Rural area flood risk management

Understanding the relationship between administrative capacities and flood management in response to floods in Chama district, eastern province, Zambia.

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Acknowledgements

This document marks the culmination of my master's degree program in Environmental and Infrastructure Planning at the University of Groningen in the Netherlands. Inspired by Dutch water management, I decided to further my studies with a particular interest in flood management. I am glad to say my mind has been enlightened by the knowledge I have acquired some of which is presented in this thesis.

As a contribution to the welfare of my country, this study is based on the rural district of Chama in the Eastern province of the Republic of Zambia. Though the district possesses a great capacity for development, floods hamper the progress and movement toward a better living environment. By applying relevant concepts I have learned throughout my studies in the Netherlands, I hope to contribute to a transition in water management. One that will not only focus on physical networks or infrastructure but will also account for those living in them and those that will do so in the future.

I would like to thank the Dutch government for opening the borders for me to undertake this study. The University of Groningen for the dedicated service to ensure I get the best of this opportunity. My gratitude goes to the Erick Bleumink Fellowship for providing the scholarship. I would also like to thank my supervisor, Prof. Dr. Gert de Roo for his impeccable guidance throughout this study. Lastly, my thanks go to my family and friends both near and far for the support and timely encouragement. This is not just an academic product but a reflection of inspiration from the above and I hope that it enriches all who read it.

I wish you a pleasant reading experience.

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Abstract

Rural area development becomes more challenging for governments to undertake when faced with recurring floods. Such is the case for the district of Chama located in the Eastern Province of the Republic of Zambia. Due to its terrain, the Chama district has been on the receiving end of floods and the intensity is projected to increase due to climate change (Chama Town Council, 2021; Lusaka Times, 2019; DMMU, 2022; ZANIS, 2022).

A dilemma for the government arises. On the one hand, the government has to guide rural area development and on the other undertake flood risk management. Because the majority of natural resources are located in such areas, the government has to sustainably use these with consideration of the next generation (Green, 2013, p. 3&5). At the same time, if not handled well, extensive use of these resources could intensify climate change impacts, particularly floods.

The government is mandated to ensure public safety and as such, this includes protection from disasters including floods. In order to carry out this function, the government employs several means to actualize governance innovations or in other words, administrative capacities. These capacities include delivery, coordination, regulation, and analytical (Wegrich & Lodge, 2014). They are implemented using resources that make it possible to apply them to problem-solving practices. The resources are the treasure, organization, authority, and information respectively. Furthermore, these capacities are used in the implementation of flood risk management which involves assessing, evaluating, and treating flood risk (Franzi, 2012). Risk treatment presents three optional courses of action; Risk reduction through structural and non-structural measures, risk transfer which involves transferring the cost of losses to another party, and risk retention involving accepting, adapting, and living with flood impacts (Franzi, 2012, p. 249). Though studies have been undertaken on administrative capacities and flood risk management, there has been no study linking the two in a rural area context. This study pursues an understanding of the relationship between the two and seeks to answer the question;

'What is the impact of the relationship between governmental administrative capacities and flood risk management in the rural area of the district of Chama?'

Due to the non-experimental nature of this inquiry as well as a lack of control over environmental conditions and government response action, this study takes on a multiple-case study approach (Yin, 2018, p. 43). Four other rural districts have been selected to be studied alongside the Chama district; Charsadda district in Pakistan, Lakhimpur district in Assam state in India, Nilphamari district in Bangladesh, and Tsholotsho district in Zimbabwe. Flood events over the past decade were studied. Information was gathered through literature and desk studies. Spatial analysis was done using ArcMap 10.08 for spatial contexts and Atlas.TI was employed for policy analysis. Policy analysis was undertaken to analyze the application of administrative capacities in prescribed functions at district level within policy documents and the actual actions taken in response to flood impacts. Due to time constriction, interviews were not conducted in this study.

