatically, with the vast majority of contributions coming from Western nations. The field is extremely interdisciplinary, with roots in the social and behavioral sciences and major

outgrowths in the medical and environmental fields. Themes in the narrative are centered on risk communication in societal and medical risk governance.

The risk communication has been broken down into five independent sections: For understanding the fundamental theories and methods of risk communication, Part one provides background knowledge. How to organize a risk communication effort is covered in Part II. Part II explains how to put risk communication into practice. Part IV examines how to assess risk communication efforts, including methods for gauging performance. The exceptional instances in risk communication that are highlighted in Part V include disasters and other emergencies, global risk communication, and public health initiatives. This book is a helpful resource for individuals concerned in discussing environmental, safety, and health hazards in government, business, and academia as well as an excellent introduction to the field (E. Lundgren, & H. McMakin, 2018).

2.16 Media Representation and Natural Disaster

The method that develops within this study is actually a lesson learnt from Ritsumeikan University which has implemented an alternative risk communication media called “white space”. Although both participants generally had a low degree of perception of multi-hazard danger as a real concern, the preliminary findings of this study suggested that local residents had better perception and awareness than tourists. Research on disaster risk reduction are increasingly concentrating on those with special needs, such as children, the elderly, and persons with disabilities; nevertheless, they rarely pay attention to tourists, who are one of the most vulnerable groups in tourist regions. The lack of risk communication media for tourists increases this vulnerable situation. **(Hassan et al., 2012)**

The best social media tactics to improve health protection and clear up misinformation during catastrophes were carefully reviewed in this mixed-method evidence synthesis, which drew on Cochrane methodology and principles. Research on risk communication during catastrophes in all UN-languages was examined, and it was discovered that agencies needed to localize social media use for specific

communities and crises. In many governmental organizations that deal with public health in the countries, social media technologies still haven't become standard operating procedures.

Governmental agencies and implementation partners need to incorporate social media, particularly Twitter and Facebook into daily operations in order to become familiar with the public before health-related problems occur. This was particularly evident in American organizations, local governments, and first responders, but it was also seen in European city administrations and school boards. For those who do use social media for health-related risk communication, studies show that PR professionals, governmental organizations, and the general public have used social media successfully to dispel rumors during disasters and spread accurate information **(Eckert et al., 2018)**.

A brief overview of the media from the perspective of public officials, including a description of the way the media thinks and works and the public as the final consumer of information. Before, during, and after a public health crisis, techniques being used for responding to and collaborating with the media in disseminating information and providing messages via media and public relations techniques, as well as the problems that may develop as a result **(Sheppard et al., 2012).** The Natural Hazard Partnership (NHP) and Hazard Impact Model's dissemination of landslide data aids in national hazard mitigation and disaster risk reduction with regard to weather and climate. Via the NHP cooperation, BGS publishes daily reports of landslide potential, and data gathered for the National Landslide Database is heavily utilized for the production of these assessments. A number of stakeholders use the National Landslide Database, which is freely accessible via an online GIS, for research (Pennington, 2019)**.**

A variety of methods in this study to highlight the conflict between awareness- and behavior-based campaign successes, particularly when using social media and humor that alludes to popular culture. The "zombie apocalypse" all-disaster-preparedness campaign from the Centers for Disease Control and Prevention (CDC) is used as an example. The pros and cons of combining social media and humorous messaging for

risk communication are revealed via an interview with a CDC campaign manager, a campaign document analysis, and experiment. However, experiment participants who received the humorous risk message reported significantly weaker intentions to take protective actions in comparison to those who received the traditional, non-humorous risk message. Studies have shown that social media can swiftly and effectively convey facts to unfamiliar audiences (Fraustino & Ma, 2015).

A study has been concluded to analyze variety of communication techniques utilized and the opportunities provided for conversation between parties, communication between the DRR (Disaster Risk Reduction) campaign team and the public is examined. Results distinguish between public education, consultation, and involvement activities. Conditions linked to each of the factors that enable and, conversely, hinder local-level interaction to develop community resilience is recognized. It uses a special analytical framework to distinguish between events that use one-way information and those that provide chances for debate and participation. This framework was adopted from the dual lenses of participatory communication and information flow models. The framework offers a technique for DRR practitioners to organize and assess local-level engagement activities to satisfy the communication requirements of specific circumstances. The framework offers a technique for DRR practitioners to organize and assess local-level engagement activities to satisfy the communication requirements of specific circumstances. The experience of one city in creating measures to increase community resilience is combined in the study and analyzed utilizing communication, social, and political theory. The results have ramifications for crisis management, leadership styles, and common command-and-control plan systems(Bradley et al., 2014).

The way that disaster reporting is presented might affect how various people understand a given incident. As authorized cultural intermediaries, journalists and news organizations have the power to portray, interpret, and shape events in ways that profoundly affect how the public views and responds to them. The people's response to the incident is influenced by media coverage, which not only informs them about what has happened but also determines how much prayer, money, and

humanitarian relief the victims may receive(Earth Journalism Network, 2016).

The level of emergency aid that a crisis may receive from governmental and NGOs depends heavily on media coverage. Since natural disasters are usually classified as hard news, reporters frequently believe that national news organizations would cover domestic calamities more extensively. Hard news is a form of journalism that focuses on reporting urgent, significant, and impactful events or incidents. It emphasizes factual accuracy and thorough investigation, distinguishing it from routine news, feature articles, or human-interest stories. This style of reporting aims to deliver timely, critical information, often covering topics like politics, disasters, or other major developments. On the other hand, large death tolls or substantial financial losses could get more attention from foreign media outlets. This calls into question not only the perceived value of disaster coverage, but also the journalistic components that drive it. Researches on disaster communication has historically concentrated on social phenomena, such as information-seeking activities in times of crisis and crisis planning and communication strategies pertaining to natural, political, and organizational disasters. Natural disasters in one area can spread quickly over the world due to globalization, which makes media coverage of these events a hot topic in international communication studies (Uvais, 2020).

2.17 ICT and AI in Disaster Communication Planning

Users of social media, sensors, cameras, satellites, and similar devices produce enormous amounts of data whenever a tragedy strikes. This information is used by victims and emergency personnel to assess the situation, make decisions, and evacuate safely. The volume of data generated might be substantial, making it difficult to make sense of it in time-constrained scenarios. To analyze, process, and visualize this data, intelligent systems are required. Numerous academics are investigating AI, machine learning (ML), and deep learning (DL) techniques for big data analytics in the effective planning and communication of catastrophes in light of recent breakthroughs in artificial intelligence (AI) (Mitra & Shaw, 2023).

Over the past few years, disaster planning and communication has gradually shifted towards a more proactive and mitigation-based approach. Disaster risk and its effects could be reduced through planning, preparation, and the development of mitigation capabilities when combined with quick action. The Hyogo framework of Action (HFA) places emphasis on action based on knowledge of hazards and vulnerabilities in society through information dissemination for disaster risk reduction (Loh, 2015).

The Sendai framework also promotes inclusive, risk informed decision making based on an open exchange and dissemination of desegregated, accessible, up to date and comprehensible data generated through scientific research and complemented by traditional Knowledge. Information and communication technologies (ICTs) and developing technologies, such as big data analysis, cloud sourcing, etc., have created a number of opportunities to reduce risk and save lives at various phases of the planning process for disaster planning and communication (SFDRR, 2015).

2.18 Remote Sensing, Geographic Information System

In a study of flood hydrology and flood control, It is stated that the use of remote sensing can help disaster prevention efforts in three primary ways (A. C. R, 2010).

- Mapping the areas vulnerable to natural disasters.
- Speculating about imminent disasters; and
- Keeping an eye on phenomena to gauge their development.

The popular belief that human activity has been the only cause of rising flooding is being challenged and questioned, and it is now more widely accepted that the recent increase in flooding is partly related to regional or global climatic (rainfall) changes. The frequent flood in a region leads to changes in the geography and the population as well as exposing the region to vulnerability. The vulnerability exposure increases with flood event frequency, but vulnerability exposure decreases with frequency. Several approaches can be used to map the area vulnerable to flooding. Under the heading "evaluation of flood vulnerability," the methodologies and approaches are

examined and provided here (Anthonysamy, 2014).

The traditional visual interpretation of LANDSAT data for the study of channel migration and water logging conditions at various time intervals, which was previously difficult to carry out due to the lack of appropriate evidence. The degree of the usefulness of the fake color composite and the black and white LANDSAT data was clearly stated by the authors. The spectrum was good for detecting phenomena at the surface that were related to the environment of the subsurface ground water.

National Remote Sensing Center, ISRO has amassed a significant database of information about floods and cyclones in various parts of the country over time. For the purpose of locating flood hazard zones, NRSC, ISRO's historical flood maps are helpful. The Bihar Flood Hazard Atlas was first released in 2013, and it includes historical satellite data from 1998 to 2010. NRSC, ISRO has updated the State level and District-level Flood Hazard Zone Atlas for Bihar State at the request of the National Disaster Communication and Planning Authority utilizing the historical satellite datasets that are now available and extend over 22 years. (1998 to 2019). During this period, the flood danger maps were created using data from 274 Indian Remote Sensing (IRS) satellite datasets and foreign satellite datasets (optical and microwave). These datasets included various flood magnitudes in Bihar State.

Based on the hazard classification schema agreed by the expert committee constituted by NDMA, the flood danger zones are divided into five classes ranging from very low hazard zone to very high hazard zone. The Central Water Commission provided water level information for 40-gauge stations during a 22- year period, which was then analyzed to determine how many flood occurrences occurred. To determine the intensity of flood hazard across all districts, the flood hazard index was generated for each district taking into account the flood hazard category, hazard area, and intra-annual flood changes. The Atlas provides information on the inundation caused by flooding and its frequency. The Disaster planning and communication

Department of the Government of Bihar, through its district administration, confirmed the flood hazard maps on the ground (ISRO, 2020).

2.19 Space Technology in Disaster Risk Reduction

India is highly vulnerable to a wide range of natural disasters, including floods, landslides, cyclones, forest fires, earthquakes, and droughts. Satellites offer crucial, regular synoptic observations that greatly enhance disaster planning and management. To effectively mitigate risks from these disasters, it's essential to integrate satellite data with field-based observations and focus on risk reduction strategies. Satellite communication and navigation systems are also pivotal in disaster management, providing advanced technological solutions.

The DMS Program by ISRO addresses various aspects of natural disasters in India by leveraging space-based inputs. ISRO disseminates critical information in an interactive geo-spatial format through platforms like Bhuvan, the National Database for Emergency Management, and MOSDAC, enabling administrators to better understand disaster impacts and make informed decisions. ISRO provides near real-time satellite information to Central and State Ministries/Departments before, during, and after major natural disasters. Additionally, ISRO contributes to capacity building by training stakeholders in the use of space technology for disaster management. On the global front, ISRO actively collaborates with various countries on disaster planning and communication through international frameworks such as the International Charter 'Space & Major Disasters', Sentinel Asia, and UNESCAP (ISRO, 2020).

2.20 Disaster Communication Plan

In 2004, the government of India's ministry of home affairs (MHA) introduced a program for the country's catastrophe planning, communication and mitigation. Along with the United Nations Development Program (UNDP), MHA created a disaster risk planning and communication program and set up a national emergency communication plan. In 12 states throughout India, 125 vulnerable districts were chosen for capacity building through various training programs related to DRR and

the integration of disaster planning and communication. The main goals of the program were to strengthen community capacity, conduct training programs, create awareness campaigns, and prepare user-friendly manuals for mitigation measures in order to produce GIS-based assessments of the identified villages and states' hazards, risks, vulnerabilities, and capacities (*National Emergency Communications Plan*, 2019).

At the national, states, and district levels, it was necessary to draught state disaster communication plans, district disaster planning and communication plans, and emergency operation centers (EOC). In addition to these, a national database for disaster risk reduction and a vulnerability database based on geographic information systems (GIS) were to be linked with disaster risk communication efforts. Moreover, the NECP would link disaster locations to the local, state, and federal emergency operations centers. VHFs (Very High Frequencies), VSATs (Very Small Aperture Terminals), and IMMERSAT would be used to accomplish this (Satellite Phones).

In European law, communication programs aimed at preventing disasters should help the public accept the risks and minimize potential harm. The effectiveness of this information must be continuously evaluated because it is one of the essential components in the planning and communication of hazard-prone areas, seeking to reduce the potential effects of disasters among people and to adopt the information regarding hazards and preventive measures. Although the question is not new, we still need to be concerned about this effect because it has not been demonstrated that knowledge intended to prevent disasters can be of some assistance when they do occur. Hence, a number of technological and natural examples in France demonstrated that the general population does not always understand or use information, particularly following a disastrous incident. In a culture where people are often held accountable for lowering their risk exposure, this circumstance becomes a serious issue. Yet, it should and possibly could be resolved by a number of proactive actions, such as compelling and binding communication (Global Risk Forum GRFDavos,2012).

Taking the public's reaction into consideration, it is difficult to conduct an awareness

and prevention campaign on flood dangers. Risk managers, stakeholders, and technicians frequently believe that the problem is the discrepancy between the "irrational perception" of danger by the populace and the "rational perception" of risk as it relates to the technical and administrative definition of the problem. Hence, their approach to intervention is typically top-down and clear-cut, constantly reminding the population that they live in a dangerous region. Yet, a deeper knowledge of social and cultural responses to dangers reveals complex and dynamic relationships that have been built to the risk. For instance, residents may be acutely aware of the risk while vehemently denying it at the same time, allowing them to continue planning projects for the future (Langumier, 2018).

Fluctuations in beliefs (fear and denial of danger) and memory (remembering and forgetting the disaster) reflect the dynamic relationships established to risk. People actually have to deal with a paradoxical command: they are aware that their location carries a high risk, but they have also built their lives here. People create a rhetorical approach that involves remembering and forgetting tragedies, thinking about and dismissing the possibility of future floods, in order to reconcile these inconsistencies. In such a context and aware of these obstacles, the Plan Rhône collaborations introduced a novel strategy through cultural and artistic projects to create and preserve the collective memory of the floods. In 2003, severe flooding from the Rhone River impacted over 12,000 people and caused damages exceeding €700 million. In response, public authorities initiated the extensive "Plan Rhône" to combat future flood threats. By 2007, a comprehensive flood planning and communication for the lower Rhone region was introduced, focusing on enhancing resilience to flood risks. With sensible and tangible media, such as photography, outdoor exhibitions, performances, documentary films, and scientific vulgarization, the goal is to raise public awareness of flood issues. The communication would outline the feedback and lessons learned from this creative effort to remember and prevent floods (SUEZ Group, 2003).

Many US universities activated their emergency pandemic preparedness plans between August and November 2009 at New Mexico State University's main Las

Cruces campus in order to ascertain influenza knowledge, attitudes, and health communication (informal support networks and social networking) strategies specifically related to the pandemic influenza A (H1N1) 2009 and seasonal influenza. The objective was to gather information for the university's readiness and response plans for pandemic illnesses and disasters. University community partners were consulted regarding advice for flu preparedness for the university's undergraduate students after the university's campus-wide efforts to educate students about pandemic flu were activated (Wilson, 2010).

Despite health education initiatives by the government and universities, 25% of people were unaware about the infection. Students' knowledge, attitudes, and behaviors were influenced by three main variables: faculty attitudes towards influenza, the prevalence of flu-like illnesses at the university, and the use of health education techniques that were incompatible with the methods by which students obtain health information (informal support networks and electronic social networking). If these student information mechanisms are not used, health education may not be as effective as it could be. Health educators should make sure that recognizable intermediates (such as teachers) are aware of and supportive of their activities. However, this university had a comparatively low H1N1 incidence, which might have impacted the study's findings.

The necessity of a well-organized safety planning and communication strategy and demonstrated the advantages such a plan may provide the drilling operation. In order to make the most of the organization's resources, an effective safety planning and communication system is created to minimize or completely eliminate all aspects of accidental loss. Setting goals, planning, organizing, staffing, and managing are used to accomplish this. Safety is therefore managed much like any other corporate function. The practical response to this is that strong safety planning and communication is important from both a humanitarian and a corporate standpoint. A government body establishes and issues the Gazette Rate for specific industries each year. This rate, which is reported as a percentage of payrolls, is based on statistical data obtained throughout the previous year. The system is designed for damage

control rather than defense as the problem becomes one of quantum, or amount. It doesn't take many common law lawsuits for insurers to pay attention, and fines are swiftly added to premiums. Safety planning and communication can help with this (Durrant, 2018).

2.21 Indian Disaster Resource Network

The India Disaster Resource Network (IDRN) is a web-based platform for keeping track of the inventory of tools, qualified personnel, and essential supplies for responding to emergencies. The IDRN portal's main goal is to make it easier for decision-makers to learn whether the tools and personnel needed to handle any emergency situation are readily available. They will be able to evaluate the level of readiness for particular calamities using this database. India is susceptible to a variety of natural disasters, including floods, earthquakes, cyclones, landslides, tsunamis, and others because of its unique geo-climatic characteristics (NIDM,2013).

The super cyclone in 1999, the earthquake in Bhuj in 2001, the flood in Kosi (Bihar) in 2008, and the earthquake in Sikkim in 2011 have all demonstrated the need to increase capacity for handling disasters more successfully. As part of the GOI-UNDP Disaster Risk program, the ministry of home affairs (MHA) launched IDRN in 2004. The goal of IDRN is to create a systematic inventory of equipment and qualified human resources so that disaster managers can locate them and learn more about them in order to provide an immediate and effective response. The national information Centre (NIC), located in New Delhi, hosts the online resource database. Data in the portal can be updated by authorized government employees, and the district authority is in charge of updating data received from various line departments. Databases are centrally controlled by NIDM. In addition, NIDM is in charge of managing users as well as the portal.

2.22 Theories

Theories and Practices related to Disaster Risk Communication are as follows:

Trust Determination Theory:

According to this theory, persons who are angry have a tendency to doubt the source of the information. As a result, public trust must gradually be established.

Mental Noise Theory:

When someone is irritated, they have trouble hearing, understanding, and remembering what you're saying. According to psychologists, in this case, messaging should be brief, repeated to aid in memory, and utilize visual aids whenever possible.

Negative Dominance Theory:

According to the negative dominance theory, people who are under stress are more likely to see the negative side of everything. Too many negative words should be avoided in communications to prevent giving them more weight. To understand how to communicate with the public effectively and how to incorporate risk communications into a public relations strategy, it is essential to grasp the theories that constitute the foundation of risk communications. (Disaster & Authority, 2004)

2.23 Risk Model to Forecast High Risk Areas

Before Hurricane Kenneth in 2017 in California and nearby hit land, a team of academic researchers, humanitarians, and health organizations developed a simple model to identify the area most likely to see a cholera outbreak. The model created risk indicators for each district by combining four metrics: information on flooding, historical yearly cholera incidence, sensitivity of previous outbreaks to the El Nio-Southern Oscillation cycle, and diffusion (gravity) model to simulate the movement of infected visitors. When fresh case-related data was made available, the risk model would be modified as needed. To pinpoint the areas at risk once the epidemic started

as well as the populations most at risk before the cyclone, a web-based application was created. The model that used prior incidence, projected floods, and El Nio (a climate pattern that occurs in the Pacific Ocean) sensitivity properly identified the cholera-prone areas before Kenneth got there. Despite this success, the model's use was constrained by the size of the vaccination campaign, and it is still unknown how much the projections were used (K. R et al., 2019).

2.24 Disaster Risk Education and Awareness

Each year, a significant number of people are affected by natural disasters. Children who experience such tragedies risk losing their lives and endure physical or emotional suffering. The development of resilience and readiness before to disasters might lessen negative effects of catastrophic events. Although risk communication and disaster education are seen as crucial components of preparedness, little is known about whether or not these tactics affect kids' behavior during natural disasters or how they handle the aftermath. This paper provides and discusses a number of preparedness-related promotion tactics. Parental counselling and strategies like informational campaigns and instructional initiatives are covered (Midtbust et al., 2018).

Schools are an appropriate setting for risk communication, and teenagers themselves should be included in the communication tactics. Nevertheless, little is known about the connection between understanding preparedness techniques and the subsequent preparedness measures. It is unknown if shifts in awareness and attitudes have led to changes in behavior. It is suggested that information-based tactics be supplemented with preparatory actions and parental involvement(Midtbust et al., 2018).

The key stakeholders who should be involved in the mitigation of the impacts of climate change in order to initiate policy innovations and dissemination for disaster risk management; explain the importance of an effective policy communication strategy in enhancing public awareness communication campaigns for climate change innovations and policy implementation; determine the

crucial enabling conditions and the real-world difficulties that climate change policy initiatives face; Talk about the lessons learned and offer practical suggestions, such creating a national climate change policy communication plan for sustainable indigenous communities in Uganda and the rest of Africa. Due to a lack of knowledge, the majority of Ugandans regarding the proper use of environmental resources to curb climate change for sustainable development, the majority of the serious issues with the growing vulnerabilities associated to the consequences of climate change in Uganda have arisen. This is understood by all the important parties involved in the development research process in Uganda. With an emphasis on environmental challenges, financial assistance, capacity training, and easily accessible information for sustainable community development, UNFCC addresses issues related to sustainable development (Okaka,2013).

2.25 Research Gaps

Disaster risk communication is not merely about disseminating information; it also involves a two-way exchange where stakeholders, including authorities, community members, and other relevant parties, share information, knowledge, attitudes, and values. However, existing research often focuses disproportionately on the one-way dissemination of hazard and risk information, neglecting the equally important aspect of engaging with communities in a meaningful dialogue.

Disaster risk communication plays a pivotal role in safeguarding communities from the devastating impacts of natural and human-made hazards. One of the most significant research gaps lies in the narrow focus on disaster, crisis, and emergency communication, which typically emphasizes communication efforts during and immediately after a hazard event. While this focus is undoubtedly crucial, it overlooks the broader scope of disaster risk communication, which encompasses proactive measures to anticipate, adapt to, and manage potential hazards. Another critical gap in the literature is the limited exploration of disaster risk communication across the four phases of the disaster cycle: mitigation and prevention, preparedness, response, and recovery.

Most studies tend to concentrate on the response phase, where communication is often reactive, focusing on immediate crisis planning and communication. However, there is a pressing need to understand how risk communication functions in the mitigation and prevention phase, where the goal is to reduce the likelihood and impact of hazards, and in the preparedness phase, where the focus is on equipping communities with the knowledge and tools needed to face potential disasters. Similarly, the recovery phase, which involves rebuilding and restoring communities, often lacks a comprehensive communication strategy. This study seeks to address these gaps by evaluating and synthesizing the impacts of risk communication interventions throughout all four phases (mitigation and prevention, preparedness, response, and recovery) of the disaster cycle.

The over-reliance on non-randomized research designs in existing studies poses significant challenges in terms of data interpretation and the generalizability of findings. Non-randomized studies often lack the rigor needed to draw definitive conclusions about the effectiveness of risk communication strategies. This methodological limitation has resulted in a fragmented understanding of what works and what doesn't in disaster risk communication. There is a need for more robust, randomized controlled trials and longitudinal studies that can provide clearer insights into the long-term impacts of risk communication efforts. By addressing this gap, the proposed study aims to contribute to a more reliable and evidence-based body of knowledge in the field.

Disasters have far-reaching societal impacts, including loss of life, community dislocation, and significant economic setbacks. However, the existing literature often overlooks the specific needs and vulnerabilities of certain populations, such as the elderly, children, and marginalized communities. These groups may require tailored communication strategies that address their unique circumstances and challenges. The proposed study aims to fill this gap by exploring how disaster risk communication can be adapted to better serve vulnerable populations, ensuring that they receive the information and support they need to effectively manage and recover from disasters.

Chapter - 3

Research Methodology

Research methodology refers to the systematic and scientific strategy used to tackle a research challenge. It encompasses the rationales behind the various methodologies employed by scholars when examining a certain phenomenon. Methodology refers to both the research tools and the rationale behind their application, particularly in relation to the theoretical framework of the study. In addition to the conceptual and philosophical presumptions that support these approaches, it includes the technical procedures for formulating research questions, gathering and analyzing data, and presenting conclusions. Methodology is essentially a description of the overall research strategy and how it relates to the underlying theoretical framework (Kothari, 2004).

The plan or technique known as research methodology describes the steps involved in gathering and evaluating data, answering research questions or hypotheses, and coming to conclusions. It covers the particular techniques used, the kind of research design, and the philosophical presumptions that guide the study. It underlines the importance of combining the research strategy's overarching objectives with the integration of research design and methodologies, as well as philosophical assumptions (Creswell, 2009).

Research methodology refers to the process that investigators must follow when conducting their investigations. The process by which these researchers create their goal and problem and deliver their findings based on the data gathered throughout the study period is depicted. In addition, this chapter on research design and technique illustrates the manner in which the final research output will be achieved in accordance with the study's objective. Hence, the research methodologies that were employed throughout the research process are covered in this chapter. From the research strategy to the results dissemination, it covers the study's research process.

The primary elements of the research process in this chapter, such as the study area, methodology, sampling and research design. Data sources consist of primary and secondary data, with population considerations and sample size determination. In addition to secondary data collection, primary data collection methods include Survey and Interview. Utilizing particular software (SPSS) data analysis encompasses both quantitative and qualitative methodologies. A qualitative and quantitative research approach is generally accepted in order to meet the study's objectives. Due to the fact that data were gathered from all facets of the data source during the study period, the study employed these mixed methodologies. Consequently, this methodology's goal is to meet the researcher's set research objectives and plan. (Sileyew, 2019).

Research methodology encompasses the principles and framework that guide the process of conducting research. It includes the underlying philosophical and theoretical beliefs that shape the research, as well as the practical implications for the chosen research methodologies. Saunders highlights the theoretical and philosophical foundations of research methodology, connecting them to the practical methods selected for the purpose of the study (Saunders, 2007).

3.1 Research Problem

According to the Bihar Disaster Management Authority (BSDMA), floods is a risk for 73.63% of North Bihar's land area (NRSC, 2020). Even with its abundance of resources, Bihar is nevertheless susceptible to the destructive effects of flooding. The absence of a thorough assessment of the communication techniques currently in use to determine how well they enhance social competencies is a major problem. Good communication is essential for educating and organizing affected population, especially in times of tragedy. In order to guarantee that the population at risk gets the information, comprehends it, and responds to it promptly, the messaging's design is essential. Regretfully, research on the planning and efficacy of communication techniques is woefully lacking, particularly when it comes to catastrophes such as the Kosi floods.

This study tackles a number of urgent concerns, chief among them being the startling dearth of empirical research assessing the efficacy of official government risk communication programs. It is imperative to evaluate these activities in order to determine whether communication efforts are in line with their intended goals and to comprehend how they contribute to the development of different social skills. These capacities—knowledge, motivation/attitudes, social and organizational elements, and psychological factors—are all essential to building community catastrophe resilience.

3.2 Research Design

The Study implies Mix method Research design. A mixed-method research design is an approach to study that integrates qualitative and quantitative methodologies in a complimentary manner to offer a more comprehensive understanding of the research subject. The process entails utilizing several forms of data to tackle distinct facets of the study inquiry. This allows for the simultaneous utilization of diverse data kinds to tackle distinct areas of the research inquiry. Mixed-method research design is a comprehensive technique that combines qualitative and quantitative methods to provide a more comprehensive knowledge of research topics. Each study emphasis on various factors, such as the complementary nature of methodologies, the iterative nature of the process, or the philosophical foundations. However, they all concur on the importance of integrating many types of data to enhance the precision and thoroughness of research findings (Hong et al., 2019).

In the context of Mixed Method Research, the term "Design" includes at least two distinct connotations. Particularly in the context of the research design process, the term "design" is frequently used as study design. Someone can be in the process of designing a study. Both definitions are applicable to mixed methods design. In order to create a robust product design, it is important to meticulously assess a range of design principles.

Mixed methods research incorporates the integration of qualitative and quantitative research approaches, such as incorporating different viewpoints, data collection methods, analysis techniques, and inference methods. The main objectives of this

approach are to achieve a comprehensive and in-depth understanding of the subject matter and to validate the findings. Mixed methods research, a sibling of multi-method research, integrates several quantitative and qualitative methodologies, encompassing both qualitative and quantitative methods. In a mixed methods notation system that is widely used, the components of qualitative and quantitative research are commonly referred to as "qual" and "quan" respectively (Morse, 1991). When formulating a mixed methods design, it is crucial to consider several essential variables (Morse, 2009).

Mix method entails the gathering, examining, and merging of both types of data within a single investigation or a sequence of investigations. Creswell and Plano Clark emphasize the use of both qualitative and quantitative data to augment the comprehensiveness and scope of comprehension (Adu et al., 2022). It often involves iterative cycles of data collection and analysis, where findings from one method inform the other. This highlights the iterative nature of mixed-methods research, where one method informs and enhances the other (Giri et al., 2021).

3.3 Research Methods

In order to develop a greater understanding of the research problem, this methodology entails collection, analysis, and "mixing" of data from a variety of sources (Terrell, 2012).

The fundamental principle underlying the utilization of mixed methods research is to maximize the advantages of each data type while mitigating their limitations. Researchers employ a combination of approaches to enhance the breadth of their evidence, enhance the credibility of their conclusions, and demonstrate the correlation between the results obtained from each method. Thorough exploration of a phenomenon often involves the use of numerous research approaches in a high-quality research project. According to Hasen and Cottle (1998), researchers should thoroughly assess their choices and decide for research methodologies or procedures that are most likely to produce valuable results. The researcher should strive to choose research methodologies, either individually or in combination, that can offer

comprehensive perspectives on the topic being studied. This will enable a more detailed comprehension of its complex processes.

The study you referred to utilized a mixed methods research approach. This methodology utilized a combination of content analysis, in-depth interviews, and survey methodologies. The selection of these research methods was intentional in order to correspond with the characteristics and demands of the study, guaranteeing a thorough investigation of the research issue from diverse viewpoints and using different data collection approaches.

Mixed-methods research offers the primary benefit of utilizing the strengths of both qualitative and quantitative research methodologies. This strategy enables you to leverage the advantages of one data type to counterbalance the limitations of the other. More than one approaches in research methodologies allows for greater flexibility as they are not constrained by established research paradigms. It enables you to address a wide array of research enquiries. The reason for this is because you have the freedom to choose from several study methods. This strategy enables researchers to obtain more robust data to support their findings. Mixed methods research enables researchers to obtain a comprehensive comprehension of the subject or phenomenon being investigated.

The explanatory sequential design commences with the gathering and analysis of quantitative data, followed by the acquisition and analysis of qualitative data, ultimately leading to interpretation. This aids in ascertaining which quantitative outcomes necessitate additional elucidation. The exploratory sequential design commences with gathering and analyzing qualitative data, and then progresses to collecting and analyzing quantitative data, ultimately resulting in interpretation. This design utilizes qualitative results to construct a novel instrument or taxonomy for quantitative analysis.

The exploratory-sequential technique is a method that involves following up qualitative discoveries with quantitative analysis. It is employed when the researcher

is interested in this sequential approach. The two-phase technique is very beneficial for a researcher who aims to create a novel instrument, taxonomy, or treatment regimen. The researcher utilizes the qualitative (exploratory) results obtained in the initial phase to aid in the development of the instrument or treatment, and subsequently evaluates this product during the second phase (quantitative). Typically, when the values of variables are not known, this method is valuable for determining significant variables for future quantitative analysis. Additionally, it is a valuable method for modifying current instruments and treatment methods, as well as for formulating and evaluating a hypothesis (Creswell, 2009).

3.3.1 Survey

Survey research is a method that employs systematic sampling and interviews with a subset of individuals to collect data. The primary aim of this research is to identify patterns and distributions of societal traits, which allows researchers to make inferences about larger populations. This approach not only tackles problems like as nonresponse and social desirability bias, but also requires the use of certain sampling and measurement techniques. Proficiency in organizational and administrative abilities is essential for conducting successful survey research. These skills can be acquired via nonprofit survey centers or commercial survey firms.

Survey research is a systematic approach of collecting information from a representative group of persons through interviews and a carefully planned sampling process. The objective is to ascertain the distributions of societal features and draw conclusions about broader groupings or populations. It encompasses precise methodologies and approaches for selecting samples and conducting measurements, while also addressing obstacles such as no responsiveness and social desirability bias. Survey research necessitates organizational and administrative capabilities, which can be fulfilled by either commercial survey companies or nonprofit survey centers.

The Review of Literature suggests that every year North Bihar witnesses flood which damages life, infrastructure as well as crops. Such disaster causes economic, human

losses in that can be prevented by good communication and information strategy. And thus, a need arises for the survey of the flood affected regions. The Survey aims to assess the effectiveness of disaster risk communication by eliciting response from affected population. The researcher will later create a possible communication plan for disaster planning and communication in future after review of literature and collection of primary data that will be helpful to combat the future challenges during the flood disaster.

According to the **Cochran formula of sampling**, the sample size for the study is 385(*Chapter 2 Determination of Appropriate Sample Size*, 2013). The survey has been done from 385 respondents from selected blocks (Supaul- Kishanpur, Supaul, Basantpur, Raghopur and Pratapganj) of Supaul with the help of area sampling. Area sampling is a method of sampling that involves dividing a population into smaller areas or clusters, and then selecting a sample from each of these areas (Wayne, 2014). In the absence of a comprehensive frame of reference, simple random sampling has been a sampling technique utilized for the study. Statistical Package for the Social Sciences (SPSS) software has been used to analyze the data.

Surveys are defined as a technique for collecting data from a subset of persons, utilizing interviews as the means of obtaining information and systematic sampling as the method for identifying the sources of information. These instruments are used to determine the patterns of societal features. Questions or items in a survey are considered to be indicators that indicate to an underlying construct or dimensions.

Survey research does not focus on gathering information about specific people. On the contrary, it is specifically intrigued by data pertaining to broader collectives, including entire societies. These specific groups of people are referred to as populations. The data collected through the process of interviewing individuals is utilised to draw conclusions about the entire group under investigation (International Encyclopedia of the Social & Behavioral Sciences, 2015)

Initially, conducting surveys may appear straightforward: it primarily involves posing enquiries, documenting responses, and deducing traits and dimensions from a

limited sample of persons to a broader community. Survey research, albeit intricate, is a complex endeavor. It encompasses precise methodologies and techniques for sampling and measurement. It must address issues like as unresponsiveness, social desirability bias, or construct validity. The phrasing of a question has consequential impacts on the manner in which it is responded to. In order to address these concerns, survey research has incorporated other fields, including cognitive psychology and statistics, since its inception.

In addition to these methodological problems, survey research also encompasses organizational and administrative challenges. Although conducting a survey in a closed classroom may not provide significant challenges for a survey researcher, the situation is markedly different when conducting a survey on a national, regional, or worldwide scale. This necessitates not just diverse approaches to engage with individuals who possess their own unique challenges, but also an adequate number of interviewers to gather the data and a sufficient number of supervisors to supervise the entire process (Anheier & Scherer, 2015).

3.3.2 Sampling

The sample has been collected from five flood affected blocks of Supaul. The sample size of the study for three set of respondents were according to the nature and requirement of the study. Five interviews will be conducted from the government officials in Supaul district and 385 villagers will be selected for survey via using Area Sampling. The capacity of the population to be divided into a finite number of distinct and recognizable units, known as sampling units, is one of the fundamental presumptions in any sampling technique. Elements of the population are the smallest groups that the population can be divided into. Clusters are the groups of such items. The use of an element as a sample unit is impractical in many real-world scenarios and populations because a list of items is not always available. In these circumstances, cluster sampling or area sampling may be used. Area sampling is the process used when the entire area containing the populations is divided into smaller area segments and each member of the population is connected with just one such area segment. Five blocks in the Bihar Supaul district (Supaul, Kishanpur, Basantpur,

Raghopur, and Pratapganj) has been selected to choose respondents for the study. Purposive sampling has been used for the in-depth interviews.

3.3.3 Interview

An in-depth interview is a qualitative research method that involves conducting lengthy interviews with a limited number of subjects. Unlike other types of qualitative research, researchers that utilize an in-depth interviewing strategy dedicate a substantial amount of time to each participant, adopting a conversational format. Interview questions are predominantly open-ended and encourage a discovery-oriented approach.

In-depth interviewing serves the objective of acquiring comprehensive information that illuminates an individual's viewpoint, encounters, emotions, and the inferred significance about a specific subject or matter. In the social sciences, in-depth interviewing is a widely used qualitative methodology. It is particularly useful in media psychology to gain a deeper understanding of a topic that requires additional investigation. In addition, it can be a valuable element in research designs that involve multiple methods (Rutledge & Hogg, 2020).

In-depth interview has been conducted for the study, utilizing written, graphic, or verbal assessments to determine the communication strategy devised by government authorities to lessen the effects of flooding. This approach enables one to acquire a deeper understanding of the circumstances and viewpoints of the individuals being interviewed. The research area has been chosen as the five blocks (Supaul-Kishanpur, Supaul, Basantpur, Raghopur, and Pratapganj) of Supaul district in Bihar. The study involved recording and analyzing interviews with five Block development officers. The objectives have been fulfilled by employing purposive sampling. An analysis of the acquired interview data will be conducted using narrative analysis techniques.

Narrative analysis is a form of qualitative data analysis that specifically centers on the interpretation of the central narratives derived from the personal tales of a study group. Through the utilization of a first-person narrative, the researcher collects and

arranges data to get insight into the personal experiences of individuals. In addition to examining the literal content of an interview, narrative analysis also encompasses the collection of data regarding the individual's manner of expression, the language employed to describe certain events or emotions, and their underlying thoughts and motivations (Parks, 2023).

A narrative analysis also examines the manner in which the research participants formulated their narratives. Narrative study invariably incorporates data obtained from individuals who recount their personal experiences. This data is obtained through loosely organized interviews. These interviews can either be conducted as a single session or as a series of lengthy interviews spread out over a period of time. Narrative research centers on the construction and articulation of the story as perceived by the study participant (International Encyclopedia of the Social & Behavioral Sciences, 2015).

3.3.4 Content Analysis

Content analysis is a widely used technique in communication research, particularly in the fields of media and popular culture studies. Content analysis is a systematic and quantitative process used to analyze the meaning or content of communicative signals. Content analysis is a descriptive research method used to analyze and characterize communicative phenomena. This section provides a comprehensive review of content analysis, including its definition, applications, methodology, and limitations.

Content analysis is a frequently employed method in communication research, particularly in the fields of media and cultural studies. Examining the substance or significance of communicative signals through content analysis is a methodical, numerical procedure. Content analysis is a descriptive research method that is employed to describe communicative phenomena. This section provides a comprehensive review of content analysis, including its definition, applications, methodology, and limitations.

The content analysis method has been employed to examine the government

advisories in order to ascertain the government's communication strategy before to, during, and following a flood. Data has been gathered from the media cell and social media platform of the Bihar State Disaster Management Authority. An investigation of the content of government advisories, such as SMS and announcement messages, has been conducted. To conduct a thorough analysis of the text content in the advisories provided by the Bihar State Disaster Management Authority (BSDMA) on disasters, a systematic and precise technique was employed. This required the use of a specifically designed codebook that was specifically created for flood awareness messaging. The aim of this technique was to understand the effectiveness and communication strategies used in these advisories, ensuring that they successfully fulfilled their stated objectives.

The first phase of this method entailed Source Identification. At first, each message was categorized based on its origin. The messages were mostly disseminated through two platforms: Facebook and SMS on mobile devices. The classification was crucial in understanding the possible influence of different channels on the spread of disaster-related information and their accessibility to distinct demographic groups. Once the origin was determined, the typology of the messages was evaluated. Each message was meticulously assigned to one of several predetermined classes.

The messages comprised informative messages (INFO) that conveyed factual information, warnings or alerts (WARN) that notified the public about imminent hazards, educational messages (EDU) that aimed to instruct or enlighten about specific topics related to disasters, appeals (APPEAL) that urged for action or assistance, testimonials or personal stories (TEST) that shared individual experiences, and other types of messages that did not fit into these categories. This classification aided in the understanding of the fundamental nature of communication and its alignment with the goals of disaster risk reduction. Afterwards, the subsequent stage entailed carefully examining the Content Focus of each communication. The primary objective was to ascertain the message's primary focus. The messages were categorized based on their focus on preparedness (PREP), response (RESP), recovery (RECOV), general awareness (AWARE), or other

specialized subjects. This stage was critical in assessing if the communication encompassed all essential elements of disaster planning and communication. The Target Audience Analysis was conducted to determine the precise individuals or groups that were meant to receive these messages. The target audience were categorized into multiple groups: the general public (GEN), vulnerable populations (VUL) including the elderly, children, and disabled individuals, specialized communities (COMM) such as riverbank inhabitants, government officials or emergency responders (OFFICIAL), and miscellaneous groups.

Identifying the audience were essential for assessing the pertinence and appropriateness of the message content for its intended recipients. Afterwards, the tone was classified as urgent (URGENT), cautionary (CAUTION), reassuring (REASSURE), inspirational (INSP). A communication's tone has a substantial impact on the audience's response and perception. Assessing the efficacy of the message was another pivotal phase. This involved evaluating the clarity and comprehensibility of the communications (CLEAR), their degree of confusion (CONFUSING), their capacity to make a powerful impression and engage the audience (IMPACTFUL), their lack of effectiveness or disregard (INEFFECTIVE), or their categorization into a different group. This assessment permitted the identification of certain areas where communication might be improved. The method of communication was also recorded, showing whether the message was conveyed over social media (Facebook) or SMS. Understanding the media helps to evaluate the scope and timeliness of the communication. Afterwards, the linguistic analysis of the patterns was done in the messages. This task required identifying the language used in the communication, namely English (EN), Hindi (HN), Bhojpuri (BHOJPURI), Maithili (MAITHILI), or Urdu. Language analysis was crucial in assessing the degree of accessibility for different language groups in the community.

Furthermore, an evaluation was done to see if the message included a specific Call to Action, categorizing it as either positive (YES) or negative (NO). This facilitated the understanding of whether the messages were designed to provoke immediate action or simply to convey information. In the end, the presence or absence of Visual

Elements, such as photographs, icons, graphs, and maps were analyzed. The visual elements are essential in the analysis as they enhance the understanding and retention of information. Using a systematic methodology, the comprehensive and precise evaluation of the BSDMA warnings was done. This allowed to get valuable insights into their efficacy and identify potential areas for enhancing disaster communication techniques.

3.3.5 Operational Analysis

Operational analysis of the categories used in the codebook for the purpose of content analysis of flood awareness messages. This analysis explains how each category is used to evaluate and categorize the content of the advisories.

3.3.5.1 Source of Message:

This category identifies the platform through which the message was disseminated. It is essential to understand the reach and impact of different communication mediums.

3.3.5.2 Type of Message:

This category classifies the message's purpose or nature. Understanding the type of message helps in assessing its role in disaster communication and how it addresses different aspects of awareness and response.

3.3.5.3 Content Focus:

This category examines the primary focus of the message. It is crucial for evaluating whether the message addresses preparedness, response, recovery, awareness, or other areas that are vital for effective disaster management.

3.3.5.4 Target Audience:

This category identifies the intended audience of the message. Targeting specific audiences is important for ensuring that the message is relevant and impactful for those who need it most.

3.3.5.5 Communication Tone:

This category assesses the tone used in the message, which can significantly influence how the message is received and acted upon by the audience.

3.3.5.6 Message Effectiveness:

This category evaluates the clarity and impact of the message. Effective communication is essential for ensuring that the message is understood and prompts the desired action.

3.3.5.7 Language:

This category identifies the language in which the message was communicated. Language plays a crucial role in accessibility and understanding, particularly in regions with diverse linguistic groups.

3.3.5.8 Call to Action:

This category checks whether the message includes a call to action, prompting the audience to take specific actions in response to the message. Calls to action are vital for engaging the audience and ensuring proactive responses.

3.3.5.9 Visual Elements:

This category examines the presence and type of visual elements in the message. Visual elements can enhance the clarity and impact of the message, making it more engaging and easier to understand.

3.3.5.10 Contextual Unit of Analysis

All the content shared by BSDMA on Facebook and via SMS related were treated as contextual unit of analysis. Frames given to the contents were analyzed against the contextual unit of analysis.

3.3.5.11 Variables and Categories of Coding

The study categorized various variables including source of message, type of message, content focus, target audience, communication tone, message effectiveness, language used, call to action, and visual elements. Each variable was examined to assess its impact on disaster communication, such as identifying the platform used (e.g., Facebook, SMS), classifying the message's purpose (e.g., information, warning), and evaluating its clarity and effectiveness. Additionally, the study considered the language of the message, the presence of a call to action, and any visual elements used, providing a comprehensive analysis of how these factors influence flood awareness and response.

3.3.5.12 Coding Unit of Analysis

For content analysis of the information shared by BSDMA on Facebook and via SMS, there some units have been formed and given a specific code in the form of a code book.

S. No.	Category	Options	Codes
1.	Source	Facebook & SMS	FB, SMS
2.	Types of Messages	Informative, Warning or Educational, Appeal, Testimonial or personal story, Other	INFO, WARN, EDU, APPEAL, TEST, OTHER
3.	Content Focus	Preparedness, Response, Recovery, General awareness, Other	PREP, RESP, RECOV, AWARE, OTHER
4.	Target Audience	General public, Vulnerable group, Specific communities, Government officials or emergency responders, Other	GEN, VUL, COMM, OFFICIAL, OTHER
5.	Comm. Tone	Urgency, Caution, Reassuring, Inspirational or motivational, Other	URGENT, CAUTION, REASSURE, INSP, OTHER
6.	Message Effectiveness	Clear and easy to understand, Confusing or ambiguous, Impactful and engaging, Ineffective or ignored, Other	CLEAR, CONFUSING, IMPACTFUL, INEFFECTIVE, OTHER
7.	Language	English, Hindi, Bhojpuri, Maithili, Urdu	EN, HN, BHOJPURI, MAITHILI, URDU
8.	Call to Action	Yes (Specify the action), No E.g.: if there is warning message of heavy rainfall and lightening, and people are instructed to stay at home, one should stay at home.	YES, NO
9.	Visual Elements	Images or photographs, Icons or symbols, Graphs or charts, Maps, No visual elements, Other	IMAGES, ICONS, GRAPHS, MAPS, NONE, OTHER

3.4 Area of the Study

The chosen research area for this study is the Mithila region, specifically focusing on Supaul, a district that was historically part of Saharsa. Mithila holds significant historical and cultural importance, tracing back to the Mithila Kingdom, also known as the Kingdom of the Videhas. During the later Vedic era, Videha emerged as a prominent political and cultural center in South Asia. Over time, the Videha Kingdom became a constituent of the Vajji confederacy, with Mithila serving as its base and Vaishali as its capital (Water et al., n.d.).

According to the 2011 Census of India, Supaul had a population of 2,228,397, with 1,157,815 men and 1,070,582 women. The subject of this investigation is five subdivisions in Supaul: Kishanpur, Supaul, Basantpur, Raghopur, and Pratapganj. These blocks were selected due to their high vulnerability to annual flooding, as highlighted by Pandey (2014). Supaul District is situated between the latitudinal coordinates 25°37' and 26°25' N and the longitudinal coordinates 86°22' and 87°10' E. It spans an area of 2,420 square kilometers in North Bihar. The district is bounded by Nepal to the north, Araria to the east, Madhubani to the west, and Saharsa to the south.

Supaul district is leading for being one of the most flood-prone regions in India. Despite its vulnerability, the district faces a significant lack of adequate facilities and disaster planning and communication infrastructure. Out of the 11 blocks in Supaul, five experience regular annual flooding. The district has been grappling with flood issues since at least 1934. This study aims to explore various dimensions of the Kosi flood and disaster planning and communication within Supaul, providing insights into the challenges faced and the strategies implemented to address this persistent disaster. By examining these aspects, the study seeks to contribute valuable information on managing flood risks and improving resilience in one of India's most flood-affected areas.

Block	Population
Kishanpur	167,669
Supaul	294,761
Basantpur	182,075
Raghopur	215,643
Pratapganj	106,884
Total Population	967,032

Chapter – 4

Data Analysis and Findings

The chapter "Data Analysis and Findings" provides a thorough examination of the data gathered using different research methods to assess the efficacy of disaster risk communication and the level of awareness regarding the Kosi flood disaster in the Supaul district of Bihar. To comply with the objective of the study, a multi-method research methodology was utilized, enabling through comprehension of the data from several viewpoints. This chapter is organized to offer an in-depth examination of the data acquired via surveys, content analysis of government warnings, and narrative analysis of interviews with block development officers of the five different blocks.

Furthermore, a thorough examination of government advisories distributed via Facebook and SMS platforms was done alongside the survey. The purpose of this analysis is to assess the lucidity, coherence, and availability of the information disseminated to the general public during the flood occurrences. Using Python programming techniques, the warnings have been methodically coded and analyzed to find repeating patterns, assess the effectiveness of the messaging, and pinpoints where communication was lacking, may be enhanced. The content analysis yields useful insights into the utilization of digital platforms by government entities for disaster communication and the subsequent effect of these endeavors on public awareness and response.

The chapter additionally incorporates a narrative analysis of interviews conducted with Block Development Officers (BDOs) in Supaul. These interviews provide a comprehensive insight into the difficulties encountered by government authorities in effectively communicating with the public and handling disaster risks at the community level. The narrative analysis, utilizing qualitative data, examines the experiences, perceptions, and methods employed by BDOs in managing the Kosi flood disaster. This study explores the practical elements of catastrophe planning and communication and the impact of local leadership on strengthening community resilience.

This chapter seeks to provide a comprehensive perspective on disaster risk communication in the Supaul district by deploying various methodologies. The integration of quantitative and qualitative studies provides a thorough and comprehensive nuanced of the data, emphasizing both the advantages and limitations of existing communication tactics. Outcome of the chapter will surely enhance future policies and practices, leading to more efficient disaster risk communication and improved preparedness in flood- prone regions such as Supaul.

4.1 Survey

The survey conducted in Supaul throughout five blocks serves as the basis for the quantitative analysis in this study. The blocks were meticulously chosen to encompass various demographic and socio-economic characteristics within the region, guaranteeing a wide range of perspectives on the knowledge and readiness levels of the population about the Kosi flood. The survey data were thoroughly examined using SPSS software, yielding robust statistical insights into the patterns, relationships, and influential factors affecting flood awareness in the region. The findings of this analysis are essential for comprehending the present condition of disaster readiness among the inhabitants and identifying areas that require attention. Here are the data analysis of the Survey done in the five blocks of the Supaul district in Bihar.

4.1.1 Demographic Analysis

4.1.1.1 Gender and Proximity: The Supaul sample area comprises five blocks, categorized into three groups based on their distance from the district headquarters:

- Proximate
- Moderate
- Distant

Analysis of gender frequency across these categories reveals a lower proportion of female respondents in all proximate, moderate, and distant areas. The overall gender distribution, as depicted in the table, indicates 40.3% female, 56.1% male, and 4 %

transgender respondents. Specifically, in the proximate area (Supaul and Kishanpur), male respondents constitute 49.7%, females 46.4%, and transgender individuals 3.9 %. In the moderate area (Raghopur & Pratapganj), the gender distribution shows 32.5% male and 64.4% female respondents. Similarly, in the distant area (Basantpur), the gender distribution is 50.7% male and 45.1% female. Overall, male respondents constitute 56.1% and female respondents 40.3% of the total. Notably, female respondents demonstrate relatively lower interest in the survey compared to their male counterparts.

Gender	**Distant from District HQ**			
	Proximate	Moderate	Distant	Total
Female	46.4 %	32.5 %	45.1 %	40.3 %
Male	49.7 %	64.4 %	50.7 %	56.1 %
Transgender	3.9 %	3.1 %	4 %	3.6 %
Total	100 %	100 %	100 %	100 %

Table - 4.1 Gender of the respondents in all five blocks and proximity

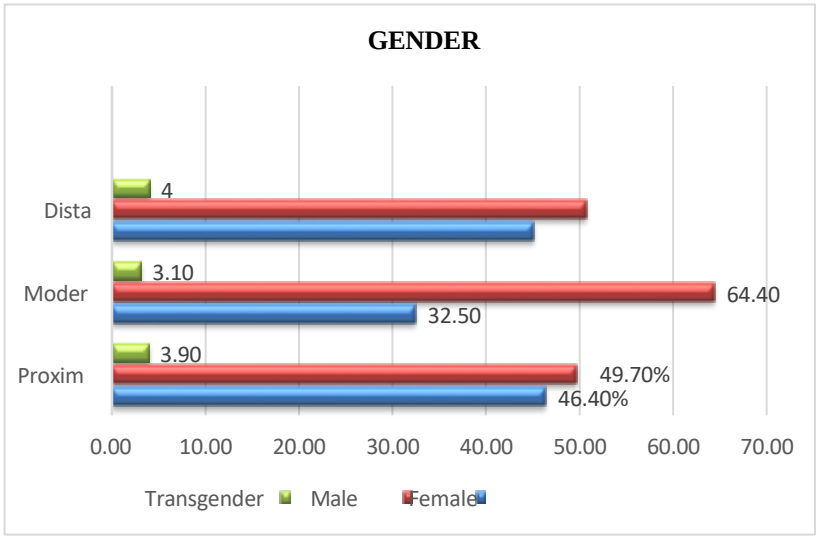


Figure 4.1: Gender Frequency of the Respondents and Proximity

4.1.1.2: Age and Proximity

The age categories have been shown below to highlight the demographic distribution across different regions. In Supaul and Kisanpur (Proximate Area) blocks, the breakdown is as follows: Teenagers (Under 18 Years) account for 4.6%, Youth (18-34 Years) constitute 41.1%, Middle-aged individuals (35-54Years) represent 41.1%, and Senior citizens (55+) make up 13.2% of the respondents. Moving to Raghopur and Pratapganj (Moderate Area) blocks, the percentages are: Teenagers (Under 18 Years) at 1.2%, Youth (18-34 Years) at 45.4%, Middle-aged individuals (35-54Years) at 46.6%, and Senior citizens (55+) at 6.7%. In Basantpur (Distant Area) blocks, the distribution stands at: Teenagers (Under 18 Years) with 1.4%, Youth (18-34 Years) with 31%, Middle-aged individuals (35-54Years) with 62%, and Senior citizens (55+) with 5.6%.

Considering the overall respondents, the proportions are: Teenagers (Under 18 Years) comprising 2.6%, Youth (18-34 Years) at 41%, Middle-aged individuals (35-54Years) at 47.3%, and Senior citizens (55+) at 9.1%. These statistics provide insights into the age demographics across different regions, highlighting variations in age group distributions.

Age	Distant from District HQ			Total
	Proximate	Moderate	Distant	
Teenager (Under 18)	4.6 %	1.2 %	1.4 %	2.6 %
Youth (18-34)	41.1 %	45.4 %	31 %	41 %
Middle Age (35-54)	41.1 %	46.6 %	62 %	47.3 %
Senior Citizen (55+)	13.2 %	6.7 %	5.6 %	9.1 %
Total	100 %	100 %	100 %	100 %

Table – 4.2 Age group of the Respondents and Proximity

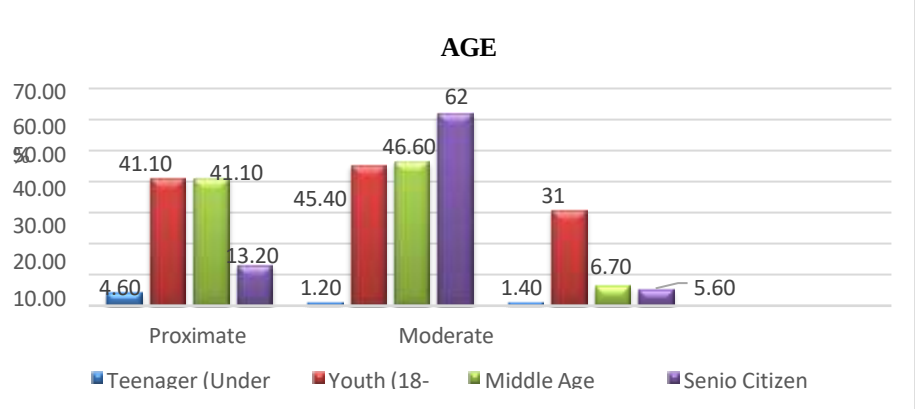


Figure -4.2 Age group of the Respondents and Proximity

4.1.1.3 Educational Qualification and Proximity

The educational qualifications of respondents across the five blocks of Supaul district. The frequency data reveals a higher occurrence of higher education qualifications in the proximate area (Supaul & Kisanpur) compared to the moderate (Raghopur & Pratapganj) and distant (Basantpur) areas. The overall distribution of educational qualifications, as outlined in the table, illustrates the following percentages: 4.7% illiterate, 8.6% literate, 35.8% completed primary education, 34% completed secondary education, 10.9% completed higher education, and only 6% were graduates.

Specifically, in the proximate area (Supaul and Kisanpur), the breakdown is as follows: 7.3% illiterate, 6.6% literate, 31.1% completed primary education, 31.1% completed secondary education, 15.9% completed higher secondary education, and 7.9% were graduates. In the moderate area (Raghopur & Pratapganj), the distribution of qualifications is: 3.1% illiterate, 11.7% literate, 41.7% completed primary education, 31.3% completed secondary education, 7.4% completed higher secondary education, and 4.9% were graduates. Similarly, in the distant area (Basantpur), the qualification distribution stands at: 2.8% illiterate, 5.6% literate, 32.4% completed primary education, 46.5% completed secondary education, 8.5% completed higher secondary education, and 4.2% were graduates. These figures provide an insight into the educational attainment levels across different regions, highlighting variations in educational qualifications among respondents.

Education	**Distant from District HQ**			Total
	Proximate	Moderate	Distant	
Illiterate	7.3%	3.1 %	2.8%	4.7 %
Literate	6.6%	11.7 %	5.6%	8.6 %
Primary	31.1%	41.7 %	32.4%	35.8%
Secondary	31.1%	31.3 %	46.5%	34 %
Higher Secondary	15.9%	7.4%	8.5%	10.9%
Graduate	7.9%	4.9%	4.2%	6%
Total	100 %	100 %	100 %	100 %

Table 4.3 Educational Qualification of the Respondents and Proximity

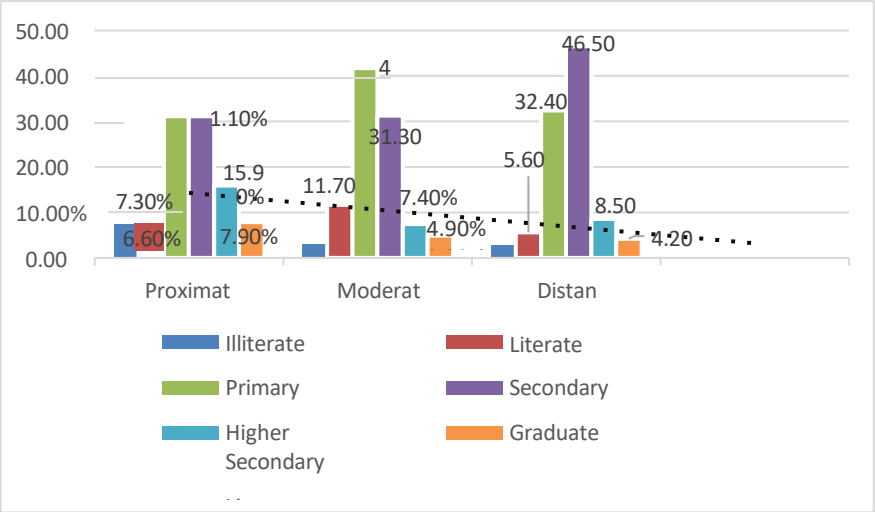


Figure 4.3 Education and the Proximity

4.1.1.4. Occupation and Proximity

The analysis of Table 4 sheds light on the occupational composition of respondents across the five blocks of the Supaul district. The frequency data highlights a notably higher unemployment rate in both the proximate area (Supaul & Kisanpur) and the moderate area (Raghopur & Pratapganj) when compared to the distant area (Basantpur). Examining the overall distribution of respondent occupations, the table reveals the following percentages: 26% are classified as entrepreneurs, 9.9% as government employees, 31.4% as private employees, 2.9% as students, and 29.9% as unemployed. Breaking down the data further, in the proximate area (Supaul and Kisanpur), the distribution is as follows: 24.5% entrepreneurs, 11.3% government employees, 23.8% private employees, 5.3% students, and 35.1% unemployed. Moving to the moderate area (Raghopur & Pratapganj), the occupational breakdown is: 19.6% entrepreneurs, 8.6% government employees, 38% private employees, 1.2% students, and 32.5% unemployed. Likewise, in the distant area (Basantpur), the distribution stands at: 43.7% entrepreneurs, 9.9% government employees, 32.4% private employees, 1.4% students, and 12.7% unemployed. These findings provide valuable insights into the employment dynamics across various regions, highlighting substantial differences in occupational profiles among respondents.