The five cases were investigated based on the theoretical framework of flood risk management and administrative capacities. Following the analysis, inferences were made to establish the meaning of the results. Findings showed that coordination capacity had the most influence on response action and was supported by the others. Contextual factors such as terrain and climatic conditions played significant roles. Governments implemented risk retention measures the most with instances of risk reduction through the construction of structural measures such as dams and embankments applied by the government of Pakistan, India, Bangladesh, and Zimbabwe. Recommendations included incorporating traditional adaptation systems of knowledge (Kipgen & Pegu, 2018, p. 308) into flood risk management in an area-oriented collaborative approach (Heeres et al., 2012; Allmendinger, 2017, p. 241; de Roo et al., 2020, p. 1). For further studies, including interviews would help give deeper insights into district response action as well as the institutional perspective to flood risk management at district level.

List of abbreviations

GHG Green House Gas(es)

DMMUDisaster Management and Mitigation Unit

GIS Geographic Information Systems

QDA Qualitative Data Analysis

USGS United States Geological Survey

ENSO El Nino/Southern Oscillation

DNPW Department of National Parks and Wildlife

NGO Non-Governmental Organization

IRC International Rescue Committee

PVDP Pakistan Village Development Program

EPS Environmental Protection Society

HEADS Health Education and Development Society

WASH Water, Sanitation and Hygiene

PWD Public Works Department

ASDMA Assam State Disaster Management Authority

CWC Central Water Commission

NESAC North Eastern Space Application System

NDMA National Disaster Management Authority

PGI Protection Gender and Inclusion

BDRCS Bangladesh Red Crescent Society

NDWRT National Disaster WASH Response Team

MPCG Multipurpose Cash Grants

CEIP Coastal Embankment Improvement Project

UNICEF United Nations Children's Fund

BWDB Bangladesh Water Development Board

FFWC Flood Forecasting and Warning Center

PDMC Provincial Disaster Management Committees

DDMC District Disaster Management Committee

SDMC Satellite Disaster Management Committee

NDMA National Disaster Management Authority

PDMA Provincial Disaster Management Authorities

DDMA District Disaster Management Authority

SDMA State Disaster Management Authority

NDMC National Disaster Management Council

NCPC National Civil Protection Committee

POCP Provincial Organization of Civil Protection

AOCP Area Organization of Civil Protection

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1. INTRODUCTION

While floods have been an occurrence in times past, the magnitude with which they occur has intensified (Restemeyer et al, 2015). Climate change has played a significant role in the exacerbation of natural disaster magnitudes and impacts (Sadiq and Graham, 2016). The escalated magnitude is attributed to high anthropogenic emissions of greenhouse gases (GHG). As a result, this has led to the warming of the atmosphere and oceans, diminishing the amounts of snow and ice, and rising sea levels (IPCC, 2014). Rainfall patterns have since changed following the rise of seawater levels: For areas prone to tropical storms and cyclones, the rise of water levels is like fuel added to a fire. As observed in the first quarter of the year 2022, tropical storm Ana and Cyclone Batsirai from the Indian Ocean and Mozambique channel reeked chaos over Madagascar, Mozambique, Malawi, and Zimbabwe. Weaker storms Dumako, Emnati, and Gombe followed these, leading to further flooding and fatalities (Otto et al., 2022).

Floods not only affect physical localities; they also affect the socio-economic status of regions and countries entirely. They disrupt any economic or industrial activities and public services undertaken within the affected locality. Floods extract an expensive toll on area development. The estimated cost over the period 1967 to 2005 in Australia amounted to an average of $377 million Australian dollars per year (Queensland Government, 2023). In Mozambique, the circulation system or cyclone Ana left an estimated 180,800 people affected, and 207 people were injured, including at least 38 deaths in addition to 70,982 hectares of land flooded (OCHA, 2022a; 2022b). Conversely, Malawi had approximately 871,000 affected people and over 22,000 displaced (UNICEF, 2022). In terms of infrastructure, the floods destroyed over 7,700 homes, and 2,457 classrooms, flooded 70,982 hectares of land, disrupted 23 water supply systems, and damaged 144 electric power line poles, as well as 2.275 km of road (Otto et al., 2022).

The destruction and fatalities caused by floods lead to other problems for the government to solve: Local authorities have to address issues of vulnerability due to the rise of needs to be met, and work to establish risk management capacities while at the same time building resilience to the natural disaster (OCHA, 2022a). In addition to the aforesaid challenges, the government has to handle social disputes such as the Mozambique armed conflicts in June 2022 (OCHA, 2022a). Food insecurity, rise in criminal activity, escalation of

tension levels, and threats to public safety and security among others all fall to the government as matters needing urgent intervention. Subsequently, this leads to stunted development within the affected areas and is most intensive in rural areas.

Governments worldwide have worked on developing remedial measures and interventions for both floods and climate change-related effects. In an effort to curb flooding, governments have resorted to several types of interventions both structural and non-structural in nature; These include constructing structural defenses like dams and dykes, non-structural measures such as warning systems and education, borrowing financial resources, acquiring insurance, cross-border river basin management, collaborative decision making, and international aid (Hansson et al., 2007). While the spectrum of solutions to flooding is wide, this study narrows the focus down to rural area local authority jurisdiction and the measures implemented within their means or administrative capacities.

1.2. Background of Chama district

Located in the Eastern Province of Zambia, Chama district has been a victim of recurring floods with the most severe events recorded in the south constituency. The district is one of Zambia's largest districts covering an area of approximately 17,630 square kilometres. The district is located in the Eastern Province and stretches between latitudes 100 15′ to 120 10′ south and longitudes 320 40′ to 330 10′ East (Chama Town Council, 2021).