Occupation	**Distant from District HQ**			
	Proximate	Moderate	Distant	Total
Entrepreneur	24.5 %	19.6%	43.7%	26 %
Govt. Employee	11.3 %	8.6%	9.9%	9.9 %
Private Employee	23.8 %	38 %	32.4%	31.4%
Student	5.3 %	1.2 %	1.4%	2.9%
Unemployed	35.1%	32.5%	12.7%	29.9%
Total	100 %	100 %	100 %	100 %

Table 4.4 Occupations of the Respondents and Proximity

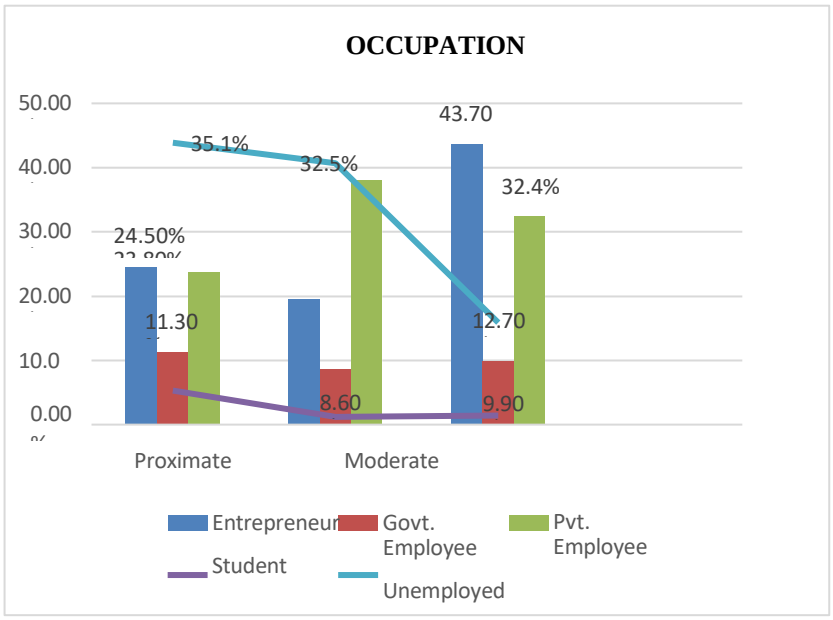


Figure 4.4 Occupations of the Respondents and Proximity

4.1.1.5 Concerned Natural Disaster in the particular area and Proximity

The frequency distribution in this section indicates the predominant natural disaster concern in Supaul is Flood. Among respondents, 99.2% identified flood as the primary concern in their area, while only 0.3% expressed concern about drought and 0.5% about earthquakes.

	Distant District HQ			Total
Concerned Natural Disaster	**Proximate**	**Moderate**	**Distant**	
Drought	0.0%	0.0%	1.4 %	0.3%
Earthquake	0.7%	0.0%	1.4 %	0.5%
Flood	99.3%	100.0%	97.2%	99.2%
Total	100%	100%	100%	100%

Table 4.5 Natural Disaster in the particular area and proximity

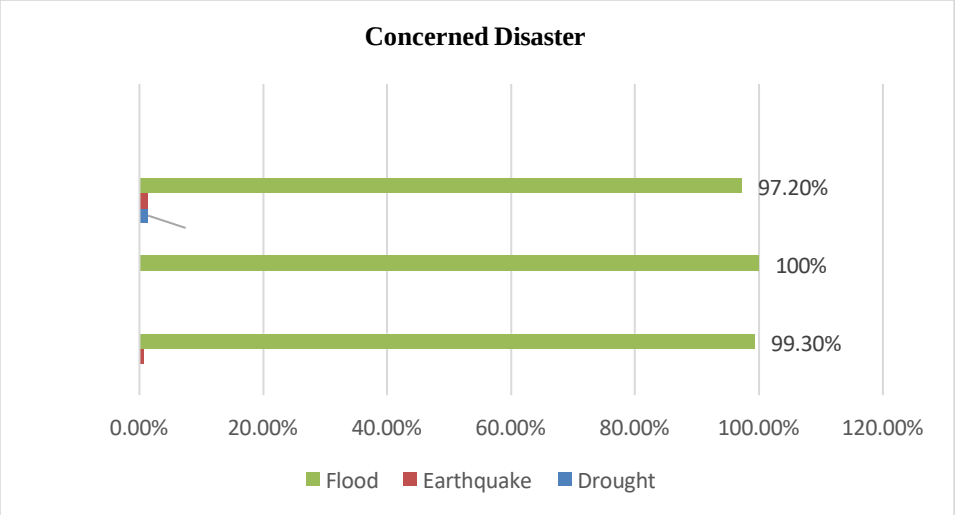


Figure 4.5 Concerned Natural Disaster in the Blocks and Proximity

4.1.1.6: Awareness about Kosi Flood Disaster and Proximity

Table 4.6 shows the cross-table frequency of the knowledge of Kosi Flood in proximate (Supaul and Kisanpur), moderate (Raghopur and Pratapganj) and Distant

(Basantpur) area. The overall frequency says that the 99.5% respondents are aware of Kosi flood in Supaul region.

	Distant District HQ			Total
Know about Kosi Flood Disaster	**Proximate**	**Moderate**	**Distant**	
Yes	100.0%	98.8%	100 %	99.5%
No	0.0%	1.2%	0.0 %	0.5%
Total	100%	100%	100%	100%

Table 4.6 shows the Awareness about Kosi Flood and Proximity

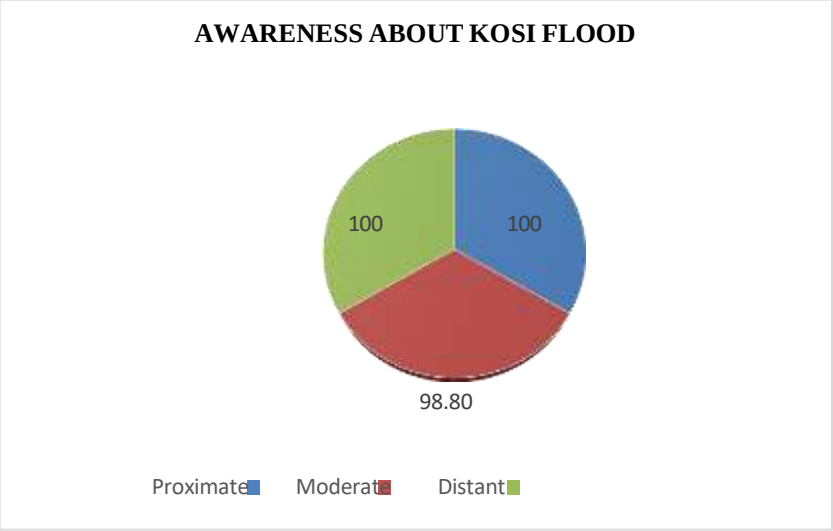


Figure 4.6 shows the Awareness about Kosi Flood and Proximity

4.1.1.7 Level of Preparation and Proximity

Table 4.7 provides a breakdown of preparation for Kosi disaster prevention across different distances from the district headquarters (HQ). Individuals in proximate areas to the district HQ show the highest percentage (22.5%) of collecting information by themselves, followed by those in distant areas (15.5%). Moderate and distant respondents display relatively lower percentages at 4.3% and 13.5%, respectively. The highest proportion of respondents obtaining information from non-governmental organizations (NGOs) is observed in moderate areas (11.0%), while proximate and distant regions show percentages of 15.2% and 22.5%, respectively. Distant areas have the highest reliance on NGOs for information. BSDMA (Bihar State Disaster Management Authority) shares information with respondents across all distances from the district HQ. Proximate and distant regions display comparatively lower percentages at 18.5% and 26.2%, respectively. Respondents from moderate areas demonstrate the highest level of preparedness in terms of having a family emergency plan (28.8%). Distant areas also show considerable preparedness (22.3%), while proximate and distant regions have lower percentages at 17.9% and 16.9%, respectively. Proximate and moderate areas display similar percentages of individuals gathering information from local disaster planning and communication authorities (17.9% and 16.6%, respectively). Distant areas have a slightly lower percentage at 11.3%.

Preparation for Kosi Disaster Prevention	**Distant District HQ**			**Total**
	Proximate	**Moderate**	**Distant**	
Collected information by self	22.5%	4.3%	15.5 %	13.5%
Information collected NGOs	15.2%	11.0%	22.5%	14.8%

Information by BSDMA	7.9%	6.7%	5.6%	7.0%
Prepared self-survival kits	18.5%	32.5%	28.2%	26.2%
Prepared emergency plan	17.9%	28.8%	16.9%	22.3%
Information gathered from disaster- local authority	17.9%	16.6%	11.3%	16.1%
Total	100%	100%	100%	100%

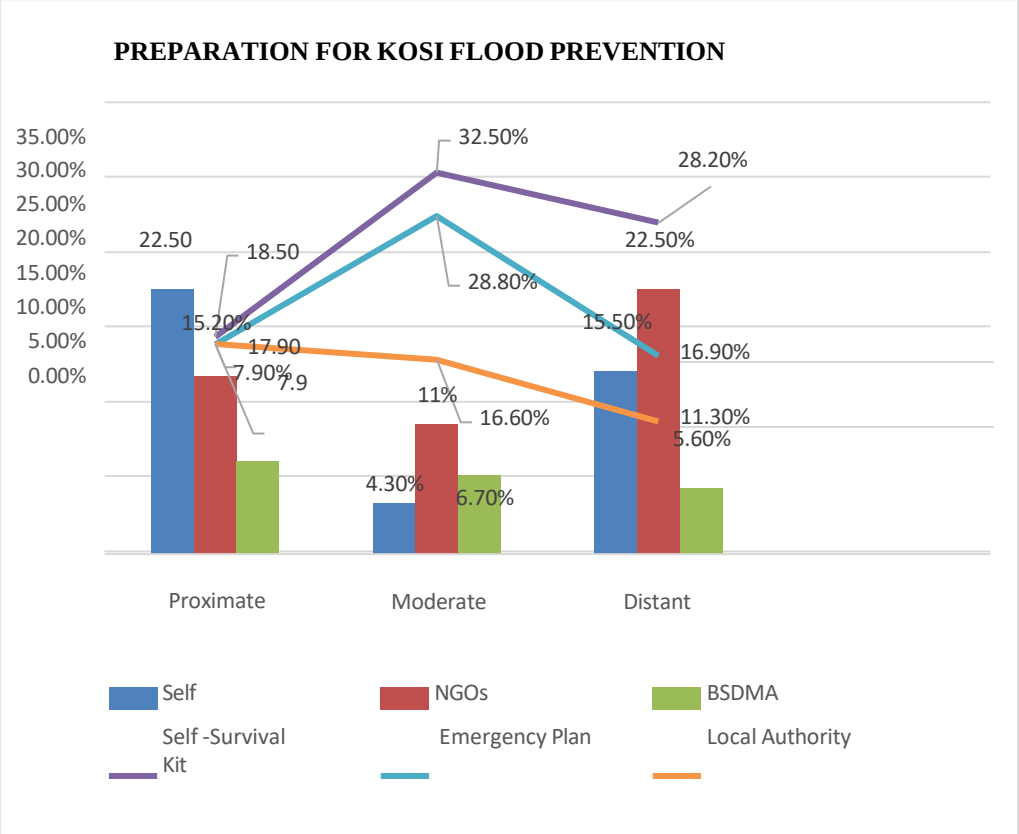


Figure 4.7 Preparation for Kosi Flood Prevention and Proximity

4.1.1.8: Sources of Information about Kosi flood or other natural disaster or emergency and Proximity

The table 4.8 provides data on the sources of information about the Kosi flood or other natural disasters or emergencies, categorized by proximity to the affected area. Here's an analysis of the data:

Family Friends:

The majority of individuals, regardless of proximity to the disaster, rely significantly on information from family friends. The reliance decreases as the distance from the disaster area increases, with 57.7% of individuals from distant areas relying on family friends compared to 37.1% from proximate areas.

Government Officials:

Government officials are a significant source of information, particularly for individuals in proximate areas, with 33.1% relying on them. However, reliance decreases with distance from the disaster area, with only 18.3% of individuals from distant areas relying on government officials.

Internet/Social Media:

Internet and social media play a minor role overall, with only 8.8% of individuals relying on them for information. Interestingly, there's a higher reliance on internet/social media among individuals from moderate areas compared to those from proximate or distant areas.

Mobile:

Mobile communication is a moderately relied-upon source, with 9.1% of individuals overall relying on it. There's a slight increase in reliance from proximate to moderate areas, but it decreases again for individuals from distant areas.

Newspaper:

Newspapers are the least relied-upon source of information, with only 0.5% of individuals overall relying on them. No individuals from moderate or distant areas relied on newspapers for information about the disaster.

TV/Radio:

TV and radio play a significant role in providing information, especially for individuals in moderate areas, with 25.2% relying on them. However, reliance decreases for individuals from distant areas.

Other:

Other sources, not explicitly defined in the table, are moderately relied upon, with 16.1% of individuals overall relying on them. The reliance is consistent across proximate, moderate, and distant areas.

Overall, the analysis shows that while some sources like family friends and government officials are consistently relied upon, others like newspapers play a negligible role. Additionally, the reliance on certain sources varies depending on the proximity to the disaster area.

	Distant District HQ			**Total**
Sources of Information	**Proximate**	**Moderate**	**Distant**	
Family Friends	37.1%	42.3%	57.7%	43.1%
Government Officials	33.1%	12.3%	18.3%	21.6%
Internet/social media	5.3%	14.7%	2.8%	8.8%
Mobile	13.2%	5.5%	8.5%	9.1%
Newspaper	1.3%	0.0%	0.0%	0.5%

TV/Radio	9.3%	25.2%	12.7%	16.6%
Other	17.9%	16.6%	11.3%	6.1%
Total	100%	100%	100%	100%

Table 4.8 Sources of Information about Kosi Disaster and Proximity

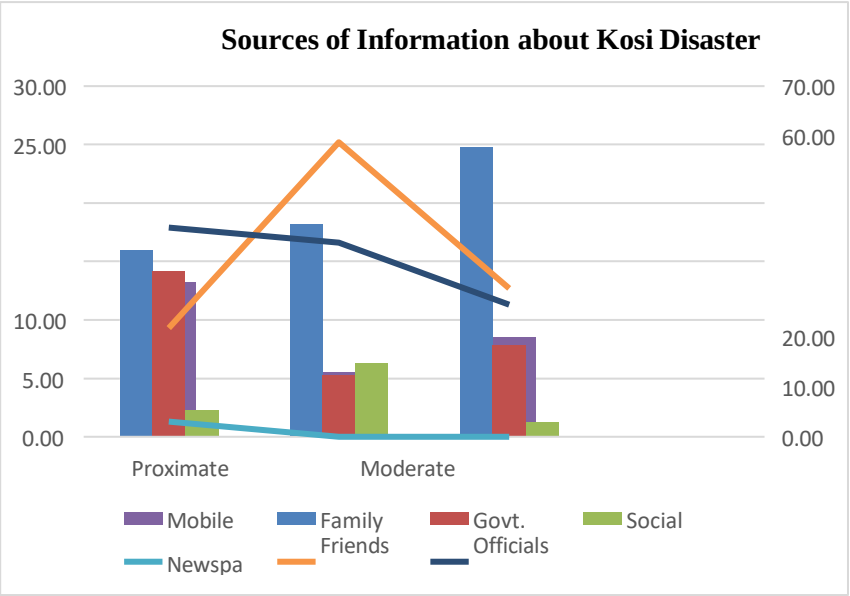


Figure 4.8 Sources of Information about Kosi Disaster and Proximity

4.1.1.9: Help in preparing the Kosi Disaster Prevention Plan and Proximity

The table 4.9 provides data on the sources from whom, the respondents received help for the preparation of the Kosi disaster prevention plan, categorized by the proximity to the affected area. Here's the analysis of the table data:

Central Government: Despite many schemes and programs of help aids from the central government, the reach is minimal across these five blocks, with only 0.5% of individuals reporting assistance. There is a slight increase in help received from proximate areas compared to moderate or distant areas.

State Government:

The state government plays a significant role in providing assistance for disaster preparation; with 13.5% of individuals reporting help overall. Assistance is higher in proximate areas (25.8%) compared to moderate or distant areas.

Local Politician/Political Parties:

Local politicians and political parties are one of the significant sources of assistance, with 24.4% of individuals reporting help overall. Assistance is higher in moderate areas (37.4%) compared to proximate or distant areas.

Municipality Office:

The municipality office is the most significant source of assistance, with 43.4% of individuals reporting help overall. Assistance is consistently high across all areas, with proximate areas reporting the highest (48.3%).

NGO/Voluntary Organizations:

NGOs and voluntary organizations also play a significant role, with 17.1% of individuals reporting help overall. Assistance is highest in distant areas (33.8%)

compared to proximate or moderate areas.

Sources of Help	Distant District HQ			Total
	Proximate	Moderate	Distant	
Central Government	1.3%	0.0%	0.0%	0.5%
State Government	25.8%	6.1%	4.2%	13.5%
Local Politician	9.3%	37.4%	26.8%	24.4%
Municipality Office	48.3%	42.3%	35.2%	43.4%
NGO	13.9%	12.9%	33.8%	17.1%
Other	1.3%	1.2%	0.0%	1.0%

Table 4.9 Sources of help received for Kosi Disaster Prevention Plan and Proximity

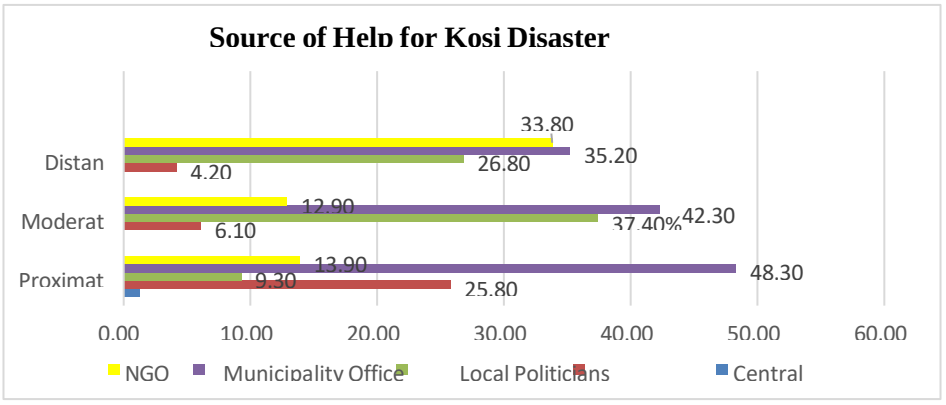


Figure 4.9 Sources of help for Kosi Disaster Prevention Plan and Proximity

4.1.1.10 Disaster Prevention Education/Trainings in School and Proximity

Table 4.10 provides data on the presence of any subject or training related to disaster prevention in schools, categorized by the proximity to the affected area. Here's an analysis of the data:

Across all areas, a significant portion of respondents report that there is some form of disaster prevention education in schools. Overall, 32.2% of respondents report that such education is provided. Proximate areas show the highest proportion of respondents (55%) confirming the presence of disaster prevention education in schools. This indicates a strong emphasis on disaster preparedness in schools located closer to disaster-prone areas. In moderate areas, 22.7% report the presence of such education, indicating a lower but still notable provision of disaster prevention training. However, in distant areas, only 5.6% of respondents report the presence of disaster prevention education in schools. This suggests a significant gap in disaster preparedness efforts in schools located farther away from disaster-prone regions.

While a substantial portion of respondents report the presence of disaster prevention education, a notable percentage still reports the absence of such education in schools. Overall, 67.5% of respondents report the absence of disaster prevention education in their schools. The absence of disaster prevention education is more prevalent in distant areas, with 93% of respondents reporting no such education. This highlights a significant gap in disaster preparedness efforts in schools located far from disaster-prone regions. In moderate areas, 77.3% report the absence of disaster prevention education, indicating a relatively higher but still substantial lack of preparedness efforts. Proximate areas show a comparatively lower proportion of respondents (45%) reporting the absence of disaster prevention education, indicating relatively better preparedness efforts in schools closer to disaster-prone areas.

A negligible percentage of respondents (0.3%) report uncertainty regarding the presence of disaster prevention education in schools, with the majority indicating a clear presence or absence. Overall, the analysis underscores the importance of

integrating disaster prevention education into school curriculums, particularly in areas prone to natural disasters. It also highlights disparities in preparedness efforts across different geographical areas, emphasizing the need for targeted interventions to enhance disaster resilience in schools, especially in distant regions.

Any Subject/Training related to Disaster prevention in School	Distant District HQ			Total
	Proximate	Moderate	Distant	
Yes	55%	22.7%	5.6%	32.2%
No	45%	77.3%	93%	67.5%
May be	0.0%	0.0%	1.4%	0.3%
Total	100%	100%	100%	100%

Table 4.10 Disaster Prevention Education in school and Proximity

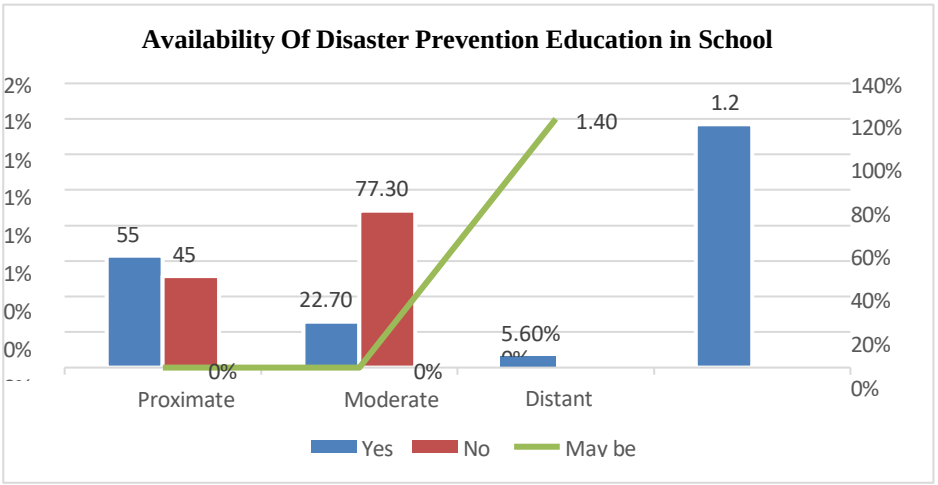


Figure 4.10 Disaster Prevention Education in school and Proximity

4.1.1.11: Level of Awareness about Government schemes for Disaster Preparedness/ Preventions and Proximity

Table 4.11 presents data on individuals' awareness of government schemes for disaster preparedness and prevention, categorized by proximity to the affected area. Here's an analysis of the data:

Overall, there is a notable lack of awareness regarding government schemes for disaster preparedness and prevention, with only 27.8% of individuals indicating awareness. Proximate areas exhibit the highest level of awareness at 40.4%. This suggests that individuals residing closer to disaster-prone regions are more likely to be aware of government initiatives aimed at disaster preparedness and prevention. In moderate areas, 18.4% of individuals are aware of government schemes, indicating a lower level of awareness compared to proximate areas but still significant. Distant areas show the lowest level of awareness at 22.5%, indicating that individuals residing far from disaster-prone regions are less likely to be aware of government schemes for disaster preparedness and prevention.

A significant majority of individuals across all areas lack awareness of government schemes for disaster preparedness and prevention. Overall, 72.2% of individuals indicate a lack of awareness. Distant areas exhibit the highest percentage of individuals (77.5%) lacking awareness of government schemes, followed closely by moderate areas (81.6%) and proximate areas (59.6%). The analysis suggests that there is a substantial need for increasing awareness about government schemes for disaster preparedness and prevention, particularly among individuals residing in moderate and distant areas. Improving awareness can enhance community resilience and enable more effective utilization of government resources for disaster management. Additionally, targeted outreach and education efforts may be necessary to address the disparity in awareness levels across different geographical areas.

Awareness about Govt. schemes for Disaster preparedness and prevention	Distant District HQ			Total
	Proximate	Moderate	Distant	
Yes	40.4%	18.4%	22.5%	27.8%
No	59.6%	81.6%	77.5%	72.2%
Total	100%	100%	100%	100%

Table 4.11 Level of Awareness schemes for Disaster preparedness and preventions and Proximity

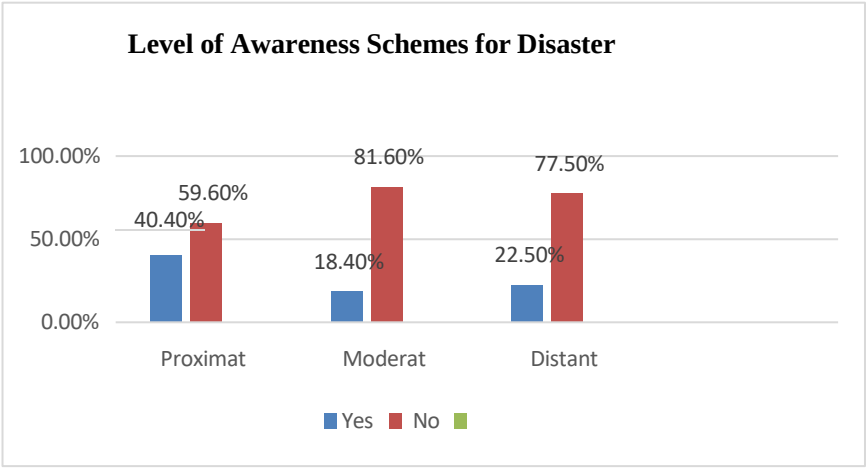


Figure 4.11 Level of Awareness about schemes for Disaster and Proximity

4.1.1.12 Language of the Disaster related Messages and Proximity

Table 4.12 presents data on the language in which individuals receive disaster awareness messages, categorized by proximity to the affected area. The vast majority of individuals across all areas receive disaster awareness messages in Hindi, with 98.7% of individuals overall reporting this language preference. Hindi is the predominant language for disseminating disaster awareness messages, reflecting its widespread use and understanding among the population. The distant areas, 98.6% of individuals receive disaster awareness messages in Hindi, indicating consistency in language preference regardless of proximity to disaster-prone regions. English is not a significant language for receiving disaster awareness messages, with negligible percentages reported across all areas. This suggests that English may not be the preferred language for communication in disaster-related contexts among the surveyed population. Local languages have a minimal presence, with only 1.0% of individuals overall receiving disaster awareness messages in their local language.

Language of the Disaster Awareness Message	**Distant District HQ**			**Total**
	Proximate	**Moderate**	**Distant**	
English	0.0%	0.0%	1.4%	0.3%
Hindi	99.3%	98.2%	98.6%	98.7%
Local Language	0.7%	1.8%	0.0%	1.0%
Total	100%	100%	100%	100%

Table 4.12 Language of the received Disaster related messages and proximity

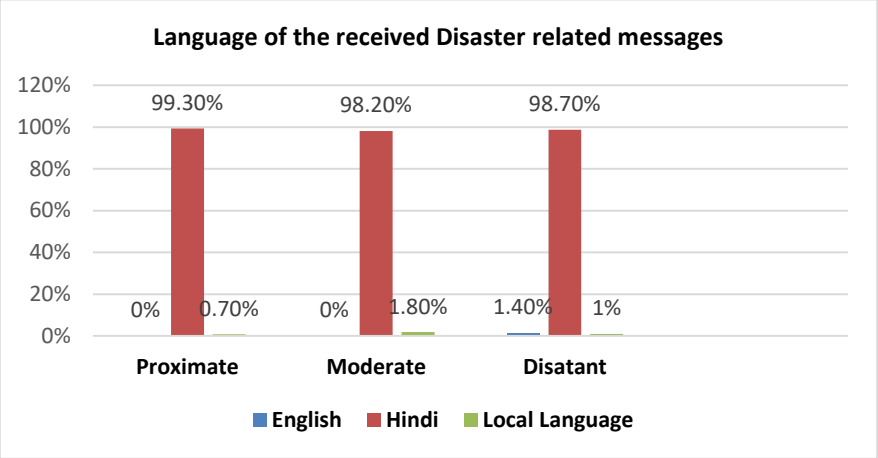


Figure 4.12 Language of the received Disaster related messages and proximity

4.1.1.13 Preferred language of the Awareness Messages and Proximity

Table 4.13 presents data on the preferred language for disaster awareness messages, categorized by proximity to the affected area. Here's an analysis of the data:

Preferred Language:

The majority of individuals across all areas prefer disaster awareness messages in either Hindi or the local language, with Hindi being slightly more preferred overall. Hindi is the preferred language for 29.6% of individuals overall, indicating a significant portion of the population prefers to receive disaster awareness messages in Hindi. Local languages are also highly preferred, with 69.6% of individuals overall indicating a preference for disaster awareness messages in their local language. English is not preferred by any individuals in proximate or moderate areas, and only 2.8% of individuals in distant areas prefer disaster awareness messages in English. This suggests that English is not the preferred language for disaster communication among the surveyed population.

Preference by Proximity:

The preference for local languages is highest among individuals in moderate and distant areas, with 82.8% and 78.9% respectively indicating a preference for disaster awareness messages in the local language. This indicates a strong attachment to local

languages for communication in disaster-related contexts among these populations. Hindi is more preferred among individuals in proximate areas compared to moderate and distant areas, with 49% indicating a preference for disaster awareness messages in Hindi. This suggests that while local languages are highly preferred in all areas, Hindi remains a viable alternative for disaster communication in areas closer to disaster-prone regions.

Implications:

The data underscores the importance of tailoring disaster awareness messages to the linguistic preferences of the target population. Local languages are highly preferred across all areas, highlighting the need for localized communication strategies that resonate with the cultural and linguistic diversity of the affected communities. While Hindi is also widely accepted, particularly in proximate areas, it's crucial to prioritize local languages to ensure the effective dissemination of disaster-related information and promote community engagement and participation in preparedness and response efforts. In conclusion, disaster awareness messages should primarily be delivered in local languages, with additional considerations given to Hindi, especially in areas closer to disaster-prone regions. This approach can enhance the effectiveness of communication strategies and improve community resilience in the face of disasters.

	Distant District HQ			**Total**
Preferred Language of Disaster Awareness Message	**Proximate**	**Moderate**	**Distant**	
English	0.0%	0.0%	2.8%	0.8%
Hindi	49%	16.6%	18.3%	29.6%
Local Language	51%	82.8%	78.9%	69.6%

Table 4.13 Preferred Language of the Awareness Messages and Proximity

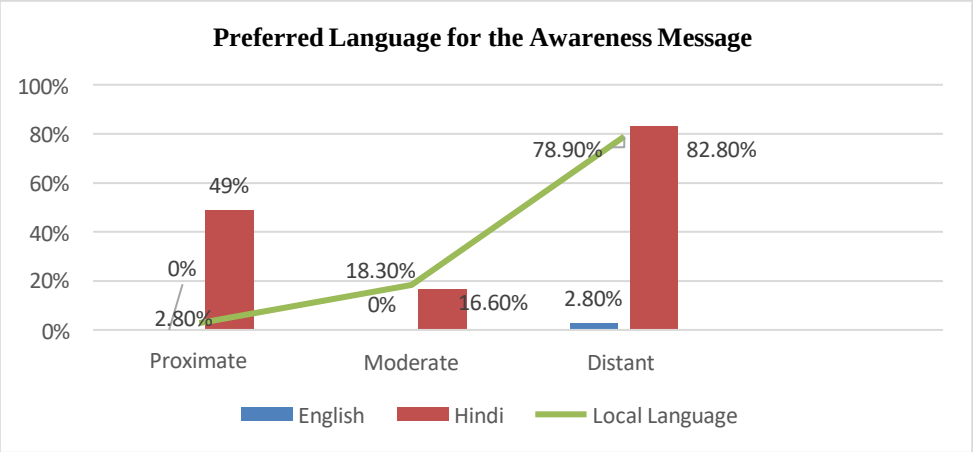


Figure 4.13 Preferred Language of the Awareness Messages and Proximity

1.1.1.14: Preferred Medium for Awareness and Proximity

Based on the detailed analysis of Table 4.14, which outlines the preferred medium of disaster awareness messages across different distances from the district headquarters (HQ) in response to Question 14, the following insights can be derived:

Folk (Nukkad):

The preference for folk mediums such as Nukkad performances is relatively low across all distances from the district HQ, ranging from 3.1% to 5.6%. The overall preference for this traditional medium stand at 4.2%, indicating a limited reliance on it for disseminating disaster awareness messages.

Local Government Officials:

Local government officials are consistently favored as a preferred medium across all distances from the district HQ, with percentages ranging from 39.1% to 42.3%. This indicates a significant trust and reliance on local administrative bodies for the dissemination of disaster-related information, with an overall preference of 40.8%.

Mobile (SMS):

Mobile SMS emerges as a popular medium, particularly among respondents located at a distant distance from the district HQ, where its preference peaks at 42.3%. Despite a slight decrease in preference at moderate distances, mobile SMS maintains a substantial overall preference of 29.4%, making it one of the top choices for conveying disaster awareness messages.

News Paper:

Newspaper is the least favored medium across all distances, with percentages ranging from 0.7% to 3.7%. Its overall preference stands at a mere 2.1%, indicating a minimal reliance on printed media for disseminating disaster-related information.

Social Media/Internet:

Social media/internet platforms show a notable preference, particularly among respondents located at a moderate distance from the district HQ, where its preference peaks at 27%. Despite a decrease in preference at proximate and distant distances, social media/internet maintains a significant overall preference of 16.4%, highlighting its growing importance as a medium for sharing disaster awareness messages.

TV/Radio:

TV/Radio exhibits a moderate preference overall, with percentages ranging from 1.2% to 16.6% across different distances. Despite its relatively higher preference among respondents located proximately, its overall preference stands at 7.3%, indicating a moderate reliance on traditional broadcast mediums for disseminating disaster-related information.

Overall Analysis:

The analysis indicates a clear preference for government-related mediums such as local government officials, alongside modern digital mediums like mobile SMS and

social media/internet platforms. Traditional mediums such as folk performances and newspapers have significantly lower preference levels. There's a notable shift towards digital mediums, particularly among respondents located at moderate distances from the district HQ. A multi-channel approach, combining government initiatives with digital communication strategies, appears to be an effective way to reach diverse populations with disaster awareness messages across different distances.

	Distant District HQ			**Total**
Preferred Medium of Disaster Awareness Message	**Proximate**	**Moderate**	**Distant**	
Folk (Nukkad)	4.6%	3.1%	5.6%	4.2%
Local Govt. Officials	39.1%	42.3%	40.8%	40.8%
Mobile (SMS)	30.5%	22.7%	42.3%	29.4%
News Paper	0.7%	3.7%	1.4%	2.1%
Social media/Internet	8.6%	27%	8.5%	16.4%
TV/Radio	16.6%	1.2%	1.4%	7.3%
Total	100%	100%	100%	100%

Table 4.14 shows Preferred Medium for Awareness and Proximity

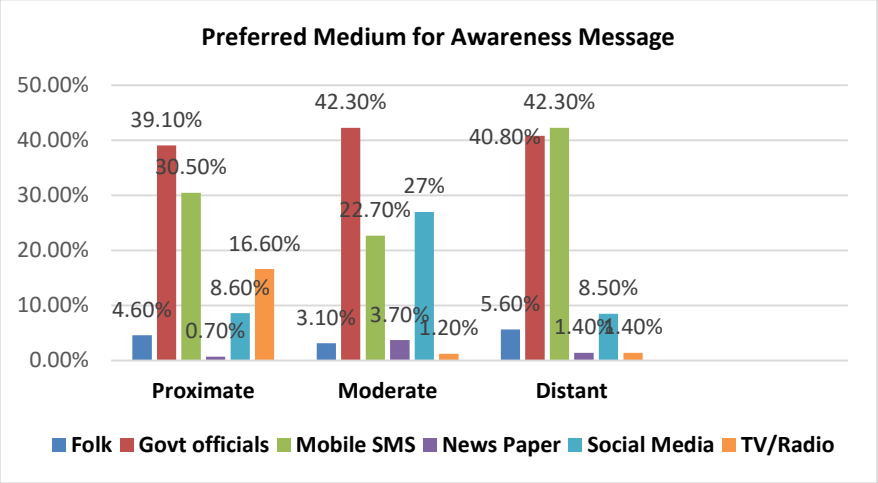


Figure 4.14 Preferred Medium for Awareness Message and Proximity

4.1.1.15: Preferred Format of the Awareness and Proximity

Based on the data presented in Table 4.15, which explores the appropriate form of messages for disaster awareness across different distances from the district headquarters (HQ), the following data analysis can be derived:

Audio: The least preferred form of messages across all distances is audio, with counts of 3, 3, and 1 for proximate, moderate, and distant locations, respectively. The percentages within each distance category are relatively low, ranging from 1.4% to 2.0%. Overall, audio messages constitute only 1.8% of the total responses, indicating a minimal preference for this form.

Multimedia: Multimedia messages, which may include a combination of audio, video, text, and images, are moderately preferred across all distances. Counts for multimedia messages are 42, 57, and 16 for proximate, moderate, and distant locations, respectively. The percentage within each distance category ranges from 22.5% to 35.0%, with an overall percentage of 29.9%. Multimedia messages emerge as the second most favored form of disaster awareness messages.

Text: Text-based messages have a lower preference compared to multimedia and video messages. Counts for text messages are 14, 5, and 2 for proximate, moderate, and distant locations, respectively. The percentage within each distance category

ranges from 2.8% to 9.3%, with an overall percentage of 5.5%. Text messages constitute a relatively small proportion of the total responses.

Video: Video messages are the most preferred form of disaster awareness messages across all distances. Counts for video messages are 92, 98, and 52 for proximate, moderate, and distant locations, respectively. The percentage within each distance category ranges from 60.1% to 73.2%, with an overall percentage of 62.9%. Video messages dominate the preferences, indicating a strong inclination towards visual communication for disaster awareness.

Overall Analysis: The analysis suggests a clear preference for visual forms of communication, particularly video messages, for disaster awareness across all distances from the district HQ. Multimedia messages, which offer a combination of different forms of media, are also favored but to a lesser extent. Text-based messages and audio messages are the least preferred forms, indicating a preference for more engaging and visually stimulating content. These findings highlight the importance of leveraging visual media in disseminating disaster awareness messages to effectively reach and engage diverse populations across different distances.

Preferred Form of Disaster Awareness Message	**Distant District HQ**			**Total**
	Proximate	**Moderate**	**Distant**	
Audio	2.0%	1.8%	1.4%	1.8%
Text	9.3%	3.1%	2.8%	5.5%
Video	60.9%	60.1%	73.2%	62.9%
Multimedia	27.8%	35.0%	22.5%	29.9%
Total	100%	100%	100%	100%

Table 4.15 Preferred Format of the Disaster Awareness Message and Proximity

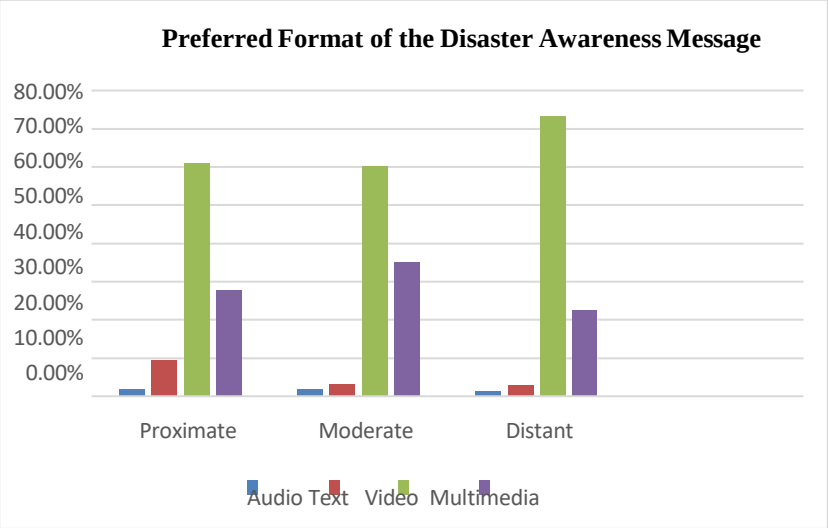


Figure 4.15 Preferred Format of the Disaster Awareness Message and Proximity

4.1.1.16: Frequency of Receiving Flood/Weather Awareness Messages and Proximity

Table 4.16 provides insights into the frequency of receiving flood/weather awareness messages across various distances from the district headquarters (HQ). Here's a detailed analysis of the data:

Never: A negligible percentage of respondents (1.3% proximate, 0.0% moderate and distant) reported never receiving disaster/weather awareness messages. Overall, only 0.5% of respondents stated they never receive such messages, indicating a high level of awareness communication in the surveyed population.

Rarely: A small but noticeable proportion of respondents reported receiving these messages rarely (15.9% proximate, 6.7% moderate and 1.4% distant). Overall, 9.4% of respondents indicated rare receipt of these messages, suggesting some gaps in communication frequency, especially in moderate and distant areas.

Sometimes: The majority of respondents across all distances reported receiving disaster/weather awareness messages sometimes (39.1% proximate, 41.1% moderate, and 40.8% distant). Overall, 40.3% of respondents reported receiving messages sometimes, indicating a common occurrence but not consistent across all regions.

Often: A significant percentage of respondents reported often receiving disaster/weather awareness messages (41.7% proximate, 50.3% moderate, and 57.7% distant). Overall, 48.3% of respondents indicated often receiving these messages, demonstrating a proactive approach to communication, particularly in moderate and distant areas.

Always: While relatively low, a small percentage of respondents reported always receiving disaster/weather awareness messages (2.0% proximate, 1.8% moderate, and 0.0% distant). Overall, only 1.6% of respondents stated they always receive such messages, suggesting some areas may need improvement in consistent communication efforts, especially in distant regions.

Overall Analysis: The majority of respondents reported receiving disaster/weather awareness messages at least sometimes, indicating a general awareness communication effort across all distances. However, there are noticeable differences in communication frequency across different distances, with a higher proportion of respondents in distant areas reporting frequent receipt of these messages. While the majority receive messages sometimes or often, there are still some respondents who report rare or no receipt of these messages, highlighting potential areas for improvement in communication strategies to ensure more consistent and widespread dissemination of disaster/weather awareness information.

Frequency of receiving Disaster/Weather Awareness Message	Distant District HQ			Total
	Proximate	Moderate	Distant	
Never	1.3%	0.0%	0.0%	0.5%
Rarely	15.9%	6.7%	1.4%	9.4%
Sometimes	39.1%	41.1%	40.8%	40.3%
Often	41.7%	50.3%	57.7%	48.3%
Always	2.0%	1.8%	0.0%	1.6%
Total	100%	100%	100%	100%

Table 4.16 Frequency of Receiving Flood Awareness Messages and Proximity

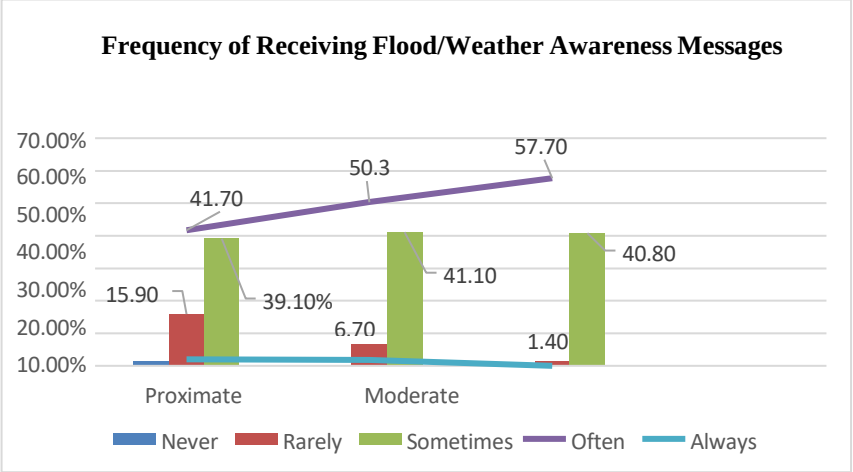


Figure 4.16 Frequency of Receiving Flood Awareness Messages and Proximity

4.1.1.17 Satisfaction Level with the Utility of the Awareness Messages and Proximity

The analysis of Table 4.17, which examines the satisfaction levels with the utility of awareness messages related to disasters across different distances from the district headquarters (HQ), provides the following insights:

High Dissatisfaction:

A smaller percentage of respondents indicated being highly dissatisfied with the awareness messages. The levels of high dissatisfaction were low across all distances, with 2.6% proximate, 0.6% moderate, and no respondents in distant areas. Overall, 1.3% of respondents were highly dissatisfied.

Dissatisfaction:

A notable portion of respondents expressed dissatisfaction with the utility of the awareness messages. Dissatisfaction levels varied across distances, with 15.9% proximate, 1.8% moderate, and no respondents reporting dissatisfaction in distant areas. Overall, 7.0% of respondents were dissatisfied.

Neutral:

A substantial proportion of respondents expressed a neutral stance towards the utility of the awareness messages. Neutral satisfaction levels varied, with 45.0% proximate, 19.0% moderate, and 46.5% distant respondents. Overall, 34.3% of respondents were neutral.

Satisfaction:

A significant majority of respondents reported satisfaction with the utility of the awareness messages. Satisfaction levels were notably high across all distances, with 35.1% proximate, 75.5% moderate, and 53.5% distant respondents. Overall, 55.6% of respondents were satisfied.

Strong Satisfaction:

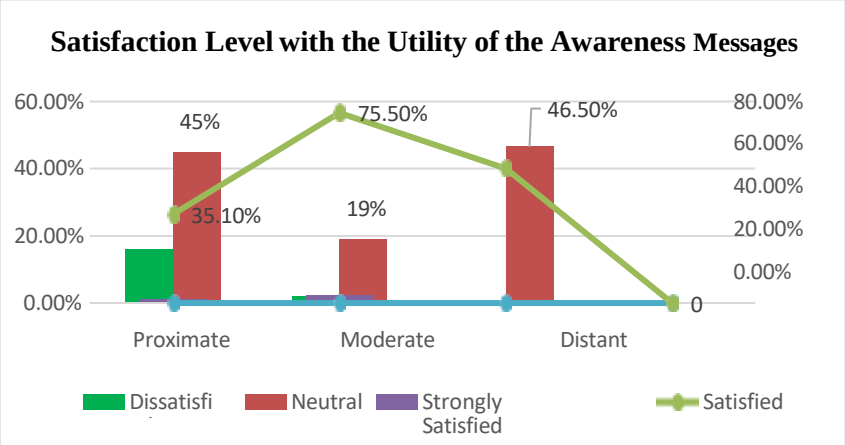
A small percentage of respondents expressed strong satisfaction with the utility of the awareness messages. Levels of strong satisfaction were relatively low, with 1.3% proximate, 3.1% moderate, and no respondents in distant areas. Overall, 1.8% of respondents were strongly satisfied.

Overall Analysis:

The analysis indicates a mixed response to the utility of awareness messages related to disasters. While a significant proportion of respondents reported satisfaction, there were also notable percentages expressing dissatisfaction or neutrality. Satisfaction levels were particularly high among respondents located at moderate distances from the district HQ. The data suggests that there may be areas for improvement in the effectiveness and reach of awareness messages, especially among respondents located proximately and in distant areas, where dissatisfaction levels are comparatively higher.

Satisfaction Level in Disaster Awareness Message	Distant District HQ			Total
	Proximate	Moderate	Distant	
Highly Dissatisfied	2.6%	0.6%	0.0%	1.3%
Dissatisfied	15.9%	1.8%	0.0%	7.0%
Neutral	45.0%	19.0%	46.5%	34.3%
Satisfied	35.1%	75.5%	53.5%	55.6%
Strongly Satisfied	1.3%	3.1%	0.0%	1.8%
Total	100%	100%	100%	100%

Table 4.17 Satisfaction Level with the Utility of the Awareness Messages and Proximity



4.1.1.18: Frequency ability to comprehend the messages send by the Govt Authority and Proximity

The table 4.18 presents data on individuals' ability to comprehend disaster or weather awareness messages, categorized by their proximity to district headquarters proximate, moderate, and distant. The percentages represent how well respondents in these different zones understand the messages they receive.

High Comprehension ("Often" and "Always"):

A significant portion of respondents reported high levels of comprehension, particularly those who "Often" or "Always" understand the messages. In moderate and distant areas, the comprehension rate is high, with 50.3% in moderate and 50.7% in distant areas reporting that they "Often" understand the messages. The "Always" category, however, shows a more varied picture, with the highest comprehension in proximate areas at 12.9%, but a drop in moderate (1.8%) and distant (7.0%) areas. This suggests that while many in distant areas frequently understand the messages, fewer people consistently fully comprehend them.

Moderate Comprehension ("Sometimes"):

A notable portion of respondents indicated they "Sometimes" comprehend the messages, with 29.1% in proximate areas, 41.7% in moderate areas, and 32.8% in distant areas. This distribution indicates that a considerable number of people, particularly in moderate and distant areas, understand the messages only occasionally. This suggests that while the messages are generally accessible, there are certain segments of the population that may struggle with understanding specific content, possibly due to complexity or less effective communication methods.

Low Comprehension ("Rarely" and "Never"):

The data shows a small but significant percentage of respondents with low comprehension. In proximate areas, 25.0% reported "Rarely" understanding the messages, compared to 6.1% in moderate and 1.4% in distant areas. The "Never" category is more concerning in distant areas, where 8.0% of respondents reported

they never comprehend the messages, compared to 3.3% in proximate areas and 2.0% in moderate areas. This highlights a critical gap in communication effectiveness, especially in remote regions where complete lack of comprehension could lead to higher risks during disasters.

Overall Analysis:

The analysis reveals a generally high level of comprehension of disaster and weather awareness messages across different zones, with moderate and distant areas showing strong comprehension rates in the "Often" category. However, the decrease in "Always" comprehension in moderate and distant areas suggests that while the messages are frequently understood, full and consistent comprehension is not always achieved, particularly in remote areas. The presence of a small but significant percentage of respondents who "Rarely" or "Never" comprehend the messages, especially in distant areas, indicates that there are still challenges in effectively reaching all segments of the population. This suggests a need for more tailored communication strategies that address the specific needs of those in remote areas, perhaps through simplifying messages or using more locally relevant language and examples.

Overall, while the communication strategies appear effective for the majority, targeted improvements could enhance the consistency of message comprehension, particularly among those who currently struggle to fully understand the information provided.

Ability to Comprehend Disaster/Weather Awareness Message	Distant District HQ		
	Proximate	**Moderate**	**Distant**
Never	3.3%	2.0%	8.0%
Rarely	25.0%	6.1%	1.4%
Sometimes	29.1%	41.7%	32.8%
Often	31.7%	50.3%	50.7%
Always	12.9%	1.8%	7.0%
Total	100%	100%	100%

Table 4.18 Ability to Comprehend Disaster/Weather Awareness Message and proximity

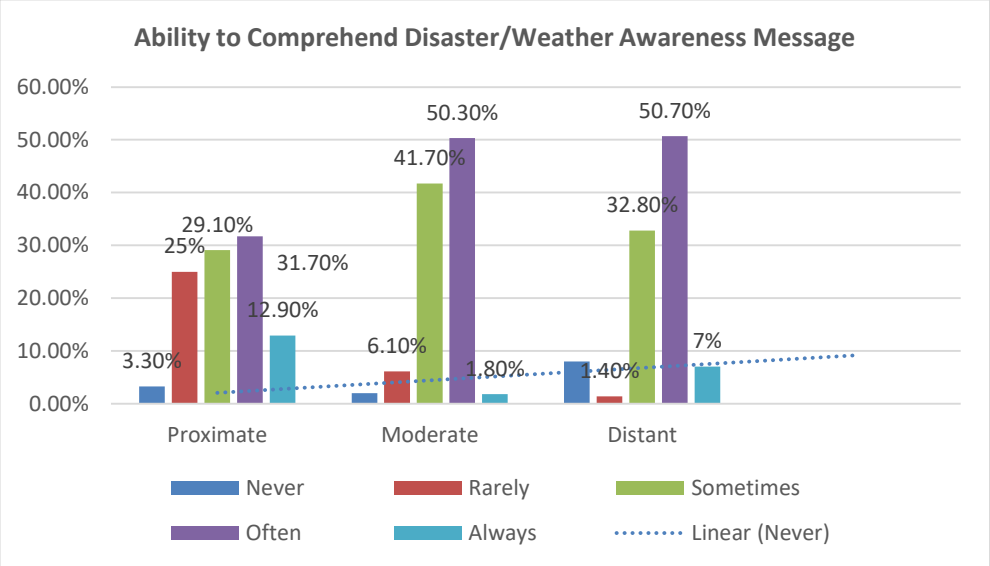


Figure 4.18 Shows the Ability to Comprehend Disaster/Weather Awareness Message and Proximity

4.2 Interview

To assess the efficacy of disaster risk communication techniques at the local level, a set of interviews were carried out with Block Development Officers (BDOs) from five important blocks in the Supaul district—Supaul, Kishanpur, Raghopur, Pratapganj, and Basantpur. As the main administrative leaders at the block level, these BDOs play a critical role in adopting steps to reduce the risk of disasters and ensuring that communities are well-prepared to handle possible threats. Their observations offer a valuable viewpoint on the practical difficulties, methods of involving the community, and the overall influence of disaster planning and communication efforts. The interviews were subjected to narrative analysis in order to reveal the latent themes and patterns in the experiences and perspectives of the BDOs. The story approach enables a more profound examination of the personal and professional stories that influence how these officers view and handle disaster risks in their specific areas of responsibility. This analysis offers a detailed understanding of the practical aspects of disaster planning and communication at the block level. It gives valuable insights that may be used to develop more effective methods for reducing catastrophe risks in sensitive places, such as Supaul district.

4.2.1 Interview Analysis of the BDO of Supaul District

The interview with the Block Development Officer (BDO) of Supaul provides valuable insights into the communication strategies and disaster preparedness efforts employed by the local government to mitigate the impact of floods in the region. This analysis synthesizes the key points discussed during the interview, highlighting the various means of communication, preparedness programs, and the challenges faced in effectively informing and protecting the population.

Government Communication Channels

The BDO emphasized that the government utilizes a mix of traditional and modern communication methods to raise awareness among residents of Supaul block. **Traditional Media** like radio and newspapers play a crucial role in disseminating information, particularly in remote areas where access to other forms of communication might be limited. **Social media platforms** such as Facebook and WhatsApp are also employed, though less frequently, to reach a broader audience, especially the younger population. **Public announcements** via loudspeakers and community meetings are organized regularly to ensure that messages reach even the most isolated communities. Additionally, **SMS alerts** are sent out to provide immediate updates and warnings during disasters, making it one of the most effective tools for rapid communication.

Communication Plan for Flood Mitigation

The BDO confirmed the existence of a detailed communication plan designed by government authorities to mitigate the impact of floods. This plan incorporates **early warning systems**, **evacuation protocols**, and **regular updates** through multiple media channels. The strategy is aimed at ensuring that residents receive timely information that can help them prepare for and respond to flood situations.

Disaster Preparedness Programs

Supaul block is proactive in conducting disaster preparedness programs. These include **regular workshops** on disaster preparedness and response, particularly targeting panchayat representatives and village-level authorities. **Simulated exercises**, such as flood response drills involving local boatmen, are conducted to enhance the community's readiness. Vulnerable families are provided with essential supplies and training to help them cope during disasters. Regular meetings are also held with authorities at various levels to discuss and update preparedness strategies.

Preferred Communication Mediums

When asked about the most effective medium for informing and raising awareness among the people, the BDO highlighted several options:

Radio: Accessible even in remote areas, making it a vital tool for widespread communication.

SMS: Offers direct and immediate communication, ensuring that residents receive critical information in real-time.

Loudspeakers: Effective in rural areas where other communication methods may not be as accessible.

Social media: Popular among the younger demographic, providing a platform for rapid dissemination of information.

Community meetings: Foster trust and provide a personal, interactive setting for communication.

Information Sources for Floods

The BDO listed the primary sources used to inform people about floods, which include **radio broadcasts, SMS alerts, social media posts, loudspeaker announcements**, and **local newspaper articles**. These sources ensure that information is distributed through various channels, catering to different segments of

the population.

Mock Drills for Disaster Preparedness

The block conducts **mock drills** every six months to simulate flood response scenarios. These drills are crucial in enhancing the community's disaster response efficiency and ensuring that residents are well-prepared in case of a real emergency.

Disaster Planning and Communication in Schools

Despite the importance of disaster preparedness, the BDO noted that schools in Supaul have not integrated disaster planning and communication into their curriculum. However, **awareness programs** are conducted regularly to educate students about disaster preparedness.

Health Campaigns for Women during Floods

The BDO mentioned that special health camps and clinics are organized for women during flood seasons. These initiatives include **health education sessions** aimed at addressing the unique health challenges that women face during such emergencies.

Language and Effectiveness of Communication

Messages related to disaster preparedness and response are delivered primarily in **Hindi**, the local language. However, the BDO acknowledged that no surveys have been conducted to assess the effectiveness of these messages.

Future Communication Plans

A comprehensive communication plan is being developed as a preventive measure for future disasters. This plan includes **early warning systems, regular updates through multiple channels**, and **community education programs** to ensure that residents are informed and prepared well in advance.

Media Habit Surveys

The BDO admitted that no surveys have been conducted to understand the media consumption habits of residents in Supaul block. This gap in knowledge could impact the effectiveness of communication strategies.

Sectoral Plans during Floods

The block has specific plans for key sectors during floods:

Health: Mobile health clinics are deployed to reach affected areas, and essential medical supplies and sanitation kits are distributed.

Education: Temporary learning centers are set up to ensure the continuity of education, although the availability of adequate space remains a challenge.

Agriculture: The block supports farmers by facilitating crop insurance claims and distributing seeds and fertilizers post-flood.

The interview with the Supaul BDO highlights the multifaceted approach taken by the local government to prepare for and respond to flood disasters. While various communication methods and preparedness programs are in place, challenges such as the integration of disaster planning and communication in education and the lack of media habit surveys indicate areas for improvement. The ongoing development of a comprehensive communication plan reflects a commitment to enhancing the resilience of the community against future disasters.