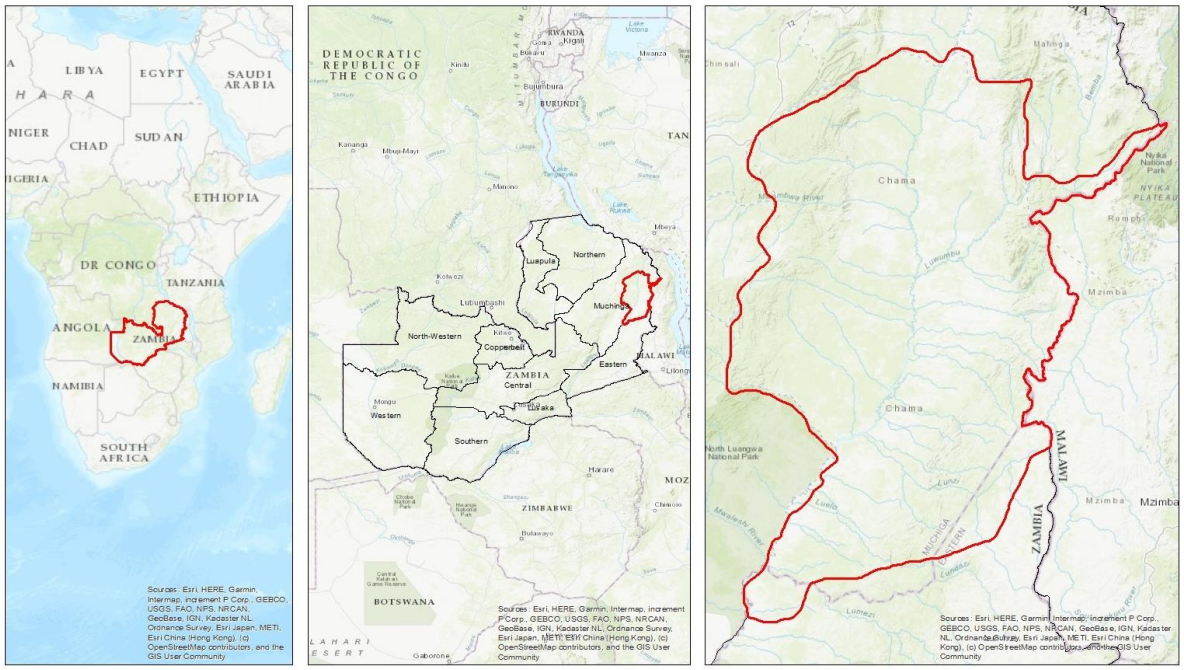

Fig. 1 Location of Chama district

The entire district is within a game management area with altitudes from 350m to 640m above sea level. It is divided into two constituencies namely Chama North and Chama South and has a collective total of twenty-four (24) wards. The Muchinga escarpment is also a significant part of the district terrain with an altitude of 1,200m above sea level (Chama Town Council, 2021). Due to its geographical nature, floods in the south constituency are mainly attributed to runoff rainwater from the upper lands of the north constituency. The most recent flooding events recorded were in Vilimukulu and Lunzi wards in the first quarter of the year 2022 (ZANIS, 2022). Prior to that were the floods in Maphamba and Vilimukulu wards in January 2019 (Lusaka Times, 2019). The floods left behind an accumulative impact of four fatalities, destroyed 377 houses, damaged a bridge, lost livestock, and washed away fields of crops.

In response to the catastrophe, the government through the Disaster Management and Mitigation Unit (DMMU) and the office of the District Commissioner for Chama district provided aid with temporary shelter and food supplies. The area Member of Parliament lobbied for aid from the government (ZANIS, 2022). The unfortunate event left Manga and Mkanda villages submerged in water. Some of the areas were left inaccessible due to the washed-away bridge and road damage. An additional challenge was the lost harvest that was swept away posing a threat of food insecurity. Not only were local residents left vulnerable to weather conditions, but they were also exposed to wildlife. The Luangwa

River is one of the major rivers in the country flowing through the district from the north to the south. Its waters are infested with crocodiles and hippos (Chama Town Council, 2021; Actalliance, 2018a, p. 1). With the extended coverage provided by the floods, the probability of local residents coming into contact with these species was increased. The responsibility to ensure public safety relied on the local authority's administrative capacities.

1.3. Background of the research and problem definition

Despite the unpleasant eventualities of natural calamities, it is astonishing to observe the persistence of residents resorting to continuing to settle in such areas (Douben, 2006). The local authority is mandated to create and sustain public safety among other duties. As a result, this places a demand on the government through the local authority to guide development in a climate-adaptive manner that also ensures public safety. This means local authorities must manage the risk of floods. A question then arises; Is the local authority able to do so? Flood protection and the development of the Chama district are reliant on the local authority's ability to solve the problems that come with both tasks. Doing so involves 'problem-solving capabilities' as put by Lodge and Wegrich (2014). While there exist studies on governmental administrative capacities and flood risk management, there has been no connection made between the two, particularly in the context of a rural area such as the Chama district. Understanding the relationship between administrative capacities and the concept of flood risk management in rural areas such as Chama will help give insight into how best to address floods and rural development.

1.4. Societal and scientific relevance

While government interventions provide relief in flood instances, the response is highly fragmented as the national authorities such as the DMMU attend to disasters nationwide. In light of long-term issues such as urbanization, population growth, and climate change, there is a need to establish what is the impact of the local authority on flood risk management. While studies on administrative capacities (Wegrich & Lodge, 2014) and flood risk management (Franzi, 2012) have been undertaken, there has been none linking the

two, and more so in a rural area context. Based on Wegrich and Lodge's (2014) study on government administrative capacities, this study looks into how these capacities relate to flood risk management in the rural district of Chama. By undertaking this study, a knowledge gap in the relationship between administrative capacities and flood risk management in the aforementioned rural area will be addressed.

Investigating this relationship will contribute to creating a path for development in the presence of flood risk. Furthermore, an area-oriented (Heeres et al., 2012) planning approach will be explored. With regard to institutional cooperation within the district, this study seeks to appreciate the implications of a collaborative approach to flood risk management in Chama district (Allmendinger, 2017, p. 241). This is in an effort to identify possible options for optimizing the potential capacity of the local authority and other government departments to efficiently and effectively manage floods in the district.