4.2.2 Interview Analysis of the BDO of Kishanpur

Communication Channels Utilized by Government

The Kishanpur Block Development Officer (BDO) highlighted multiple communication channels used by the government to raise awareness among the public. These include:

Public Gatherings: Meetings held in community centers (Block/Panchayat Bhawan)

to disseminate information.

Mobile Notifications: Emergency alerts sent via SMS to residents' phones.

Government Communication Plan for Flood Mitigation

A communication strategy is in place to mitigate the impact of floods. This plan encompasses:

Public Service Announcements: Broadly disseminated messages to inform the public.

SMS Alerts: Timely notifications to keep residents informed.

Coordination with Local Representatives: Ensuring information reaches all community members through local leaders.

Ongoing Disaster Preparedness Programs

Current programs run by the block to enhance disaster preparedness include:

Mock Drills: Regular mock drills to practice evacuation and safety protocols.

Public Forums: Educational meetings to raise awareness about flood risks and preparedness measures.

Preferred Communication Mediums

The BDO identified several effective mediums for communicating with the public:

Text Messages: Recognized as a quick and direct method to reach people.

Public Announcements: Utilizing loudspeakers for immediate alerts.

Face-to-Face Meetings: Providing clarity and allowing for immediate feedback.

Information Sources for Flood Alerts

The primary sources used to inform people about floods are:

Text Messages: Sending timely alerts to mobile phones.

Online Platforms: Leveraging social media for updates.

Public Announcements: Using loudspeakers in communities for widespread dissemination.

Natural Disaster Prevention Mock Drills

Mock drills are organized quarterly to train and prepare residents for natural disasters, ensuring they are well-versed in evacuation and safety procedures.

Education on Natural Disaster Planning and Communication

Currently, there is no specific subject on natural disaster planning and communication in schools. However, awareness programs are conducted to educate students on the topic.

Health Campaigns for Women During Floods

While there are no specific health campaigns for women during floods, special health camps are organized to address women's health needs during flood seasons.

Language and Effectiveness of Communication

Messages are delivered in Hindi, and their effectiveness is evaluated through community feedback to ensure clear and comprehensible communication.

Future Preventive Communication Plans

A preventive communication plan is being designed to include:

- SMS Alerts

- Social Media Updates
- Community Workshops
- Radio and Television Broadcasts

Mobile Alerts Media Habit Surveys

No surveys have been conducted to analyze media habits in the block, indicating a potential area for future improvement to tailor communication strategies more effectively.

Plans During Floods (Health, Education, and Agriculture)

Health: Deployment of emergency health services to prevent waterborne diseases.

Education: Setting up temporary classrooms in unaffected areas to continue education.

Agriculture: Assessing crop damage and providing compensation to affected farmer

4.2.2 Outcome of the In-depth Interview of the BDO Raghopur

The interview with the Block Development Officer (BDO) of Raghopur focuses on the communication strategies, disaster preparedness programs, and specific measures taken by the local administration to mitigate the impact of floods. This analysis aims to provide an in-depth understanding of how the Raghopur block manages flood-related challenges and keeps the community informed and prepared.

Means of Communication for Public Awareness

Local Radio: Regular updates and warnings are broadcasted via local radio stations, ensuring a wide reach within the community.

Online Platforms: Information is shared on social media and government websites to keep the public informed.

Community Announcements: Loudspeakers are used in villages to make announcements, particularly effective in reaching remote areas.

Text Messages: Direct SMS alerts are sent to residents' mobile phones for timely and urgent updates.

Government Communication Plan for Flood Mitigation

The BDO confirmed the existence of a comprehensive communication plan that includes pre-flood awareness campaigns, real-time updates during floods, and post-flood recovery information to help the community manage and recover from flood events.

Current Disaster Preparedness Programs: Regular meetings are held to discuss and plan for flood preparedness, ensuring that community members are aware of the necessary steps to take before, during, and after a flood.

Effective Communication Mediums

SMS Alerts: Considered the fastest and most effective for urgent communication.

Loudspeaker Announcements: Provide clear and immediate dissemination of information, especially in rural areas.

Social media: Effective for reaching younger and tech-savvy residents.

Public Forums: Facilitate direct interaction and information sharing among community members.

Sources for Flood Information Dissemination

SMS Notifications: Direct messages to residents' phones to ensure they receive timely updates.

Social Media Channels: Used to share updates and information with the public.

Loudspeaker Announcements: Important for informing people in rural areas quickly and effectively.

Mock Drills for Natural Disaster Prevention

The BDO confirmed that mock drills are conducted whenever required to ensure the community is well-prepared for natural disasters.

Disaster Prevention Education in Schools

While there is no formal subject dedicated to natural disaster management, disaster preparedness is covered in other subjects to ensure students are aware of basic safety measures.

Health Campaigns for Women During Floods

Specific health campaigns are conducted to address women's health issues during floods, ensuring they receive the necessary support and information.

Language and Effectiveness of Communication

Messages are delivered primarily in Hindi. Surveys are conducted to ensure that the community understands the messages and to assess their effectiveness.

Future Communication Plans

A comprehensive communication plan is being developed to provide early alerts, regular updates, and continuous public education about disaster preparedness.

Media Consumption

No surveys have been conducted to assess the media consumption habits of residents, indicating a potential area for improvement in understanding how best to reach the community.

Plans During Floods (Health, Education, and Agriculture)

Health: Health awareness programs focusing on sanitation and hygiene are established to prevent disease outbreaks.

Education: Education suffers due to the lack of high lands; schools are often used as shelters. However, educational activities continue in schools that are used as relief centers.

Agriculture: Farmers are provided with financial aid and resources for replanting crops, ensuring they can recover from the damage caused by floods.

Observations

Diverse Communication Channels: The use of multiple communication channels, including radio, SMS, social media, and loudspeakers, ensures that information reaches a broad audience.

Community Involvement: Regular community meetings and public forums highlight the importance of engaging the community in disaster preparedness efforts.

Health and Education Challenges: The lack of high lands for schools and the need for specific health campaigns for women indicate ongoing challenges that require continuous attention and resources.

The interview with the BDO of Raghopur reveals a well-rounded approach to disaster communication and preparedness. The use of various communication channels ensures that information reaches different segments of the population, while regular mock drills and community outreach programs enhance readiness. However, the absence of formal surveys on media habits and the challenges faced in health and

education during floods suggest areas for further improvement. The proactive development of a comprehensive future communication plan and continuous public education are essential for building a resilient community capable of effectively responding to natural disasters.

4.2.4 Outcome of the in-depth Interview with BDO of Pratapganj

Context and Background

The interview with the Block Development Officer (BDO) of Pratapganj provides a detailed overview of the communication strategies, disaster preparedness programs, and various measures implemented to mitigate the impact of floods in the region. The focus is on understanding how effectively the local government communicates with the public and prepares for natural disasters.

Means of Communication for Public Awareness

Block Meetings: Face-to-face communication in block and panchayat centers is a primary method for disseminating information and discussing flood preparedness.

SMS Services: Text alerts are sent to the public to provide timely updates and warnings about impending floods.

Government Communication Plan for Flood Mitigation

The BDO confirmed that a comprehensive communication plan is in place, utilizing multiple channels like radio, TV, and social media to keep the public informed and prepared for floods.

Current Disaster Preparedness Programs

Training Programs: Sessions are conducted to educate the public on how to prepare for floods, including safety measures and evacuation procedures.

Mock Drills: Regular drills are organized to practice evacuation and ensure readiness among the community members.

Effective Communication Mediums

Mobile Notifications: These are considered the most immediate and direct means of communication.

Loudspeakers: Particularly effective in rural and remote areas for reaching a wider audience quickly.

Sources for Flood Information Dissemination

Radio Services: Broadcasting essential flood-related information.

Mobile Alerts: Sending text messages to the public for quick dissemination of information.

Community Announcements: Using loudspeakers to alert and inform residents about floods.

Mock Drills for Natural Disaster Prevention

The BDO confirmed that mock drills are conducted regularly to ensure preparedness and effective response to natural disasters.

Disaster Planning and Communication Education in Schools

While there is no specific subject on natural disaster management, schools conduct awareness programs on various issues, including disaster preparedness.

Health Campaigns for Women During Floods

Health education programs specifically targeting women are conducted during flood events to address their unique health needs and concerns.

Language and Effectiveness of Communication

Messages are delivered in Hindi. However, the effectiveness of these messages is not regularly checked through feedback mechanisms.

Future Communication Plans

The authorities are working on a future communication plan focusing on early alerts, regular updates, and continuous public education about disaster preparedness.

Surveys on Media Habits

No surveys have been conducted to understand media habits in the block.

Plans During Floods (Health, Education, and Agriculture)

Health: Health camps are organized to treat injuries and prevent disease outbreaks.

Education: Mobile educational units and temporary classrooms are set up to ensure that education continues despite the floods.

Agriculture: Immediate relief is provided to affected farmers through financial aid and resources.

Observations

Community Engagement: There is a significant emphasis on engaging the community through various communication channels and training programs to ensure they are well-prepared for floods.

Challenges in Communication: Despite the efforts, challenges such as feedback collection and the reach of messages in remote areas remain.

Proactive Measures: The local administration is proactive in organizing mock drills and health campaigns, indicating a commitment to improving disaster preparedness and response.

The interview with the BDO of Pratapganj highlights the multifaceted approach of the local administration in communicating with the public and preparing for floods. While the existing communication strategies and preparedness programs have shown positive impacts, there is room for improvement in areas such as feedback collection and ensuring the reach of information to all community members. The proactive

steps taken by the authorities, including future communication plans and continuous public education, are crucial for enhancing the community's resilience to natural disasters.

4.2.5 In-depth Interview Analysis of the BDO of Basantpur Communication Methods for Awareness

Basantpur block utilizes multiple communication channels to disseminate information to the public. The primary means include Radio services, Social Media Channels, Community Outreach, Mobile Alerts and Cable TV. Local radio is a significant medium for government announcements, leveraging its broad reach to ensure information dissemination across various demographics. Platforms like Facebook and Twitter are used to provide updates and alerts, catering primarily to the tech- savvy younger population.

4.2.5.1 Traditional methods like community meetings and loudspeaker announcements are employed to ensure that information reaches even the most remote areas. SMS notifications are sent directly to individuals' mobile phones, providing a fast and effective way to communicate urgent messages. Information is also broadcasted on local television networks to reach those who prefer this medium.

Government Communication Plan for Flood Mitigation

The Basantpur block has a well-structured communication plan designed to mitigate the impact of floods. This plan includes: Early Warning System, Evacuation Protocols and Regular Updates. **Early Warning Systems** are crucial for providing advance notice to residents, allowing them to take necessary precautions.

Evacuation Protocols are Clear and actionable evacuation plans are there to ensure the safety of residents during a flood. **Regular Updates and** Continuous information flow through various media channels keeps the community informed about the evolving situation.

Disaster Preparedness Programs

Current disaster preparedness programs in Basantpur focus on education and practical exercises:

Awareness Workshops: These workshops aim to educate the community about flood preparedness, highlighting the importance of knowing what to do before, during, and after a flood.

Evacuation Drills: Mock drills simulate flood scenarios, helping residents practice evacuation procedures and improve their readiness.

Effective Communication Mediums

According to the BDO, the most effective mediums for informing and raising awareness in Basantpur are: The Widespread reach of **Local Radio** makes it an ideal tool for mass communication. **SMS Services p**rovide a quick and direct method to deliver important messages.

Public Announcements through loudspeakers are effective for immediate dissemination of information, especially in rural areas. **Social media** are useful for engaging with younger demographics and providing timely updates.

Information Sources about Floods

To keep the community informed about floods, Basantpur uses several sources:

Community Radio: Regularly broadcasts flood updates, leveraging its local focus.
SMS Alerts: Quick and direct messages to residents' mobile phones.
Social media: Platforms like Facebook are used to post updates and important information.
Loudspeakers: Announcements made in rural areas to ensure everyone receives critical information.

Mock Drills for Natural Disaster Prevention

Regular mock drills are conducted in Basantpur to prepare the community for natural disasters. These drills are essential for testing the effectiveness of the evacuation plans and ensuring that residents are familiar with the procedures.

Disaster Planning and Communication Education in Schools

Currently, there is no specific subject related to natural disaster planning and communication in the school curriculum. However, awareness programs are conducted to educate students about disaster preparedness.

Health Campaigns for Women During Floods

Women's health is a priority during floods in Basantpur. Special health services are organized to address the specific needs of women, ensuring they receive the necessary care and support.

Language and Effectiveness of Messages:

Messages are primarily delivered in Hindi, the local language. However, the effectiveness of these messages is not routinely checked, indicating an area for potential improvement.

Future Communication Plans

The BDO indicated that a detailed communication framework is being developed to ensure comprehensive and timely disaster preparedness and response. This plan aims to utilize various media channels and community outreach programs to enhance the effectiveness of communication.

Surveys on Media Habits

No surveys have been conducted to understand the media habits of residents in Basantpur. This lack of data could hinder the effectiveness of communication strategies, suggesting a need for such surveys in the future.

Plans for Health, Education, and Agriculture During Floods

Medical teams and mobile health clinics are deployed to affected areas, ensuring access to necessary medical services. Temporary schools and learning centers are established in safe locations to ensure continuity of education. Support is provided for crop damage assessment and insurance claims to help farmers recover from the impact of floods.

The interview with the BDO of Basantpur block reveals a comprehensive and multi-faceted approach to disaster communication and preparedness. While the current strategies are robust, areas for improvement include checking the effectiveness of communication messages and conducting surveys to better understand the media habits of residents. Overall, the efforts in Basantpur reflect a strong commitment to ensuring community safety and resilience in the face of floods.

Conclusion

The interviews conducted with Block Development Officers (BDOs) from the five blocks in Supaul district, namely Supaul, Kishanpur, Raghopur, Pratapganj, and Basantpur, have yielded significant insights into the practical implementation of disaster planning and communication at the grassroots level. These interviews have highlighted the importance of strong communication strategies, efficient disaster preparedness programs, and proactive actions in reducing the impact of floods in the region. The interviews yielded insights into both the positive aspects and the areas in need of enhancement in the existing disaster planning and communication protocols.

An important advantage found in all areas is the utilization of various communication channels to effectively reach different parts of the public. The BDOs emphasized the significance of employing conventional media such as radio and loudspeakers, in addition to contemporary platforms like SMS and social media, for the efficient dissemination of information. This multi-channel strategy guarantees that even the most isolated and susceptible populations are well-informed and equipped to handle future flood occurrences. Incorporating community meetings and public forums into the communication plan promotes trust and involvement among

locals, hence improving the overall efficacy of disaster preparedness initiatives.

Another notable outcome is the focus on disaster preparedness programs, namely the frequent arrangement of simulated exercises and instructional sessions. These programs play a vital role in ensuring that communities are not only informed about the potential dangers but also possess the necessary knowledge and abilities to appropriately handle catastrophes. The participation of local stakeholders, such as panchayat representatives and village-level officials, enhances the community's ability to effectively handle and mitigate the risks associated with disasters.

In addition to these strengths, the interviews also brought attention to other obstacles that must be tackled in order to enhance disaster planning and communication at the block level. A persistent problem is the absence of official surveys to evaluate the efficacy of communication initiatives and comprehend the media consumption patterns of communities. Without this essential feedback, it is challenging to assess whether the messages are effectively reaching the intended audience and if they are being comprehended and acted upon. The lack of knowledge in this area highlights the necessity for a communication planning approach that relies more heavily on data.

Another obstacle that has been highlighted is the incorporation of disaster planning and communication education into the school curriculum. Although awareness activities are currently being undertaken, there is a necessity for a more organized strategy to educate students about the hazards and readiness for disasters. Schools have a crucial impact on the attitudes and actions of young people, and integrating disaster planning and communication into the curriculum could greatly improve the community's ability to withstand and recover from disasters in the long run.

The health and education sectors encounter distinct difficulties during flood occurrences. The interviews uncovered that although health campaigns are carried out, with a special focus on women, there remains a want for more extensive and ongoing health education to tackle the distinct difficulties presented by floods. Furthermore, the interruption of education caused by the utilization of schools as

relief centers emphasizes the necessity for alternative measures, such as mobile educational units, to guarantee the uninterrupted progress of learning in times of calamities.

Overall, the interviews with the BDOs from the Supaul district provide a thorough assessment of the present condition of disaster planning and communication at the block level. The results emphasize the significance of employing a communication plan that utilizes several channels, the worth of implementing regular programs for preparing for disasters, and the necessity of maintaining ongoing involvement with the community. However, in order to increase the effectiveness of these initiatives, it is crucial to tackle the specific issues that have been identified. These challenges include establishing formal feedback channels, incorporating disaster planning and communication education into schools, and enhancing health and education services during floods. By leveraging these observations, municipal officials can formulate more efficient tactics to mitigate calamity hazards and construct resilient communities in flood- prone regions such as Supaul district.

4.3 Content Analysis

This study has also utilized a content analysis method to assess the efficacy and extent of disaster communication by the Bihar State Disaster Management Authority (BSDMA) considering SMS and Facebook social media posts. This analysis specifically examines the content, tone, and dissemination tactics employed by BSDMA to communicate with the public during the Kosi River floods, recognizing the crucial importance of timely and accurate information in disaster planning and communication.

Methodical strategy was employed, commencing with data scraping. Automated scraping techniques were utilized to collect and create datasets consisting of SMS data and Facebook postings from BSDMA. Python programs were employed to extract and arrange the pertinent data, guaranteeing its comprehensiveness and readiness for study. Excel was used to handle and preprocess the data, making it easier to categories and quantify the main themes and messages represented in the

communications.

The analysis encompassed both quantitative and qualitative approaches. The coding techniques of Python were utilized to detect repetitive patterns, keywords, and the frequency of specific message kinds. This facilitated a comprehensive understanding of the key areas of concentration in BSDMA's communication strategy, including warnings, safety instructions, and motivational messages. The data was subsequently examined to evaluate the timing, frequency, and possible influence of these messages, taking into account the socio-economic and geographical context of the intended audience. This content analysis aims to examine the strengths and weaknesses of BSDMA's communication efforts during catastrophe events.

4.3.1 Facebook Data Analysis

For this part of Data Analysis, the data has been scrapped from the Facebook page (https://www.facebook.com/Bsdma/) of Bihar State Disaster Management Authority (BSDMA). The data has been considered for the period of Jun 2021 – Dec 2023. All the posts for the specified period was collected. For the period of 2007-2008 there was no data (screenshot below). The data of the 2007-2008 was searched because in that period Bihar had faced devasted flood and it took years to recover and resettle people.

4.3.1.1 Data Overview:

The year 2022 was quite inactive based on number of posts on the Facebook page of BSDMA. The number of posts has increased a lot in 2023. The total number of posts on Facebook for each year is shown below:

S.No.	Year	Number of Posts on Facebook page of BSDMA
1.	**Jun-Dec 2021**	41
2.	**2022 (Jan -Dec)**	47
3.	**2023 (Jan- Dec)**	436

Table 4.19 the total number of the posts on Facebook page of BSDMA (2021 June -2023 Dec)

4.3.1.2 Data Processing:

The data filtration was done and then the relevant data attributes that can be useful for the analysis were identified. Following are the data attributes that were considered for the analysis:

- Post Text
- Date Posted
- Post URL

Then, data was further filtered by considering posts that was related to either of these terms:

- Flood
- Rainfall
- Drown

Following data processing was further done:

- The date in correct format for each post was extracted.
- Video posts were extracted.

Only three video posts were found relevant, and among these only one was related to Disaster planning and communication during Flood. The other two were related to Bihar Diwas and Drowning Awareness Film. There are other videos that were not separated as video posts and will be analyzed with the text posts as they are the part of text posts.

Some of the posts were removed based on the criteria of the "text" duplicates.

Note: There are some general training programs being held for "Disaster Management" and "Risk Mitigation and Management". The analysis has not

considered these programs in the analysis as these are more generic and don't pertain specifically to Flood.

4.3.1.3 Filtered Data Overview:

For the filtered data, the total number of posts for each year is shown below:

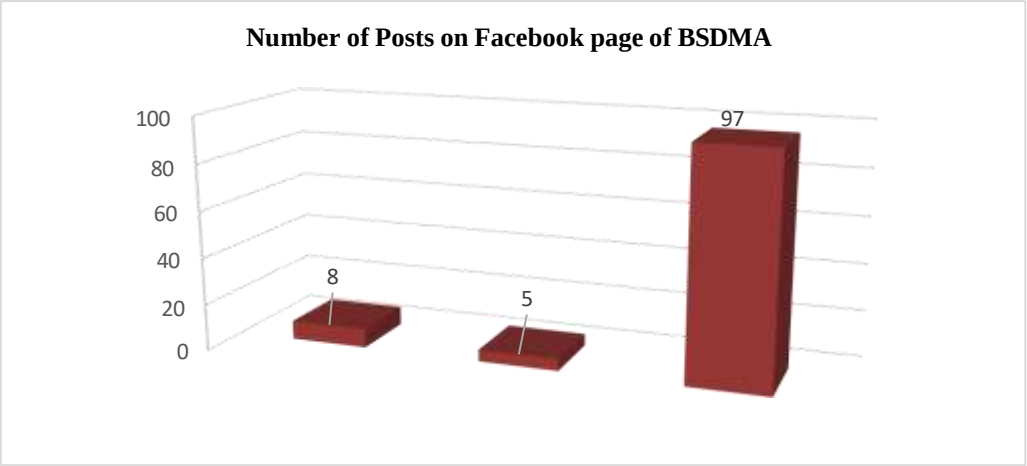


Figure 4.19 the number of posts on FB page of BSDM

The year 2021 and 2022 was quite inactive based on the number of posts posted on the Facebook page of BSDMA. The number of posts is only significant in 2023. For further analysis, the distribution of the posts across months for the period Jun2021 – Dec 2023 was created.

In the year 2023, majority of posts were posted in the month of May and June. The rest of the months in the year 2023 did not have many posts owing to the timing of Flood/Rain.

S. No.	Category	Options	Codes
1.	Types of Messages	Informative, Warning or Educational, Appeal, Testimonial or personal story, Other	INFO, WARN, EDU, APPEAL, TEST, OTHER
2.	Content Focus	Preparedness, Response, Recovery, General awareness, Other	PREP, RESP, RECOV, AWARE, OTHER
3.	Target Audience	General public, Vulnerable group, Specific communities, emergency responders, Other	GEN, VUL, COMM, OFFICIAL, OTHER
4.	Comm. Tone	Urgency, Caution, Reassuring, Inspirational or motivational, Other	URGENT, CAUTION, REASSURE, INSP, OTHER
5.	Message Effectiveness	Clear and easy to understand, Confusing or ambiguous, Impactful and engaging, Ineffective or ignored, Other	CLEAR, CONFUSING, IMPACTFUL, INEFFECTIVE, OTHER
6.	Language	English, Hindi, Bhojpuri, Maithili, Urdu	EN, HN, BHOJPURI, MAITHILI, URDU
7.	Call to Action	Yes (Specify the action), No	YES, NO

Units of the Content Analysis of the SMS

4.3.1.4 Analysis: Types of Messages

The analysis of SMS content categories reveals a deliberate emphasis on teaching and promoting awareness, with a restricted emphasis on disseminating information and less emphasis on warnings and other types of messages.

Approximately 78.30% of the content on the page is comprised of Warning and Information Posts (WARN/INFO). The data suggest that the primary objective of the page is to educate the audience and raise their awareness of disaster preparedness, safety procedures, and related topics.11.7% of all posts consist of SMS that are classified as appeal (APPEAL), making it the second-largest category. These articles are anticipated to provide information on the progress of rehabilitation, measures to

prevent further incidents, and readiness for future events.

Test SMS (TEST) are employed for the purpose of verifying or carrying out experiments. They make up 2.1% of all the posts. These may include SMS messages used to evaluate the scope or effectiveness of particular types of content or formats. 7.90% of the SMS fall into the category labelled as "OTHER," encompassing a diverse range of information in various forms. This category may include a range of updates, general notices, or postings intended to actively involve the community.

In summary, the BSDMA SMS advisories prioritize raising awareness and providing warnings, allocating less space for educational, promotional, and other sorts of posts. This strategy emphasizes the Authority's commitment to alerting and educating the public about disaster management. However, it also signifies the necessity of giving greater significance to the dissemination of useful information and other pressing messages.

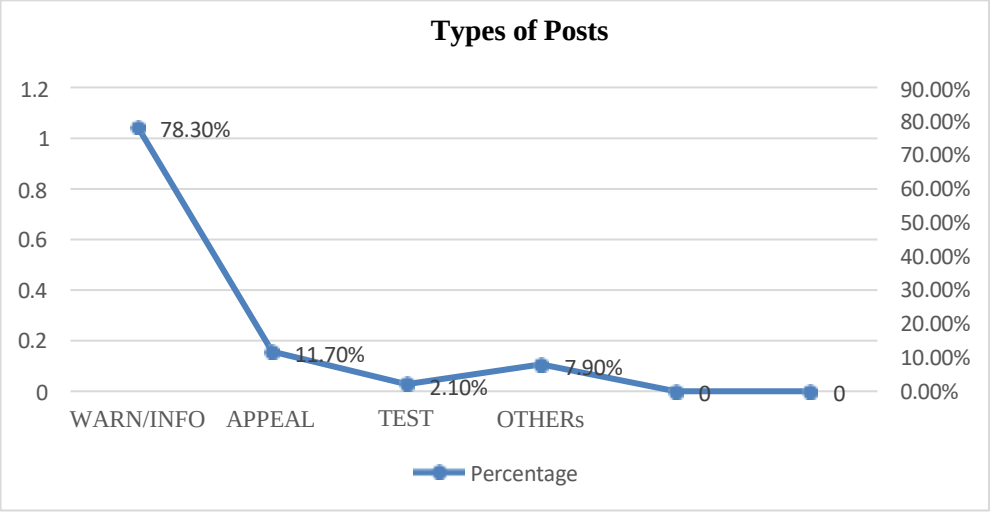


Figure 4.20 shows the Types of the Posts in the BSDMA FB page

4.3.1.5 Content Focus

The content of the Facebook page of the Bihar State Disaster Management Authority (BSDMA) mostly focusses on raising awareness, while other important phases of disaster planning and communication receive comparatively little attention.

The page is predominantly filled with posts related to Awareness (AWARE), making up 75.7% of the material. BSDMA places a high priority on increasing public awareness regarding disaster risks, safety measures, and preparedness tactics. The significant emphasis on awareness implies a proactive strategy of teaching the community before to the occurrence of disasters.

PREP posts account up 12.15% of the material. These posts probably contain information regarding disaster preparedness strategies, guidelines for individuals and communities, and training or drills organized by the authorities. Although significant, the relatively lower percentage in comparison to awareness posts indicates that preparedness content is given less priority.

RESP postings constitute only 0.93% of the material, indicating a little emphasis on disaster response operations on this network. The low percentage may suggest that real-time response updates are communicated through alternative routes, or that there are fewer instances that necessitate quick reaction information.

There is a complete absence of Recovery (RECOV) posts, with no content related to this phase. The dearth of activity on BSDMA's Facebook page indicates that it may not utilize the platform to convey its post-disaster recovery activities. It is possible that recovery content is disseminated through alternative channels or at different stages of the disaster planning and communication process.

11.21% of the posts consist of miscellaneous content that is unrelated to the phases of disaster management. This category encompasses a range of information, such as overall updates, news related to the organization, or events including community interaction.

To summarize, the main objective of the BSDMA Facebook page is to increase public knowledge about the hazards associated with disasters and how to be prepared for them. However, there is little emphasis on actually being prepared and very little information dedicated to the actions taken during and after a catastrophe. This content approach emphasizes a dedication to proactive education and prevention, but it also highlights certain deficiencies in effectively communicating

response and recovery operations through this platform.

4.1.1.1 Target Audience

The posts are split between two categories with “General Public (GEN)”: ~ 43% and “Specific communities (e.g., riverside residents) / Vulnerable groups (e.g., elderly, children, disabled) (COMM)” - ~57%. There are no posts that have “Government officials or emergency responders” as the target audience. Majority of the posts in the COMM category have “Specific Communities” as target audience.

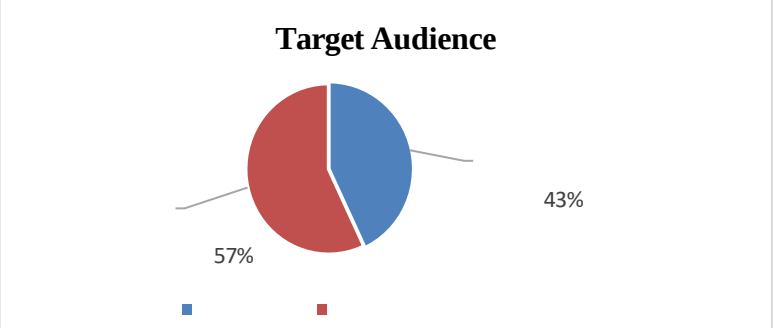


Figure 4.21 shows the Target Audiences on the BSDMA Facebook page

4.3.2.6 Communication Tone

The analysis of communication tones in the posts on the Bihar State Disaster Management Authority (BSDMA) Facebook page indicates a distinct inclination towards conveying information in a direct manner, with limited utilization of urgent or cautionary tones.

The page is predominantly characterized by an informational tone (INFO), which accounts for 92.52% of all posts. This suggests that the main purpose of the page is to distribute accurate information, updates, and instructions for catastrophe management. The emphasis on an informative tone implies a desire to educate and enlighten the audience without causing panic.

Posts with a cautionary tone, indicated by the CAUTION label, make up 5.61% of the material. These entries are likely to provide advice to the public on exercising caution or to emphasize potential hazards and warnings that need attention. Although

it is now existent, the relatively small proportion implies that warning communication is utilized infrequently, possibly only for situations that do not demand an immediate response but nevertheless necessitate public awareness.

The material consists of only 1.87% of posts with an Inspirational Tone (INSP). These entries may contain motivational messages, anecdotes of accomplishment, or encouragement for communities to engage in disaster preparedness and resilience. The limited utilization of an inspirational tone suggests that inspiration is infrequently employed as a communication strategy on this platform.

No posts with the Urgent Tone (URGENT) are present in the material, accounting for 0% of the total. The absence of urgent messages on this platform implies that such information is likely shared through alternative channels that are more equipped for providing real-time emergency alerts, or that the site is not utilized for rapid crisis communication.

The content on the page is only focused on the aforementioned categories and does not include any unclassified tones, as indicated by the 0% presence of Other Tones (OTHER).

Essentially, the BSDMA Facebook page predominantly employs an informative tone, with a specific emphasis on educating and keeping the audience updated in a composed and direct manner. The deliberate choice to employ warning and inspirational tones sparingly, while also refraining from urgent communication, emphasizes a content strategy that prioritizes consistent and informative interaction rather than relying on reactive or emotionally charged messaging.

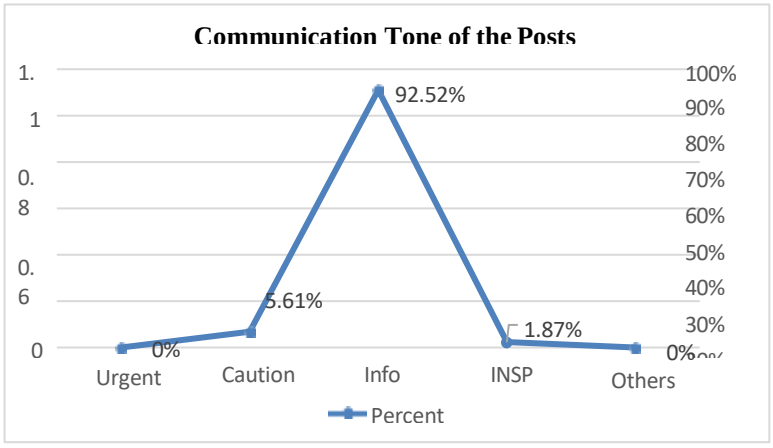


Figure 4.22 shows the Communication Tone of the Posts of the BSDMA

4.1.1.2 Message Effectiveness

The evaluation of message efficacy on the Bihar State Disaster Management Authority (BSDMA) Facebook page reveals that most of the posts are comprehensible, however a significant proportion is deemed ineffectual.

81.31% of the posts on the BSDMA Facebook page are Clear Messages (CLEAR), indicating that the bulk of the content effectively conveys its intended message and is easily understood. The Authority's communication approach, which is characterized by clarity and straightforwardness, is reflected in this high proportion.

Posts categorized as Impactful Messages (IMPACTFUL) account for 4.67% of the total posts. These postings are likely to significantly resonate with the audience, leading to increased interaction, prompting action, or fostering a better knowledge of the subject. Although the occurrence of influential messages is not very high, it suggests that certain posts are highly successful in accomplishing their communication goals.

The proportion of posts classified as Ineffective Messages (INEFFECTIVE) is 14.02%. This indicates that a substantial proportion of the content is ineffective in communicating its intended message or in capturing the attention of the audience. Ineffective messages may suggest opportunities for enhancing communication, either by refining the targeting, using clearer language, or creating more engaging material.

The absence of confusing messages is evident, as none of the content falls into this category, accounting for 0%. This lack of presence implies that all of the posts are easily comprehensible, while their usefulness may differ. The absence of ambiguous messages is a favorable indication of the overall excellence of the content's delivery. The posts in the Other Categories (OTHER) section account for 0% of the total content, indicating that all posts have been classified under the primary efficacy measures.

To summarize, the BSDMA Facebook page effectively communicates clear messages to its audience, but a small amount of its content has a significant impact. However, there is a noticeable number of postings that are considered ineffective.

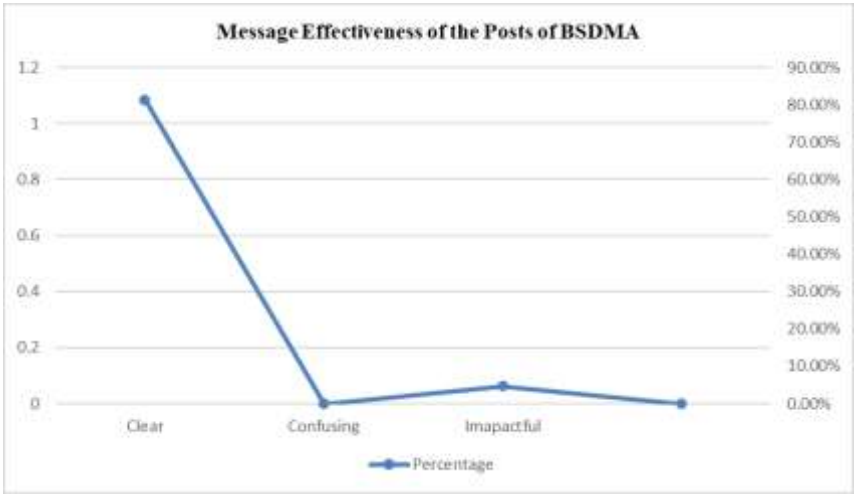


Figure 4.23 shows the Message Effectiveness of the Posts of the BSDMA

4.3.2.7 Languages

There are no posts in vernacular language which limits the reach of the posts to group of people who know how to read either Hindi or English language. One more point to note is that for many posts dealing with awareness in communities were in English. This decreases the effectiveness of the post

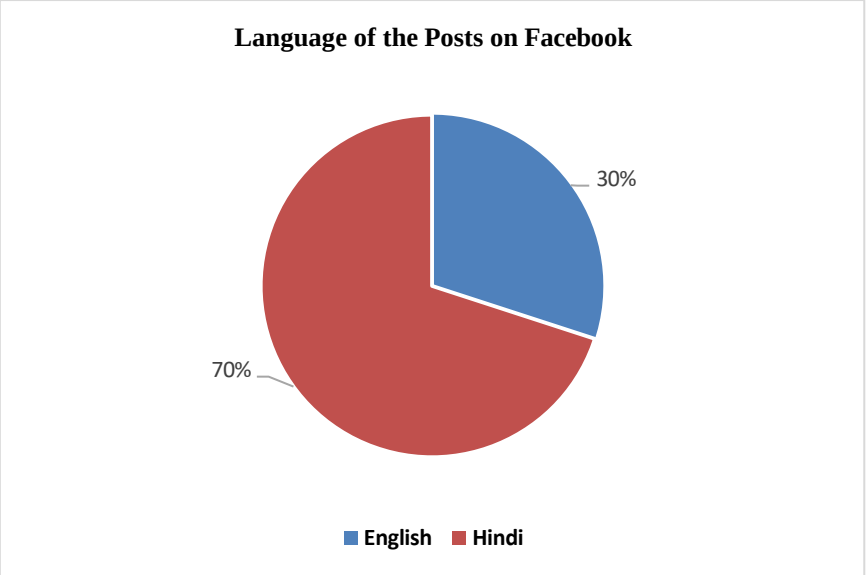


Figure 4.24 shows the Language of the posts of BSDMA Facebook page

4.2.3.8 Call to Action

The lack of calls to action in the Facebook posts of the Bihar State Disaster Management Authority (BSDMA) can be attributable to two primary issues. Initially, the nature of BSDMA's activities may not be suitable for direct involvement via social media platforms. Furthermore, proficient handling of social media necessitates specific knowledge and skills, which may influence the incorporation of interactive features such as calls to action. As a result, the posts prioritize conveying important information rather than encouraging quick audience interaction.

4.2.3.9 Visual Elements

All the posts analyzed either uses images or has videos.

- Images ~ 72%
- Video ~ 28%

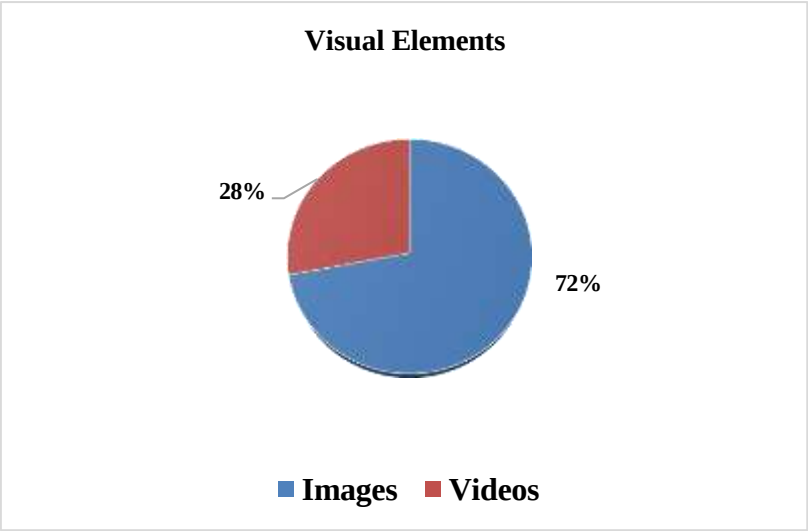


Figure 4.25 shows the visual elements in the posts of the BSDMA Facebook

Just to mention, couple of posts had maps in the image but were classified as images. There were 3 posts that had a mix of images and videos, but were classified as videos

Most of the posts have either images or videos as visual elements. The posts that have images are repetitive in nature. They can be made interactive and engaging by using other visual elements such as icons, graphs, and maps.

4.3.1 SMS Data Analysis

For this part of Data Analysis, the data has been scrapped from the SMS of Bihar State Disaster Management Authority (BSDMA). The data has been considered for the period of Jun 2021 – Dec 2023. All the posts for the specified period were collected.

4.3.1.1 Data Overview:

The total number of SMS by BSDMA for each year is shown below. These SMS were related to Disaster planning and communication for various kinds of warnings and information related to heavy rainfall, thunderstorm, lightening, storm, heatwaves etc. the SMS data has been taken for the period of June 2021 to Dec 2023.

S. No.	Year	Number of Posts on Facebook page of BSDMA
1.	**Jun-Dec 2021**	127
2.	**2022 (Jan -Dec)**	301
3.	**2023 (Jan- Dec)**	289
Total		717

Table 4.20 Shows the total number of the SMS sent by BSDMA (2021 June -2023 Dec)

4.3.1.2 Data Processing:

First the data cleaning was done and then the relevant data attributes that can be useful for the analysis were identified. Following are the data attributes that were considered for the analysis. The table summarizes the distribution of SMS messages sent in response to various natural events. A total of 178 SMSs were deemed relevant to disaster efforts.

Flood-related disasters accounted for the highest number of messages (58), highlighting the priority given to flood management. The remaining 120 SMS were distributed among other events, with lightning and storms receiving significant attention.

Further data processing was conducted to ensure the accuracy and relevance of the information. Dates were extracted and formatted correctly for each message, and duplicate texts were removed. This refinement process was crucial in maintaining the integrity of the data and ensuring that the SMS messages retained were both unique and relevant to the disaster planning and communication efforts, particularly in the context of flood events.

4.3.1.3 Filtered Data Overview:

For the filtered data, the total number of posts for each year is shown below figure. In the year 2023, majority of posts were posted in the month of May to September. The rest of the months in the year 2023 did not have many posts owing to the timing of Flood/Rain. The BSDMA database has limited SMS related to flood crisis. Total 58 SMS were there related to flood. These SMS were not only for Kosi Areas but for all the flood zone areas of Bihar. Since the research area for the study is Supaul, so more data filtration was done. Out of which, only 31 SMS were for the Kosi region. Supaul received a total of 13 SMS messages.

Supaul received the most flood warning SMS (13), suggesting a notable emphasis on this region, maybe due to its heightened susceptibility or risk of flooding. The distribution indicates the need for a focused strategy in communicating flood risks, with emphasis placed on regions that are thought to have a greater likelihood of being affected. The data emphasises the necessity of a customised communication approach, guaranteeing that high-risk locations such as Supaul receive sufficient information while also maintaining coverage in other susceptible regions.

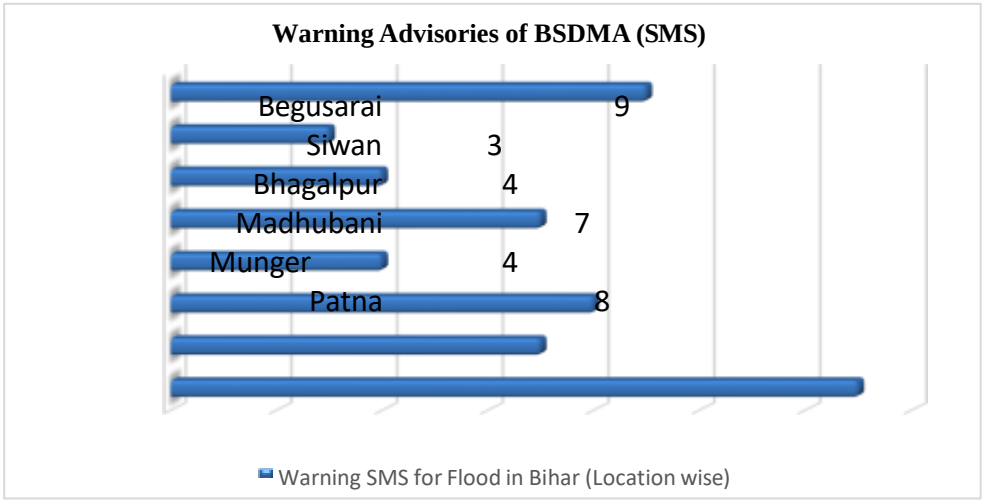


Figure 4.26 shows the overall distribution of the Advisories SMS related to Flood in Bihar

4.3.1.4 Text Analysis:

4.3.1.4.1Types of Messages

An analysis of content categories on the SMS of the Bihar State Disaster Management Authority (BSDMA) reveals a deliberate emphasis on weather alerts, with a restricted emphasis on disseminating knowledge. Approximately 64% of the content on the page is comprised of warning (WARN) information. The data suggest that the primary objective of the page is to educate the audience and enhance their understanding of disaster preparedness, safety measures, and related topics. Informational (INFO) SMS account for 27% of all posts, making it the second-largest category. These posts are anticipated to provide updates on ongoing disaster planning and communication measures and other crucial information.

Only 3.50% of all SMS messages, namely those classified as Appealing (APPEAL), are considered highly important in emergency situations. This low percentage may indicate that warnings are distributed through other means or that the occurrence of such advisories is infrequent. Test SMS (TEST) are employed for the purpose of verifying or carrying out experiments. They make up 0% of all the posts. These may include postings used to evaluate the scope or effectiveness of particular types of material or formats. BSDMA refrains from issuing advisories until they have been alerted by IMD for a yellow/orange alert.

Only 0.93% of SMS messages fall under the category of Promotional (PROM), which includes promotional activities or awareness initiatives. Other postings (OTHER) account for 4.57% of the total postings, encompassing a diverse range of material. This category may include a range of updates, general notices, or postings with the purpose of actively involving the community. In summary, the BSDMA SMS advisories prioritize awareness information and allocate less space to cautions, promotions, and other sorts of posts. This strategy emphasizes the Authority's commitment to raising awareness and educating the public about disaster management. However, it also signifies the necessity of giving greater significance to warnings and other pressing signals.:

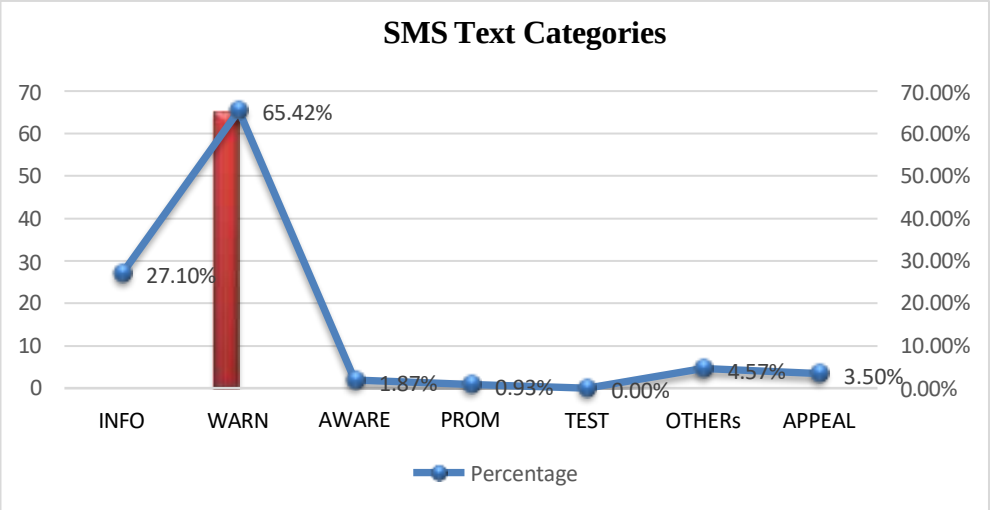


Figure 4.27 shows the various categories of the SMS Advisories by BSDMA

4.3.1.4.2 Content Focus

The primary emphasis of the Bihar State Disaster Management Authority (BSDMA) is on promoting awareness, with relatively less attention given to other crucial aspects of disaster management.

The SMS advice mostly consists of posts pertaining to Warning (WARN) Awareness (AWARE), accounting for 78% of the content. BSDMA prioritises the enhancement of public awareness concerning disaster hazards. The notable focus on awareness suggests a proactive approach to educating the community prior to the onset of calamities.

The percentage of advisories related to the PREP SMS account has remained unchanged at 0%. These entries likely contain information pertaining to disaster preparedness measures, instructions for individuals and communities, and training or drills organised by the authorities. While the lower percentage of preparedness information in contrast to awareness articles is noteworthy, it suggests that readiness content is given a lower priority. There is a total lack of Recovery (RECOV) posts, devoid of any content pertaining to this phase. The lack of activity on BSDMA's SMS suggests that it may not effectively utilize the platform to communicate its post-disaster recovery efforts. Recovery information may be distributed through

alternative channels or at various phases of the disaster planning and communication process.

22% of the posts contain random content that is not relevant to the stages of disaster management. This category includes a variety of material, such as general updates, news about the organization, or activities that involve community engagement.

In essence, the primary goal of the BSDMA is to enhance public awareness of the perils linked to catastrophes and the necessary measures to be prepared for such events. Nevertheless, there is a little focus on actively ensuring readiness and a scarcity of information devoted to the measures undertaken during and subsequent to a catastrophe. This content strategy prioritizes proactive education and prevention, but it also exposes significant shortcomings in properly conveying reaction and recovery activities using this platform.

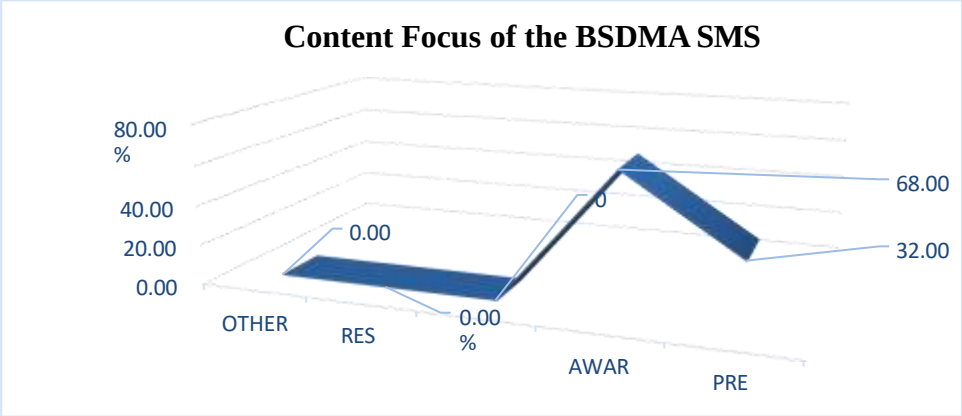


Figure 4.28 shows the content focus of the SMS Advisories of the BSDMA

4.3.2.3 Target Audience

The SMS were divided into two categories: "General Public (GEN)" accounts for approximately 37% and "Specific communities (e.g., riverside residents) / Vulnerable groups (e.g., elderly, children, disabled) (COMM)" accounts for approximately 63%. There are currently no postings specifically intended for the target audience of government officials or emergency responders. The majority of the

posts in the COMM category are intended for a specific audience, namely "Specific Communities".

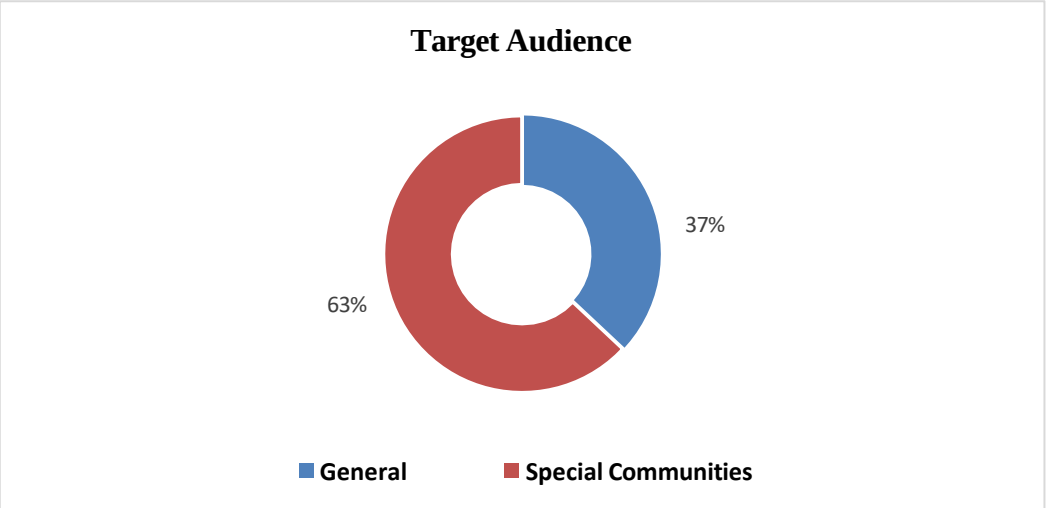


Figure 4.29 shows the Target Audiences of the SMS advisories by BSDMA

4.3.2.4 Communication Tone

An analysis of communication tones in the SMS messages from the Bihar State Disaster Management Authority (BSDMA) reveals a clear preference for presenting information in a straightforward manner, with minimal use of urgent or cautionary tones. The majority of SMS messages are characterized by a warning tone (WARN), which makes up 92.52% of all posts. It may be inferred that the primary objective of the page is to disseminate precise information, updates, and directives for disaster management. The focus on an informational tone suggests an intention to teach and enlighten the audience while avoiding generating alarm.

6.51% of the material consists of SMS messages that have a cautionary tone, as indicated by the CAUTION label. These entries are expected to offer guidance to the general public regarding the importance of being cautious or to highlight potential dangers and warnings that require attention. While warning communication exists, it is used sparingly, perhaps exclusively for situations that require public awareness but

not a quick response.

The contents comprise mere 1.87% of posts with an information Tone (INFO). These posts may include motivating words, stories of achievement, or encouragement for communities to actively participate in disaster preparedness and resilience. The minimal utilization of an inspirational tone indicates that inspiration is seldom used as a communication tactic on this platform.

There are no posts with the Urgent Tone (URGENT) in the material, making up 0% of the total. The lack of immediate notifications on this platform suggests that such crucial information is probably disseminated through other channels that are better suited for delivering timely emergency alerts, or that the site is not used for swift crisis communication.

The content on the page exclusively focusses on the given categories and completely excludes any unclassified tones, as evidenced by the absence of Other Tones (OTHER) which accounts for 0% of the content.

The BSDMA Facebook page primarily utilises an educational tone, focussing on educating and keeping the audience updated in a calm and straightforward manner. The intentional decision to use cautionary and motivational tones sparingly, while also avoiding urgent communication, highlights a content strategy that focusses on constant and informed engagement rather than depending on reactive or emotionally driven messaging

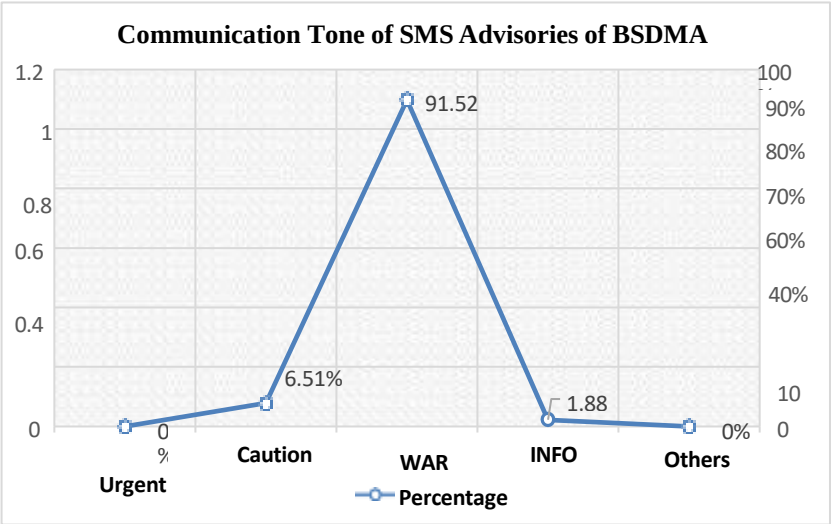


Figure 4.30 shows the Communication Tone of the SMS Advisories of the BSDMA

4.3.2.5 Message Effectiveness

The evaluation of the effectiveness of the Bihar State Disaster Management Authority (BSDMA) SMS advisories shows that while most of the messages are understandable, a considerable portion is considered ineffective.

The BSDMA advisory has a majority of SMSs, specifically 49.74%, that are categorized as Clear Messages (CLEAR). This indicates that most of the content on the page effectively communicates its intended message and is clearly comprehensible. This high proportion reflects the Authority's communication approach, which is marked by clarity and straightforwardness. 23.23% of the total postings are classified as Impactful Messages (IMPACTFUL) in the SMS category. These posts are likely to strongly resonate with the audience, resulting in greater engagement, motivating action, or enhancing understanding of the issue. While the frequency of impactful messages may be relatively low, it indicates that specific posts are particularly effective in achieving their communication objectives.

The percentage of posts categorized as Ineffective Messages (INEFFECTIVE) is 27.03%. This suggests that a significant amount of the content is not successful in conveying its intended message or in engaging the audience's attention. Inadequate messages may indicate potential for improving communication, either through improving the targeting, employing more precise language, or developing more captivating content.

The lack of ambiguous signals is clearly apparent, as none of the information can be classified as such, making up 0% of the total. The absence of presence suggests that all of the posts are clearly understandable, however their value may vary. The lack of unclear messages is a positive indication of the overall quality of the content's delivery. All posts in the Other Categories (OTHER) section make up 0% of the overall content, suggesting that every post has been categorised under the key efficacy measures.

In summary, the BSDMA SMS advisories efficiently convey precise signals to their target audience, but a minor portion of their content has a substantial influence. Nevertheless, a significant proportion of the postings are deemed ineffective. This highlights the necessity to improve the precision and efficiency of all messages in order to establish suitable connections and foster engagement.

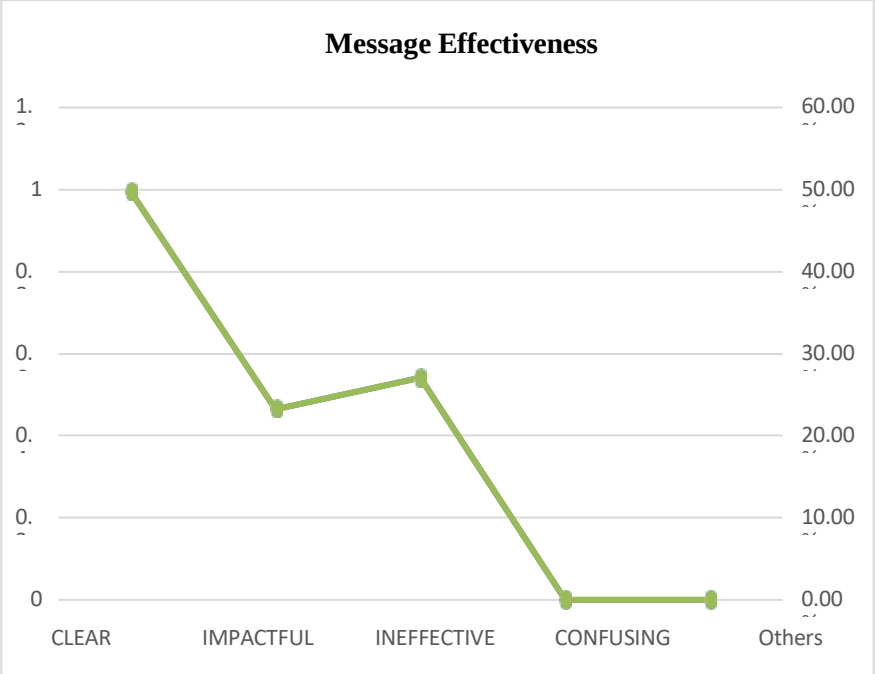


Figure 4.31 shows the Message Effectiveness of the SMS Advisories of the BSDMA

4.1.1.3 Languages

There are no SMS in vernacular language which limits the reach of the posts to group of people who know how to read either Hindi or English language. One more point to note is that for 10% SMS dealing with awareness in communities were in English.

4.1.1.4 Call to Action

The SMS advisories released by the Bihar State Disaster Management Authority (BSDMA) were commendably proactive, effectively urging receivers to promptly and appropriately respond to potential hazards. An examination of these advisories indicates that a substantial majority, specifically 82%, had explicit directives intended to stimulate particular activities. These advisories were created with the purpose of providing information and guidance to the public on how to reduce risks, highlighting the significance of prompt and decisive actions in reaction to crisis circumstances. BSDMA's approach demonstrates their dedication to ensuring that

their communication is not only informational but also focused on taking action, hence improving the success of their disaster planning and communication initiatives.

4.3.2.9 Visual Elements

An extensive analysis of the SMS advisories provided by the Bihar State Disaster Management Authority (BSDMA) found that these communications were solely composed of text and did not include any visual components. This implies that the advisory lacked any visual elements such as photographs, graphics, emojis, or other types of visual media to enhance the written message. BSDMA prioritized the use of textual material to provide explicit and succinct written instructions and cautions, recognizing the constraints of the SMS format, which mainly supports text. BSDMA's SMS advisories deliberately prioritize clear and accessible messaging by not include graphic elements. This ensures that the information can be easily understood and received on different devices and in varied user scenarios.

Chapter - Five

Major Findings, Discussion, Conclusion,

Limitations of the Study & Future Scope

Disasters throughout human history have served as important contexts for studying many aspects that have impacted social development and the subsequent consequences for human life. Post-disaster studies provide a distinct chance to examine how human societies restructure themselves, using the resources, abilities, and financial assets at their disposal to overcome challenges. Each disaster reveals the varying ways in which humans respond to cope with their environment. This is influenced by the wide range of societal statuses and practices associated to socio-cultural and economic factors. An assessment of vulnerability can provide a deeper understanding of the fundamental elements of populations affected by catastrophes. This comprehension not only aids in the reconstruction process but also allows for the creation of more sustainable recovery solutions.

Moreover, it serves as a benchmark for the formulation of forthcoming disaster planning and communication plans and policies that prioritize the needs of the community. Nevertheless, the importance of a well-designed disaster communication plan has just recently gained considerable attention in the Indian context. India's disaster planning and planning and communication activities prioritize the preservation of human life before a disaster occurs, with less attention on physical restoration afterwards. The national disaster preparedness and mitigation policy in India now overlooks the crucial aspect of social rebuilding, which involves tackling significant long-term crises both during and after disasters. Furthermore, it is crucial to examine how individuals facing limited resources and lacking institutional assistance adapt to handle the difficulties of a disaster, and the long-term effects of these tactics on society.

5.1 Major Findings

As per the first objective of the study, the various instances of communication by the government during the Kosi flood have been observed by state government and the central government.

Flooding is a recurring annual occurrence in India, which impacts one or more regions in the country and results in loss of life and damage to public property. The flood damages in India from 1953 to 2018 can be attributed to various factors including intense rainfall in a short period, decreased capacity of water channels, inadequate communication plans, diminished natural drainage in flood-prone areas, insufficient drainage systems, flawed reservoir regulations, malfunctioning flood control structures, encroachment on flood plains, and other related factors.

Currently, the State and District Emergency Operations Centre collect information from IMD and CWC observation stations. Additionally, certain states make use of data obtained from Private Weather Services and Citizen Science initiatives. The information is disseminated through the updating of the Flood Forecasting Website, as well as FAX, email, Telephone communication and circulation via social media. Within the context of CWC, Flood forecasting encompasses two main components: Level Forecasting and Inflow Forecasting. Forecasts are issued when the water level of a river reaches a certain alert level.

As per the findings of the second and third objectives, Bihar is extremely susceptible to floods due to its geographical and meteorological circumstances, as well as other contributing factors. The State has the highest percentage of land that is prone to floods compared to any other region in the country. The State has a flood-prone area of around 68.80 lakh hectares, which makes up 73.06 percent of its overall geographical area and 17.2 percent of the country's total flood-prone area.

In recent years, the state has seen catastrophic floods. Indeed, the South West

Monsoon rain has become synonymous with floods in the North Bihar plains, leading to significant loss of life and property, and causing immense human misery and hardship. The floods in Bihar during the South West Monsoon highlight the state's susceptibility to recurring floods and serve as a reminder of the widespread devastation and disruption caused by such floods. The floods of 2007 represent a departure from previous occurrences in terms of their intensity, unpredictability, and occurrence outside of the usual season. The occurrence of continuous rainfall for around twenty days, exceeding the average trends by 300 to 400% during the latter half of July, was extraordinary. In August, the occurrence was repeated once more, and at the same time, the issue was exacerbated by substantial precipitation in the upper catchment regions of Nepal.

Public Opinion on Disaster Communication Plan in Supaul, Bihar

The distribution of gender across five blocks of the Supaul district in Bihar, in total, male respondents make up 56.1% while female respondents make up 40.3%. Significantly, female respondents exhibit comparatively diminished interest in the poll in comparison to their male counterparts.

Within the immediate area of Supaul and Kisanpur, there is a small segment of the population that lacks basic literacy skills. However, there is an almost equal number of individuals who have completed primary and secondary school. A smaller proportion of the population has reached higher secondary education, and an even smaller number have successfully graduated. In the moderate region of Raghopur and Pratapganj, a greater number of individuals successfully complete elementary education, with a notable proportion also finishing secondary education. However, there is a lower percentage of individuals who go to upper secondary education or obtain a college degree. In Basantpur, a remote region, the majority of individuals have completed secondary school, while some have finished primary or higher secondary education. However, only a small number of people have graduated.

The distribution of occupations among respondents in the five blocks of the Supaul district. The frequency data reveals a significantly elevated unemployment

rate in both the nearby region (Supaul & Kisanpur) and the intermediate region (Raghopur & Pratapganj) in comparison to the far region (Basantpur). The analysis of the respondent occupations reveals that 26% are categorized as entrepreneurs, 9.9% as government employees, 31.4% as private employees, 2.9% as students, and 29.9% as jobless.

Approximately 99.2% of the respondents indicated that flooding is the main issue in their region.

There are differences in the amount of preparedness measures depending on the distance from the district headquarters. Generally, places that are moderately far away show better levels of preparedness compared to locations that are closer or farther away. Moreover, the dependence on non- governmental organizations (NGOs) for information appears to be particularly noticeable in remote regions.

The source of information regarding the Kosi flood varies depending on the vicinity of the source. Close family members and close friends are the most trusted and relied upon, but the level of dependency decreases as the physical distance between individuals rises. Government officials play a crucial role in nearby regions, whereas the utilization of the internet, social media, and mobile communication is moderate. The use of social media among the youth is more. Newspapers have a minimal impact, particularly in remote regions.

The level of support for Kosi disaster preparedness differs depending on the closeness to the affected area. Merely 0.5% of individuals received assistance from the central government, with marginal increments in nearby regions. The state government provided assistance amounting to 13.5%, with the majority of it being allocated to nearby regions (25.8%). Local politicians provided assistance to 24.4% of the population, with a particular focus on intermediate areas, which accounted for 37.4%. The majority of support (43.4%) was supplied by municipality offices, while NGOs had a role in assisting 17.1% of the population, particularly in remote areas (33.8%).

A minuscule proportion of respondents (0.3%) express confusion regarding the

inclusion of disaster prevention education in schools, while the majority indicate a definitive presence or absence. The analysis highlights the significance of including disaster prevention education into school curriculums, especially in regions susceptible to natural catastrophes.

Furthermore, it underscores the discrepancies in preparedness initiatives among various geographical locations, underscoring the necessity for focused interventions to bolster disaster resilience in schools, particularly in remote places.

Approximately 27.8% of persons had knowledge of government catastrophe preparedness initiatives. **The level of awareness is highest in places that are in close proximity, reaching 40.4%.** This indicates that being close in distance enhances the level of awareness. Within regions of moderate proximity, the level of awareness is at 18.4%, **however in remote locations, the awareness rate drops to 22.5%,** suggesting a lower level of awareness among individuals residing farther away from places susceptible to disasters.

Approximately **98.7% of individuals receive catastrophe awareness messages in Hindi,** indicating its extensive usage. This choice remains constant in all places, including remote regions (98.6%). English is seldom employed for such messages, and only 1.0% of recipients receive them in local languages, suggesting a low utilization of local languages for disaster communication.

The choice of communication channels for disaster alert messaging depends on the proximity to the district headquarters. Folk performances are the least favored, with an overall preference rate of only 4.2%. **Local government officials have a significant level of popularity, with a preference ranging from 39.1% to 42.3%. Mobile SMS is widely used, with a peak of 42.3% in remote locations and an overall usage rate of 29.4%.** The preference for social media/internet is 16.4%, with the largest preference observed at moderate distances (27%). **Newspapers are the least popular medium, with a preference rate of only 2.1%,** while TV and radio are somewhat preferred, with a choice rate of 7.3%. The data indicates a shift towards government and digital platforms in favor of conventional ones.

The video messages are the most favored medium for catastrophe awareness, regardless of the distance from the district HQ. They have an overall preference rate of 62.9%. 29.9% of individuals prefer multimedia messages. **Text messages and audio messages are the least preferred**, with a usage rate of 5.5% and 1.8% respectively. Visual media is undeniably the favored method for achieving successful communication.

Most participants indicate that they regularly receive flood/weather alert messages, with 40.3% hearing them occasionally and 48.3% receiving them frequently. Only a little 1.6% of individuals consistently receive messages, while a mere 0.5% never receive them. There are significant disparities in the frequency of messages, particularly in locations that are moderate or far away, indicating the need for enhanced communication endeavors.

Local Administrations and the Disaster Plans (Based on Interviews)

The local government in Supaul block utilizes a combination of conventional and contemporary communication channels to distribute crucial information. Traditional media such as radio and newspapers play a vital role, particularly in distant regions, but **social media platforms like Facebook and WhatsApp are also utilised.** Timely warnings are conveyed to even the most secluded areas through the use of loudspeakers and community meetings. SMS notifications are highly successful, providing fast updates in times of crisis.

The district has an elaborate communication strategy for flood prevention, which encompasses early warning systems, evacuation procedures, and frequent updates across multiple media platforms. Disaster preparedness programs are characterised by their proactive nature, which includes conducting frequent training, organising flood response drills, and providing necessary supplies to families that are particularly vulnerable**. The preferred communication channels encompass radio, SMS, loudspeakers, social media, and community meetings.**

The BDO emphasized the utilization of a combination of conventional and contemporary communication channels to efficiently connect with the varied

population of Supaul. The utilization of radio and newspapers is crucial for the widespread distribution of information, particularly in geographically isolated regions where digital connectivity may be restricted. **In addition, younger individuals are actively involved on social media platforms such as Facebook and WhatsApp, while SMS alerts play a crucial role in promptly conveying updates during emergency situations.**

The BDO also deliberated on the district's all-encompassing communication strategy, encompassing early warning mechanisms, evacuation procedures, and regular updates across various media platforms. **Disaster preparedness is strengthened by conducting frequent training, practicing flood response drills, and providing necessary supplies to families at risk. The indicated preferred communication methods include radio, SMS, loudspeakers, social media, and community gatherings.** This demonstrates a customized approach to cater to the specific requirements of various community segments.

However, there are still obstacles that need to be addressed, like **the absence of disaster planning and communication instruction in schools and the lack of media habit surveys to improve communication tactics.** However, the district is currently making efforts to improve its communication plan in order to be better prepared for future crises.

The Block Development Officer (BDO) of Raghopur offers a detailed insight into the local administration's endeavors to effectively handle flood-related difficulties and ensure that the community is well-informed and prepared. The BDO emphasized the importance of a comprehensive communication strategy to effectively reach the heterogeneous people of Raghopur. **Local radio broadcasts are the main means of communication for providing extensive flood updates, while social media platforms and government websites are used to create a greater level of public awareness.** Rural communities utilise loudspeakers for community announcements to ensure that even the most isolated populations receive essential information. In addition, SMS alerts offer immediate and timely notifications to citizens, underscoring the significance of prompt communication in

emergency situations.

The BDO has verified the presence of a comprehensive government communication strategy, encompassing pre-flood awareness initiatives, real- time flood updates, and post-flood recovery information. **Disaster preparedness is strengthened by frequent community meetings, simulated exercises, and outreach initiatives,** guaranteeing that residents comprehend the essential measures to be taken prior to, during, and following a flood.

The preferred communication channels encompass SMS notifications, loudspeaker announcements, social media platforms, and public forums, all customized to efficiently engage various sectors of the community. **The BDO recognized the difficulties, such as the absence of structured disaster planning and communication teaching in schools and the necessity for specific health campaigns for women during floods.** Although the primary mode of delivery for messages is in Hindi, surveys are carried out to evaluate their efficacy and the level of comprehension among the community.

The continuous progress in creating a thorough communication strategy demonstrates the administration's dedication to improving resilience. Nevertheless**, the lack of surveys of media consumption patterns and the difficulties faced in the fields of health and education during floods highlight specific areas that need to be enhanced.** In summary, the Raghopur block exhibits a proactive and comprehensive strategy for disaster communication and preparedness, with the goal of creating a community that can respond successfully to natural disasters.

The Block Development Officer (BDO) of Pratapganj provides information on the local government's communication initiatives and disaster preparedness measures aimed at reducing the impact of floods. The debate highlights the strategies employed to guarantee efficient public knowledge and preparedness for natural calamities.

Face-to-face block meetings and panchayat centers serve as the main means of distributing information and engaging in discussions about flood

preparedness. SMS services offer prompt notifications and advisories, whilst loudspeakers are especially efficient in reaching rural and isolated regions. The BDO has established a thorough communication strategy that utilises radio, television, and social media platforms to ensure the public is well-informed and ready.

The training workshops aim to provide the public with knowledge on flood preparedness, which includes information on safety measures and procedures for evacuation. Regular simulated exercises are carried out to rehearse these protocols, guaranteeing preparedness within the community. **Disaster planning and communication education, while not formally included as a curriculum, is imparted through school awareness programs.**

Challenges encompass the absence of consistent feedback mechanisms and the complexity of accessing distant populations. **The authorities are formulating future communication strategies that prioritize timely notifications, frequent information dissemination, and ongoing public instruction. Health campaigns during floods notably target the specific needs of women, while mobile educational units and temporary classrooms enable the uninterrupted provision of education during floods.**

Although the existing tactics are successful, there is a need for enhancements in the collecting of feedback and the expansion of message reach. Implementing proactive measures, such as developing comprehensive communication strategies, is crucial for strengthening the community's ability to withstand and recover from natural catastrophes.

The Block Development Officer (BDO) of Basantpur Block, Supaul District, presents detailed communication strategies and disaster preparedness initiatives aimed at reducing the impact of floods. The block utilises a range of communication channels, such as radio services, social media sites like Facebook and Twitter, neighborhood outreach, cellphone alerts, and cable TV. Local radio appeals to a wide range of people, while social media specifically targets younger individuals who are knowledgeable about technology. Conventional approaches such as

community gatherings and loudspeaker broadcasts guarantee the dissemination of information to isolated regions. SMS notifications offer a rapid and direct means of conveying vital messages, while local television networks disseminate crucial updates.

Early warning systems provide inhabitants with ample notice, while effective evacuation plans guarantee safety during floods. The community remains updated about developing situations through regular updates disseminated across multiple media platforms.

Disaster preparedness programs primarily emphasize community education and practical exercises, including workshops to raise awareness and drills to practice evacuations. These programs prioritize the significance of understanding how to respond before, during, and after a flood, so improving overall preparedness.

The BDO recognized local radio, SMS services, loudspeakers, and social media as the most efficient communication mediums for informing and creating awareness. Each medium caters to distinct portions of the population, guaranteeing extensive coverage.

Additional measures include conducting regular mock drills to familiarize locals with natural catastrophes, and implementing awareness programs in schools to educate students about disaster management. Special health initiatives prioritize addressing the specific needs of women during floods, while also striving to ensure the continuity of schooling and support for agriculture.

There is a necessity for enhancements, such as evaluating the efficacy of communication messages and conducting surveys to gain a deeper understanding of citizens' media preferences. A comprehensive communication strategy is now being established to boost the level of catastrophe preparedness and response.The conversation showcases Basantpur's resilient and versatile approach to disaster communication and preparedness. Although the present tactics are beneficial, enhancing the evaluation of message efficacy and understanding of media consumption might further improve overall efforts. The dedication of Basantpur to

ensuring the safety and ability to recover of the community in the event of floods is clearly apparent.

The findings of the fourth objective of the study:

According to data released by multiple government organizations, both real and intangible losses are on the rise in India. According to the Central Water Commission (CWC), an average of over 1650 people died, 32 million people were impacted, and more than 7 million hectares of land were devastated by floods annually in India between 1953 and 2018 (Dubey & Saklani, 2019).

The National Water Policy (NWP) was created to regulate the strategic planning and advancement of water resources and their most efficient utilization. The initial NWP was implemented in 1987. The document underwent a review and update in 2002, followed by another update in 2012. (National Disaster Management Authority, 2019) The policy paper is being revised and a droughting committee was formed on November 5th, 2019 (Press Trust of India, 2021).

The Central Water Commission (CWC) establishes a central flood control center that receives meteorological and hydrological data from the India Meteorological Department (IMD), CWC, and state Departments (PIB, 2021). The control room activities commence on 1st May for the North East area of India and on 1st June for the rest of India. They continue to operate until the conclusion of the flood season, which is 31st October for regions experiencing South West monsoon spells and 31st December for regions experiencing North East monsoon spells. Flood warnings are generated for multiple flood forecasting locations based on the use of this data. The flood warning is disseminated by various communication channels such as SMS, telephone, wireless, radio, TV, email, social media etc. This enables the district authorities to promptly implement the required evacuation measures.

Inflow Forecasting is employed by reservoir/dam authorities to optimize the functioning of reservoirs. Its purpose is twofold: to facilitate the safe passage of floodwaters downstream and to maintain sufficient storage in the reservoirs to meet demand during the non-monsoon period. The forecasts are disseminated to the

appropriate stakeholders, including State Emergency Operations Centers and District Emergency Operations Centers, to facilitate the evacuation of the affected area based on the level of threat and the needs identified by Local Self Governments and DDMAs (KSDMA, 2020).

Upon receiving consent from the DDMA, in conjunction with the relevant Local Self Governments as needed, the water is discharged from the dam in accordance with the assessed threat level. The district and local authorities, SDMA/State Disaster Response Force (SDRF), NDMA/National Disaster Response Force (NDRF), and the military forces are responsible for carrying out evacuation, relief, rescue, and rehabilitation efforts as needed.

The evaluation of damage following a flood is conducted by various government departments including the Local Self Governments, Agriculture evaluation, Land Revenue Department, Animal Husbandry Department, Public Work Department, Electricity Department, and Irrigation Department. These departments together evaluate the extent of damage in different sectors within the district. The damages are assessed by DDMAs at the district level using verified reports from the relevant Heads of Departments.

The department encompasses the loss of human and animal lives, as well as damage and destruction to many types of property such as agriculture, plantations, dwellings, boats, and infrastructure including roads, water supply, electricity, and telecommunication. The respective authorities, such as Local Self Governments, Public Works Department (PWD), Public Health Engineering Department (PHE), Telecommunication, Power, etc., are responsible for the rehabilitation and restoration of villages and affected communities at the local level after conducting a thorough assessment of the damages.

An early flood warning system offers ample time to implement temporary emergency measures before the onset of floods, hence reducing the potential for loss of life and property by minimizing exposure to floodwaters. Emergency procedures

depend mostly on accurate and timely information regarding the timing and location of the flood, the size of the affected area, and the available time for individuals to escape the at-risk zone.

Prior to an occurrence, it is crucial for the people at risk to be familiar with **Emergency Action Plans (EAP)** and **Disaster Mitigation Plans (DMP)** as part of their readiness measures. These plans are equally important as the warning system itself. FEWSs offer temporal information regarding the occurrence of flooding, whereas flood-risk maps provide spatial information regarding the areas that will be affected by the flood. Additionally, they provide crucial data for emergency management, namely for strategizing the response to the flood occurrence.

The functionality of credit top-up and contact number storage would be facilitated through SMS. Users can receive text notifications about changes in the water level upon their request. The technology promptly delivers information and alerts to vulnerable or endangered populations and appropriate authorities via SMS when the water level exceeds the threshold value set by the user.

The **District Disaster Planning and Communication** is an operational framework used by district administrations to efficiently mitigate and reduce the risks associated with various types of catastrophes. It utilizes locally available resources and manpower to give prompt aid to affected individuals.

Recently, there has been a noticeable increase in the occurrence of flooding and the related hazards in India. This can be attributed to various factors, such as alterations in rainfall patterns, more frequent extreme events, changes in land use, and the expansion of development into areas prone to flooding due to socio-economic demands. Recently, it has been recognized that climate change is having a substantial effect on the hydrological system and is increasing the likelihood and susceptibility to flooding. Flooding poses a growing threat to human lives, property, the environment, and socio- economic conditions.

This study's content analysis sheds light on the Bihar State catastrophe Management Authority's (BSDMA) catastrophe communication strategy, with a special emphasis on their usage of Facebook and SMS. This study, which looks at BSDMA's communication strategy from June 2021 through December 2023, finds both good and bad things.

The majority of the BSDMA's Facebook posts (75.7% to be exact) are educational on disaster risks and how to be prepared for them. Although it is praiseworthy that this instructional strategy is proactive, the study shows that other important phases of disaster management, such response and recovery, are not covered. There is zero content pertaining to recovery, and just 0.93 percent of posts are about reaction activities.

This shows that BSDMA may not be making the most of its Facebook page to provide crisis alerts in real-time and recovery efforts after the fact. Furthermore, although most of the time the tone is instructive, there is a noticeable lack of cautionary or urgent tones, which could be really important in times of crisis.

The study also highlights how successful BSDMA's communications were. The dedication to direct communication shown by BSDMA is seen in the large percentage (81.31%) of Facebook posts that are easy to understand. There is opportunity to enhance the creation of more meaningful and engaging messages, as 14.02% of the postings are considered ineffective.

Another issue that has to be addressed is the low use of vernacular languages on Facebook. This limits the reach and efficacy of posts among communities that do not understand Hindi or English.

According to the data, BSDMA has issued a plethora of disaster-related SMS messages, the most of which deal with flood management. Although there is a large number of messages, the systematic data processing and classification show that different disaster kinds and stages of disaster planning and communication require

varied content dissemination.

In sum, the results of this content analysis show that BSDMA has to diversify and strategically approach catastrophe communication. During the reaction and recovery stages, there has to be timely and useful information in addition to the existing focus on education and awareness. It is possible that BSDMA's communication efforts may be more effective if they used a variety of tones and languages and included more interactive and interesting visual components. These findings have the potential to inform the creation of stronger catastrophe risk communication plans, which could lead to increased public readiness and resilience.

Discussion

The Kosi River, commonly known as the "Sorrow of Bihar," has once more caused devastation in 2024, significantly impacting northern Bihar. The floods, caused by embankment failures and significant rainfall in Nepal, has inundated extensive regions, displacing over 1.5 million individuals in districts like Supaul, Purnea, Saharsa, and East and West Champaran. The failure of several embankments on October 1 intensified the crisis, especially in low-lying settlements, where inhabitants were isolated and urgently need rescue and assistance. The Kosi and Gandak rivers, among the most flood-prone in the area, had unprecedented water release, exacerbating the calamity.

The flooding in northern Bihar is not a one-off incident but rather a larger flood scenario affecting most of the state. Large-scale water discharges from the Kosi and Gandak barrages resulted from significant rain falling over Nepal and some of Bihar between September and October 2024. The Birpur Barrage discharged more than 5.79 lakh cusecs of water overall, the greatest discharge since 1968. Concurrent with this, the Valmikinagar Barrage on the Gandak River discharged 5.38 lakh cusecs—its highest level in 20 years. Over 500 villages were submerged and people were forced to flee atop embankments and roadways as these record water flows flooded many districts (*Down To Earth India, South Asia*, 2024)

Even with 16 National Disaster Response Force (NDRF) and 17 State Disaster

Response Force (SDRF) teams ramping up rescue and relief operations, hundreds of families remain critically in need of help. Although many were sent to relief camps, the lack of food, pure drinking water, and healthcare still causes great problems. Although 18 aid camps have housed about 6,200 people, the sheer scope of the tragedy makes it challenging to quickly identify all impacted persons. Particularly in remote locations, helicopter air drops of food and other supplies have been continuous.

The continuous floods have also resulted in a public health disaster; the Bihar Health Department is using resources to stop waterborne disease outbreak. With over 1.46 million persons impacted over 17 districts, the matter has required a comprehensive response. Civil surgeons in areas affected by floods have been directed to give vulnerable groups—including children, the elderly, and pregnant women top priority in healthcare. There are now health camps, and more boat ambulances on call to offer medical aid (India Today, 2024).

Apart from the immediate humanitarian issues, the floods have seriously affected Bihar's agriculture. Farmers in the flood-affected districts—particularly areas along the Gandak, Bagmati, and Burhi Gandak rivers—have reported severe damage to their Kharif crops, including vegetables and paddy. Submerged thousands of acres of farmland have left the agricultural economy in ruins. Many of the farmers depend on seasonal harvests, hence the damage to standing crops may have long-term consequences for food security and livelihoods.

The extent of this natural disaster is mostly related to embankment failures, a recurrent problem in Bihar. The Kosi River's erratic path makes it challenging to keep flood control measures in integrity. Although the government has been working on this issue with embankment reinforcement and monitoring, breaches continue to be regular as this year's failures show. The Bihar Water Resources Department (WRD) has sent teams of engineers to monitor embankments and handle erosion threats in reaction to the 2024 disaster; yet, the unpredictable Kosi and Gandak rivers interfere with these initiatives.

The Bihar flood of 2024 underlines how vulnerable the state remains to river-induced flooding. The region's vulnerability to high rainfall and water discharge from Nepal remains a constant challenge even with large expenditures in flood control infrastructure including embankments, barrages, and disaster response systems. Working with the national government, the Bihar government has been trying to increase flood readiness and response; yet, the sheer scope of the 2024 flood emphasises the need of long-term solutions. Reducing the impact of next floods depends critically on improved collaboration with Nepal, better embankment management, and more strong community disaster preparedness.

Looking ahead, climate change may aggravate Bihar's flooding problems. Northern Bihar is probably going to see more regular and catastrophic floods as global warming causes more variable and strong rain patterns. This makes it absolutely necessary for the state government to implement a multi-pronged strategy addressing the underlying causes of vulnerability in addition to immediate relief and rescue operations. This covers bettering embankment design, encouraging sustainable agriculture in flood-prone regions, and funding community-based disaster-risk lowering projects.

The study provides valuable insights into the advantages and difficulties of government information campaigns in disaster management. The results indicate that the government made significant attempts to engage with the affected populations. However, the effectiveness of these efforts varied significantly based on various factors, such as the communication channel used, the clarity and timeliness of the messages, and the socio-cultural background of the intended recipients.

Conventional forms of media, including radio and television, were essential in effectively reaching a wide range of people, particularly in regions with restricted availability of digital technologies. Nevertheless, the dissemination of these messages was frequently constrained by power outages and infrastructural impairment resulting from the flood, impeding the public's access to various forms of communication. However, mobile-based notifications and social media platforms have shown greater resilience and effectiveness in quickly spreading information.

Nevertheless, the extent of their influence was restricted by the digital divide, namely in rural and isolated regions where there was irregular cell network coverage and limited internet accessibility.

The success of the information campaign was significantly influenced by the clarity of the disaster communication messaging. Concise, unambiguous, and actionable messages were more effective in eliciting the intended response from the public. Nevertheless, the study also revealed that the cultural significance of the messages had a substantial influence on how they were received.

Local communities had a higher level of comprehension and acceptance of messages that included local languages, dialects, and cultural references. Conversely, generic communications that lacked cultural sensitivity were frequently misunderstood or ignored, so diminishing their efficacy.

Accessibility and timeliness have been identified as crucial factors in disaster communication. The study revealed that timely early warning signals, provided far in advance of the flood, had a crucial role in facilitating communities to make necessary preparations and evacuate, therefore minimizing casualties and damage. Nevertheless, the occurrence of communication delays, frequently attributable to technological limitations, led to missed chances for prompt interventions.

The synchronization across different central agencies and municipal bodies was also recognized as a crucial element. The effectiveness of the communication effort was enhanced in cases where there was a high level of coordination. In contrast, regions that lacked coordination encountered fragmented and occasionally conflicting signals, resulting in confusion and diminished trust in the information delivered.

The study also emphasized the significance of community involvement and procedures for receiving feedback in the context of catastrophe communication. Campaigns that actively engaged local leaders, NGOs, and community-based organizations achieved greater success in reaching the grassroots level and customizing the messages to suit the specific requirements of the community.

The effectiveness of communication theories is undermined by their lack applicability in disaster risk awareness messages. Often disregarded are important theories include Negative Dominance, Mental Noise, and Trust Determination. In risk communication, trust is absolutely essential; mistrust may rapidly damage credibility. Mental Noise Theory emphasises how stress reduces people's capacity for information processing and calls for consistent, simplified messages. According to negative dominance theory, individuals often pay more attention to negative information, thus communications have to find a balance without exaggerating threats. Including these ideas into catastrophe messaging can help public knowledge and response during emergencies to be much better.

Furthermore, feedback methods that facilitated the community's expression of their concerns and requirements to the authorities were crucial in enhancing and optimizing the communication tactics in real-time. The lack of such systems in certain regions resulted in a disconnection between the government's communication and the community's genuine needs and views.

Conclusion

Kosi flood is a stark reminder of Bihar's vulnerability to natural disasters. The flood has displaced over a million people, damaged crops, and overwhelmed relief efforts. While rescue operations and relief camps have provided some respite, long-term solutions are needed to reduce the impact of such disasters. As Bihar and the surrounding regions brace for future floods, collaboration between local governments, national agencies, and international partners will be crucial in mitigating the impact of these recurring calamities.

The study highlights the necessity of implementing a more extensive and all-encompassing disaster communication policy that takes into account the varied requirements of various communities. The evident disparity in access to digital resources emphasizes the need for laws that guarantee fair and equal availability of information in both urban and rural regions. This may entail allocating resources

towards enhancing communication infrastructure in rural areas and ensuring that disaster communication plans encompass both digital and conventional media. In addition, the policy should prioritize the significance of early warning systems and require their incorporation into local disaster preparedness plans.

The variable efficacy of diverse communication channels during the Kosi flood highlights the necessity for a versatile and adaptable multi-channel communication plan tailored to the unique circumstances of a disaster. Disaster communication strategies should be strategically developed to capitalize on the advantages of several types of media, including traditional, digital, and community-based platforms. Additionally, these efforts should also include the possibility of disruptions that may arise as a result of the disaster. It is crucial to consider the significance of culturally relevant message, which implies that communication tactics should be customized to fit the linguistic and cultural background of the intended recipients. One way to accomplish this is by engaging local experts and community leaders in the process of designing the message.

The study also highlights the vital need of effective coordination and promptness in catastrophe communication for agencies responsible for disaster management. The results indicate that adopting a decentralized approach, wherein local authorities are granted more autonomy and responsibility in distributing information, may result in more prompt and situation-specific communication. Capacity-building activities can be implemented to empower local organizations with the essential resources and expertise required to efficiently oversee disaster communication, hence facilitating decentralization.

Moreover, the study emphasizes the significance of implementing strong feedback mechanisms that enable immediate modifications to communication techniques in response to community reactions. These strategies can ensure that communication is adaptable to the changing requirements of impacted people and can enhance trust and collaboration between authorities and the public.

The study's results indicate that increased involvement of the community is crucial

for the successful transmission of information during disasters. Enabling communities to actively engage in catastrophe preparedness and response can increase the significance and approval of communicated messages. Engaging community-based organizations, NGOs, and local leaders in the design and implementation of communication campaigns can accomplish this goal. In addition, providing continual awareness initiatives to educate communities about disaster planning and response can enhance their resilience and capacity to respond promptly and effectively to disaster alerts. The study also emphasizes the need for additional research, specifically in comprehending the enduring effects of crisis communication on community resilience and behavioral modification. Subsequent studies could investigate the impact of various communication tactics on the acceptance of precautionary actions and the efficiency of emergency planning and communication in the long run. Furthermore, it is necessary to conduct additional region-specific research that investigate the particular difficulties and advantages in distinct areas. These studies can offer valuable insights into how disaster communication techniques can be improved and tailored to certain regions.

To conclude, this study offers useful insights that can guide the creation of disaster communication methods that are more successful, inclusive, and tailored to specific contexts. To enhance the overall efficiency of disaster communication and promote the preparedness and resilience of communities, authorities can overcome the highlighted obstacles and utilize the advantages of different communication methods.

The results of this study regarding the efficacy of disaster communication during the Kosi River flood in Bihar have significant implications for policymakers, disaster planning and communication agencies, and communication strategists. These consequences are crucial for improving future disaster communication endeavors and constructing more resilient societies.

Suggestions

Localization of Messages: Emphasizing 'Local for Vocal'

One of the most critical suggestions for enhancing the effectiveness of disaster risk communication is the localization of messages. In the case of Bihar, where the Kosi River flood poses a significant risk, messages must be delivered in local languages such as Maithili, Bhojpuri, and Hindi. This approach aligns with the 'Local for Vocal' concept, ensuring that the messages resonate with the local population and are easily understood.

Simplification and Creativity in Awareness Campaigns

Awareness campaigns should be straightforward yet engaging to maximize their reach and effectiveness. Creative approaches, such as using visual aids, storytelling, folks media, and interactive sessions, can make the communication more engaging. For instance, using local art forms like street plays, puppet shows, or folk songs to convey disaster preparedness messages can capture the community's attention and encourage active participation.

Integration of Disaster-Related Subjects in School Curricula Incorporating disaster-related subjects into school curricula is a long-term strategy to build a culture of safety and preparedness. By educating children about disaster risks and response strategies from a young age, schools can cultivate a generation that is better equipped to handle emergencies. The curriculum should include practical knowledge, such as how to respond during floods, earthquakes, or cyclones, as well as theoretical knowledge about the science behind these disasters.

Implementation of Feedback Mechanisms: Media Habit Surveys

One effective approach is to conduct media habit surveys, which can provide insights into the public’s media consumption patterns, preferences, and perceptions of the communication strategies employed. These surveys can reveal which channels (e.g., radio, television, social media, print) are most effective in reaching the target

audience and which types of content resonate the most. The findings can guide future campaigns, helping to refine message design, delivery methods, and the overall communication strategy. Furthermore, continuous feedback from the community can help identify gaps in awareness and areas where additional efforts are needed.

Community Learning and Awareness

The concept of 'Ritsukman' from Japan, which emphasizes community-based learning and awareness, can be a valuable model for disaster awareness programs in Bihar. Ritsukman involves community members actively participating in disaster preparedness and response training, fostering a sense of collective responsibility and resilience. This model encourages community-driven initiatives, where local leaders, schools, and organizations collaborate to disseminate knowledge and skills. Adopting this concept in Bihar would not only empower communities but also ensure that disaster risk communication is sustained at the grassroots level. Community learning sessions could include practical demonstrations, participatory workshops, and the sharing of local knowledge and experiences, thereby making the communication process more inclusive and effective.

Message Designing Based on Risk Communication Theories

While creating awareness messages using risk communication theories, it is crucial to consider how individuals perceive dangers and process information, particularly while they are experiencing stress. Gaining comprehension and implementing these theories can greatly improve the efficiency of catastrophe risk communication.

Trust Determination Theory highlights the significance of trust as a crucial element in risk communication, particularly in situations where the public is experiencing anxiety or anger. Distrust can quickly undermine if the origin of information is seen as untrustworthy or lacking credibility.

According to the **Mental Noise Theory**, individuals experience a reduction in their cognitive processing abilities while they are under stress or anxiety. They may experience challenges in maintaining focus, comprehending, or retaining knowledge.

Consequently, in order to guarantee understanding and memory, it is necessary to simplify communications, repeat them, and provide visual aids as assistance.

Negative Dominance Theory asserts that individuals tend to prioritise negative information and assign it greater significance compared to positive or neutral information in times of stress. In order to offset this inclination, communicators need meticulously strike a balance in their message, refraining from excessively highlighting negative features but still effectively conveying the gravity of the situation.

By **incorporating risk communication ideas into a comprehensive public relations plan,** it is possible to create a cohesive and efficient method for promoting disaster awareness. This entails comprehending the target audience, selecting appropriate communication channels, and formulating messages that strongly connect with the intended demography. Through comprehension and implementation of these theories, communicators of disaster risk can provide messages that not only provide information but also enable the public to undertake essential measures to safeguard themselves and their communities.

In conclusion, the suggestions outlined in this study provide a comprehensive framework for improving disaster risk communication in Bihar. By focusing on localization, simplification, creativity, education, feedback mechanisms, community involvement, theoretical grounding, and structured communication processes, the state can develop more effective and impactful communication strategies. These efforts, supported by policy interventions, can contribute to a safer, more prepared population capable of responding effectively to the recurring threat of floods in the region.

Scope of Future Research

The future potential of this study on disaster risk communication and the Kosi River flood in Bihar presents numerous viable avenues. By extending the research outside the Mithila region, namely Supaul district, to encompass additional flood-prone areas in Bihar and neighboring states, we can gain useful comparative insights into the

effectiveness of communication across different geographies. Longitudinal studies have the ability to monitor and analyses changes in awareness, behavior, and preparedness over a period of time. This allows for a more comprehensive comprehension of the lasting effects of communication techniques on the development of resilience. Subsequent investigations may also investigate the impact of developing technologies such as social media, mobile apps, and geospatial systems on improving real-time catastrophe communication and community involvement. An assessment of the effects of policy interventions, such as initiatives led by the government and programs implemented by the community, could aid in the identification of effective ways for enhancing disaster preparedness and response. Furthermore, doing research on the impact of cultural beliefs and social norms on disaster communication and community reactions could result in the development of more culturally sensitive and efficient tactics. Evaluating the efficacy of various media tactics, encompassing both conventional and digital platforms, would facilitate the optimization of content distribution for optimal influence. By engaging in interdisciplinary collaboration with experts in environmental science, sociology, public health, and information technology, the study can be enhanced, leading to a more thorough comprehension of the obstacles in communicating disaster risks. The results could provide valuable insights for policymakers at both state and national levels, facilitating the creation of more efficient disaster planning and communication policies and procedures. This would ultimately enhance the resilience of communities and optimize catastrophe risk communication tactics.

Limitations of the Study

It is important to recognize that this study has some constraints. The research largely focused on flood-related concerns, while also aiming to explore communication tactics and disaster preparedness. The scope could be broadened to encompass a wider array of calamities, so providing a more all- encompassing comprehension of disaster communication and readiness in diverse circumstances. Furthermore, the study examined the efficacy of communication routes, however its findings were

limited due to data availability and time constraints. Due to time constraints, it was not possible to conduct a thorough examination of all possible communication channels, including new technologies and sustainable communication methods, in this study.

Furthermore, the comprehensive evaluation of messaging efficacy across several platforms was hindered by constraints in data gathering and analysis. An in-depth assessment of the performance of different communication channels in real-life situations would yield significant insights. Subsequent investigations should focus on overcoming these constraints by investigating a broader spectrum of catastrophic situations and integrating a more comprehensive examination of communication mediums. Furthermore, incorporating long-term data and a variety of communication channels into the study would improve the comprehension of message efficacy and the adoption of sustainable practices in disaster communication.

ANNEXURE - I

Survey Questionnaire (Schedule)

The questions asked in the below form is just for the sake of the research study to be done in Supaul by Ms. Sweta Rani, Research Scholar, Mizoram University, Aizawl (India). The study is based on the awareness of the Kosi flood disaster in the area of Supaul. The privacy of the shared information will be the priority. Kindly fill the form and help me to complete the study on - "**Effectiveness of the Disaster Risk Communication: A Case study on information campaign about flood in Kosi River in Bihar".**

Demographic Section (Question 1-5)

1. Gender

a) Male
b) Female
c) Transgender
d) Prefer not to say

2. Age

a) 18-27 [ ]
b) 28-37 [ ]
c) 38-47 [ ]
d) 48-57 [ ]
e) 58-67 [ ]
f) 68+ [ ]

3. Education

a) Illiterate
b) Primary
c) Secondary
d) Higher Secondary
e) Under Graduate
f) Post Graduate

4. Native Place

a) Supaul
b) Kishanpur
c) Raghopur
d) Pratapganj
e) Basantpur

5. Employment

a) Student
b) Employed
c) Entrepreneur
d) Unemployed
e) Other

6. Which natural disaster have witnessed in your life time. (You can choose more than one) -

a) Flood
b) Earthquake
c) Drought
d) Wildfires

7. **Did you get affected by Kosi flood Disaster?**
   a) Never
   b) Rarely
   c) Sometimes
   d) Often
   e) Always

8. **How would you say that you are prepared for Kosi flood in future?**
   a) Not at all
   b) Slightly
   c) Moderately
   d) Very much
   e) Extremely

9. **Which of these steps you have taken in regard to flood preparation? (One or More options)**

   a) I have spoken to disaster management representative in my area.
   b) I have prepared a family emergency plan
   c) I have prepared a disaster survival kit.
   d) I have asked Government officials for help.
   e) I have contact with NGOs that provide emergency services
   f) Others: Please Specify.....

10. **What Information do you get under flood disaster preparedness?**
    a) Food Storage
    b) Disaster prevention drill
    c) Evacuation details
    d) Flood hazard map
    e) Flood fighting instructions
    f) Others: Please Specify.....

11. **How do you come to know about the flood related information?**
    a) Newspapers
    b) Mobile
    c) TV/Radio
    d) Internet/Social Media
    e) Family/ Friends
    f) Government officials
    g) Other: Please Specify.....

12. **Has anyone from the following helped you or your community in preparing the Kosi disaster Plan?**

a) Central/State Government
b) NGO/Voluntary Organization
c) Local Politician or Party
d) Municipality Office
e) United Nations Agency
f) Others : Please Specify……

13. Did your school teach you preparation or mock drill for flood from any other disaster?

a) Never
b) Rarely
c) Sometimes
d) Often
e) Always

14. Do you know about the government schemes for Disaster preparedness and preventions? If yes, Please mention the name ……..

a) Yes
b) No
c) May be

15. In which language do you receive the disaster awareness message?

a) Hindi
b) English
c) Maithili
d) Urdu
e) Other : Please specify ……

16. In which form, you have seen such awareness messages?

a) Jingle
b) Flyer
c) Wall painting
d) Drama
e) Advertisement
f) Others : Please Specify…

17. **Were the messages disseminated by government relevant and helpful in disaster mitigation?**

a) Yes
b) No

18. If No, Please elaborate the problems you faced with message conveyed

……

19. Which medium you prefer for receiving messages related to flood or other disaster?

a) TV/Radio
b) Mobile(SMS)
c) Newspaper
d) Social Media/ Internet
e) Local Government officials
f) Others : Please Specify……..

20. What do you think, awareness messages should be in which form?

a) Video
b) Audio
c) Text
d) Multimedia
e) Other: Please Specify ……..

21. What are the steps you must take in case there is rise in river?

……

22. What are the health threats from flood?

……

23. What do you do if someone suffers from water borne disease during flood?

……

24. What are the ways to communicate flood warnings or water rise to others?

a) Poster
b) SMS
c) Announcements
d) News
e) Government Officials
f) Social Media/Internet
g) Others: Please Specify

25. What will you do if you come to know about water level rise in your village?

a) Alert others
b) Assemble everyone and move to altitude
c) Inform Village head
d) Move with family to relatives
e) Other : Please Specify

26. Any suggestions that you want to share about the disaster campaign being run in your area.

……

……

ANNEXURE- II

(Interview Questions)

The questions asked below are just to fulfill the requirement of the research study to be done in Supaul district of Bihar by Ms. Sweta Rani, Research Scholar, Mizoram University, Aizawl (India). The study is based – "Effectiveness of the Disaster Risk Communication: A Case study on information campaign about flood in Kosi River in Bihar".

1. What are the various means of communication via which government authority communicate with mass people in the block?

2. Do you have any communication plan designed by the govt. authorities to mitigate the impact of flood? If yes, please explain.

3. What are disaster preparedness program being run by the block at present?

4. According to you, which communication medium (TV/Radio/Newspaper/Social Media/Folk Medium) is the best medium to inform and aware people in the block? Why?

5. What are the medium of communication being used by the govt. to aware people about flood?

6. Has any survey been done to check the media habits among the natives in the block?

7. Has ever natural disaster prevention mock drill been organized by the block authority in the block area?

8. Does the school have any subject related to natural disaster management in the academic curriculum? Opinion

9. Does the block authority run any specific health campaign for women health to

combat health issues during flood?

10. In which language, messages are being delivered to people. Does the authority have ever checked the effectiveness of the message among the people?

11. Do you have any kind of possible communication plan to be created as preventive measures for any natural disaster in future?

12. What are plans (Health, Education and Agriculture) being executed during the flood?

ANNEXURE - III

Photographs Taken During the Field Work

Flood Affected Region in Supaul

With one of the respondents

With Block Development Officer of Kishanpur Block

With Block Development Officer of Supaul

With Block Development Officer of Basantpur Block

At Raghopur Block

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+Midtbust%2C+Liv+Gunvor+Hove%3B+Dyregrov%2C+Atle%3B+Djup%2C+Heidi+Wittrup&aqs=chrome..69i57.2623j0j4&sourceid=chrome&ie=UTF-8

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BRIEF BIODATA OF THE SCHOLAR

Sweta Rani is a proficient expert in mass communication, focussing on disaster communication, climate change, and digital media. She is pursuing a Ph.D. in Mass Communication from Mizoram Central University, demonstrating a dedication to research in media and communication. She has attained several academic qualifications, including a Master's in Broadcast Journalism and an M.Phil. in Media Studies from Makhanlal Chaturvedi National University of Journalism and Communication (MCNUJC), highlighting her proficiency in the discipline.

Sweta has held several jobs, ranging from content creation and research to academic duties, thereby constructing a comprehensive portfolio in media and communication. She has served as an Assistant Professor in the Department of Journalism and Mass Communication at IES University in Bhopal and has worked as a Researcher and Content Creator at Limpidstone Technology in Delhi. She presently holds the position of Consultant in Media Communication and Public Relations at the National Institute of Disaster Management (NIDM), where she aids in the development of communication strategies pertaining to disaster preparedness and resilience.

Her academic contributions are extensive, encompassing works on media's role in disaster preparedness, the empowerment of rural women, and health communication. Sweta has co-authored multiple book chapters, encompassing research on social media and crime, the empowerment of rural women, and the health status of the Musahar ethnic group in Bihar. Her scholarly essays have been published in esteemed publications, focussing on topics such as e-waste management and visual communication via Madhubani painting. She notably authored a Scopus-indexed study titled "The Relationship between the TV News Media and Public Agendas on Electoral Issues in India."

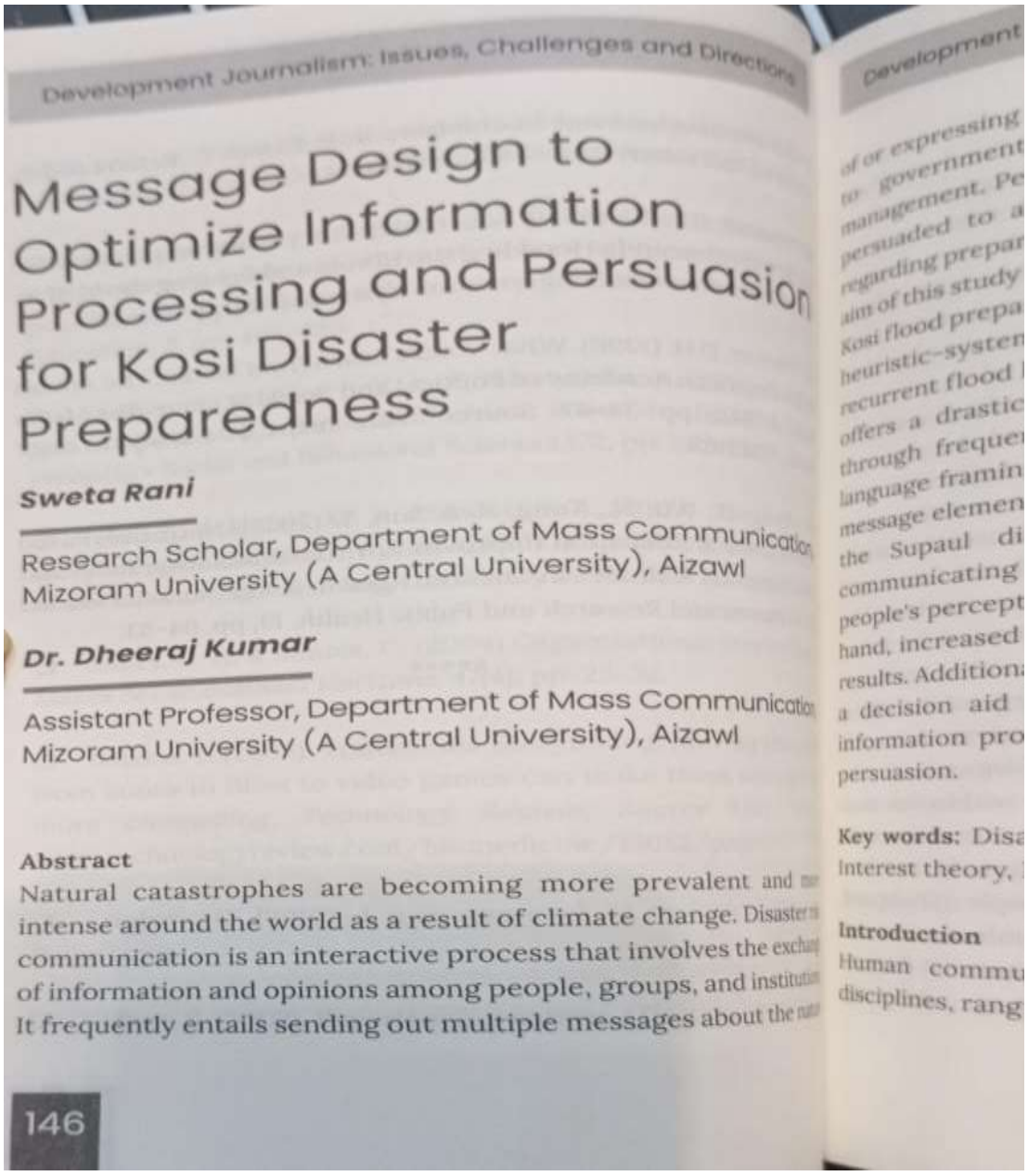
Sweta has diligently showcased her findings at numerous national and international conferences. She delivered presentations on subjects including the influence of media on women's empowerment, transcultural communication via Mithila paintings, and

disaster awareness in children. She has engaged in workshops and seminars including a range of topics, including social science research methodologies, gender equity, and quantitative data analysis. She received the **"Champion of Change"** award for her efforts to women's empowerment in Bihar, awarded by the State Government of Bihar and the Jagran Group. She received the **Best Paper Award** for her research on transcultural communication in Mithila art at a conference organised by Mizoram University.

Sweta's career exemplifies her commitment to enhancing understanding in media communication, especially on societal and environmental issues. Proficient in Hindi and English, she persistently provides significant insights in disaster management, media research, and sustainable development.

PUBLICATIONS DETAILS

Research Paper published as chapter on "Message Design to Optimize Information Processing and Persuasion for Kosi Disaster Preparedness" in the book Development Journalism – Issues, Challenges and Directions, edited by Snehasis Sur and Dr. Uma Shankar Pandey. ISBN No – 978-93-92092-03-9 in 2022.



Development Journalism: Issues, Challenges and Directions

Message Design to Optimize Information Processing and Persuasion for Kosi Disaster Preparedness

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Abstract

Natural catastrophes are becoming more prevalent and more intense around the world as a result of climate change. Disaster communication is an interactive process that involves the exchange of information and opinions among people, groups, and institutions. It frequently entails sending out multiple messages about the nat

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Research paper published on “Strategies for Effective Disaster Preparedness Messaging: A Focus on Persuasion and Information Processing” in UGC CARE listed journal (print) Urban India, vol 44, Issue no. 2 – (July -Dec 2024).

URBAN INDIA
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ISSN: 0970-9045 (Print)

STRATEGIES FOR EFFECTIVE DISASTER PREPAREDNESS MESSAGING: A FOCUS ON PERSUASION AND INFORMATION PROCESSING

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ABSTRACT

The Kosi River, commonly known as the "Sorrow of Bihar," is infamous for its catastrophic floods that impact millions of individuals, resulting in substantial casualties, damage to property, and disruption of livelihoods. Although these floods occur repeatedly, the efficacy of communication initiatives targeting risk reduction and public awareness has not been well investigated. This study is based on the theoretical frameworks of disaster communication, which highlight the significance of providing information that is timely, accurate, and easily available in order to decrease the risk associated with disasters. The study employs a mixed-method methodology, integrating quantitative data obtained from surveys done in five blocks of Supaul district, a very flood-prone region in Bihar, with qualitative insights derived from narrative analyses of interviews with Block Development Officers (BDOs). The study suggests implementing a multi-channel communication strategy that utilises both traditional and digital media, as well as community-based initiatives, to effectively disseminate information to all segments of the population. This research provides useful insights for policymakers, practitioners, and scholars in the field of disaster management, specifically in flood-prone regions such as Bihar, by connecting policy and practice. The study's results have wider implications for disaster risk communication in different situations, emphasising the necessity for adaptable, inclusive, and contextually aware communication strategies that can efficiently mitigate the dangers and consequences of disasters.

Keywords: Disaster Communication, Kosi Flood, Communication Strategy, Effectiveness, Community engagement

INTRODUCTION

Human communication has been studied in a diversity of disciplines, ranging from the early arts of rhetoric over psychology, sociology, anthropology, geography organizations, and computer science to contemporary journalism and marketing. For the millions of Indians who are vulnerable to natural catastrophes such as earthquakes, landslides, floods, wildfires, and other natural disasters, a thorough awareness of the hazards they face is important to ensure they are prepared for disasters and able to recover afterward (Thayyib Sahini, 2010). Disaster risk communication helps achieve this aim by giving individuals with clear information about the risks they encounter, as well as the advantages and costs of various risk mitigation and insurance options. Disaster risk is the likelihood that there will be fatalities, injuries, or destruction and damage as a result of a disaster within a specific time frame.

Applied to risk, disaster communication has been defined broadly as a social process of information ex-change between any entities in society on any form of risk that can be

PAPER PRESENATION DETAILS

Presented paper on “Evaluation of Multimedia Disaster Awareness Programs Among Children” in 2nd International Science Communication Congress and 22nd Indian Science Communication Congress on “Science writing for Journalism and Communication” from 20th and 21st December 2022.

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CERTIFICATE

OF PRESENTATION

This certifies that the oral presentation Sweta Rani

authored by .....

was presented at the 3-day **Media Conference on Development Journalism** organised by Press Club, Kolkata in collaboration with UNICEF, West Bengal from **12 - 14 December 2022** held at Siliguri, West Bengal.

Kingshuk Pramanik
Secretary
Press Club, Kolkata

Snehasis Sur
President
Press Club, Kolkata

Mohammad Mohiuddin
Chief, UNICEF
West Bengal Office

Presented paper on "Kosi Flood Disaster and Women Health: A Case study of Supaul District of Bihar" in National Conference on Reconnaissance of Resilience, Re-emergence, Strengthening, Re-Building of the Nation organized by Aditi Mahavidyalaya, University of Delhi and Sponsored by ICSSR on 17th and 18th January 2023.

ADITI MAHAVIDYALAYA

UNIVERSITY OF DELHI

TWO-DAY NATIONAL CONFERENCE

on

Reconnaissance of Resilience, Re-Emergence, Strengthening, Re-Building of the Nation

on 19th - 20th January, 2023

sponsored by

INDIAN COUNCIL OF SOCIAL SCIENCE RESEARCH (ICSSR)

Certificate

This is to certify that Ms./Mr./Dr./Prof. Sweta Rani of Mizoram University, Aizwal has been invited as a Speaker/ Chaired a Session/ Participated in the Conference/ Presented the Paper titled Kosi flood Disaster and Women Health : A Case study of Bihar in the National Conference organised by Aditi Mahavidyalaya, University of Delhi.

Prof. Mamta Sharma
Patron

Dr. Ritu Sharma
Convenor

Mrs. Neerja Nagpal
Co-Convenor

Presented paper on “Disaster Communication to enhance information processing and persuasion in the international seminar on “New Era of Social Responsibility, Sustainability and Innovations” held on 4th - 6th, March 2024 at Mizoram University.

MIZORAM UNIVERSITY

A Central University established by an Act of Parliament
Accredited 'A' Grade by NAAC in 2019
School of Economics, Management and Information Science (SEMIS)

Certificate of Participation

This is to certify that Mr/Mrs/Ms. Sweta Rani, Department of Mass Communication Mizoram University presented a paper entitled; Disaster Communication to Enhance Information Processing and Persuasion

in the International Seminar on "*NEW ERA OF SOCIAL RESPONSIBILITY, SUSTAINABILITY AND INNOVATIONS*" held on March 4th-6th, 2024 at Mizoram University.

(Prof. BHARTENDU SINGH)
Dean, SEMIS & Convener

Organised by
School of Economics, Management and Information Science (SEMIS)

PARTICULARS OF THE CANDIDATE

NAME OF THE CANDIDATE	:SWETA RANI
DEGREE	:DOCTOR OF PHILOSOPHY
DEPARTMENT	:MASS COMMUNICATION
TITLE OF THE THESIS	:EFFECTIVENESS OF DISASTER COMMUNICATION : A CASE STUDY ON EVALUATION OF INFORMATION CAMPAIGN DURING FLOOD IN KOSI IN BIHAR
DATE OF ADMISSION	:31st August, 2021

APPROVAL OF RESEARCH PROPOSAL

DRC	:17th March 2022
BOS	:27th May, 2022
SCHOOL BOARD	:6th June 2022
MZU REGISTRATION NO	:2200202

Ph.D. REGISTRATION NO.&DATE: MZU/Ph.D./1875 of 31.08.2021

EXTENSION (IF ANY): NA

Prof. V. Ratnamala
Head
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Abstract

The Kosi River, commonly known as the "Sorrow of Bihar," is infamous for its catastrophic floods that impact millions of individuals, resulting in substantial casualties, damage to property, and disruption of livelihoods. Although these floods occur repeatedly, the efficacy of communication initiatives targeting risk reduction and public awareness has not been well investigated. This study is based on the theoretical frameworks of disaster communication, which highlight the significance of providing information that is timely, accurate, and easily available in order to decrease the risk associated with disasters. The study employs a mixed-method methodology, integrating quantitative data obtained from surveys done in five blocks of Supaul district, a very flood-prone region in Bihar, with qualitative insights derived from narrative analyses of interviews with Block Development Officers (BDOs). The quantitative study, performed utilizing SPSS software, evaluates the levels of awareness, sources of information, and changes in behavior among the impacted population. Conversely, qualitative analysis offers a detailed comprehension of the difficulties encountered by local authorities in conveying risk information and the perceived efficacy of these endeavors. Moreover, the study emphasizes the significance of ongoing surveillance and assessment of communication tactics to detect deficiencies and opportunities for enhancement, while also adjusting to the dynamic nature of flood hazards and the evolving communication environment. Ultimately, this study adds to the expanding collection of research on disaster risk communication by offering empirical proof on the efficacy of information campaigns during the Kosi River flood in Bihar. This statement emphasizes the crucial importance of communication in reducing the risks associated with disasters. It also advocates for a comprehensive and community-focused strategy to disaster communication. This research provides useful insights for policymakers, practitioners, and scholars in the field of disaster communication & planning, specifically in flood- prone regions such as Bihar, by connecting policy and practice.

Keywords: Disaster Communication, Kosi Flood, Communication Strategy, Effectiveness, Community engagement