1.5. Research questions

A multiple case study is undertaken to establish a generic understanding of the relationship between the two concepts. Taking into consideration that the government systems are context-dependent, this study seeks to establish an answer to the main research question:

'What is the impact of the relationship between governmental administrative capacities and flood risk management in the rural area of the district of Chama?'

The answer to the main question will be obtained by exploring and investigating the following secondary questions:

1. *How can a theoretical perspective on administrative capacities in flood risk management be conceptualized?*
2. *What is the implication of the physical and institutional context in flood risk management?*
3. *How can the adoption of an area-oriented approach in flood risk management influence rural development in the Chama district?*
4. *What are the possible implications of employing a collaborative approach in flood risk management in the case of the district of Chama?*

1.6. Research outline

For the purpose of clarity, the following reading guide has been provided. This study constitutes 6 chapters. Following the introduction in the first chapter above, the theoretical framework is covered in Chapter 2. Concepts on which this study is based will be introduced and their relevance to this study will be elaborated.

Chapter 3 covers the methodology where the research method and research design will be discussed. In this chapter, reasons for the choice of approach will be highlighted as well as the means of data collection, data analysis, and research ethics.

Subsequently, Chapter 4 dives into the multiple cases outlining the gathered data. Based on the concepts introduced in chapter two, the cases will be presented with individual descriptions of their contexts.

Following the case introductions, Chapter 5 involves the results of the analysis of the collected data. Inferences made based on the covered theoretical concepts will be explained therein.

Last but not least, Chapter 6 will sum up the study with a discussion and conclusion on the findings of the study. Here the answers to the research questions, the limitations of this study, and recommendations for future research will be discussed.

2. Theoretical Framework

2.1. The nature of floods

While there are many ways of describing floods, a simplified perception of a flood is an overflow of water spreading across normally dry territories (Earth Networks, 2023). A more in-depth description would be an occurrence as a result of a disruption in the natural water cycle caused by an increase in precipitation leading to an overflow of water spreading beyond its normal natural geographical boundaries (SEPA, 2015). Another cause of floods could be other factors such as climate change or physical water system malfunctions or errors in spatial planning regarding channelization (Jonkman, 2005; Opolot, 2013).

Floods are one of, if not, the most common natural catastrophic weather event. With varying dynamics that are dependent on several factors, floods differ in the way they may occur; They can range from shallow levels of water to significantly higher heights and magnitudes happening both gradually and rapidly (Earth Networks, 2023). The magnitude is dependent on factors relating to the flood itself and or the flooded area. For instance, flood storms are a result of changes in the natural water cycle and rapid flash floods could be facilitated by weaknesses in a city's drainage system (Jonkman, 2005). Floods are complex in nature and their impacts are context dependent: Locational characteristics such as emergency response systems, population density, and land use among others play vital roles in the outcome of the event (Jonkman, 2005).

2.2. Implications of Floods on rural development

Rural Development

Rural areas are arguably the backbone of most economies because of the significant roles they play. A high priority is placed on these areas for a number of reasons: Rural areas tend to be the source of national food supply, residents are often custodians of national natural resources, and are at times the hosts of industrial activity (Green, 2013). As Green (2013) pointed out in his work, social and environmental justice issues may arise if these areas are neglected and subjected to uneven development with urban areas. In addition,

the pursuit of public services and amenities mostly accessible in urban areas is a catalyst for rural-urban migration: Residents in rural areas are equally interested in access to major road networks and urban centers (Tomaney et al., 2019). Furthermore, the sensitivity of rural areas demands a balance of agricultural and forestry activities, control of natural resources and amenities, safeguarding biodiversity, and most importantly, establishment of climate change mitigation and adaptation measures (Tomaney et al., 2019).

Development as defined by Green (2013) entails the creation of conditions that give individuals the capacity to improve their quality of life through institutional change. By focusing on institutional change, the definition is not limited to material conditions such as wealth and income as measures of development. To add to this basis, this definition takes into account not only the development of the current generation but also the development of the one to come (Green, 2013).

There are four types of development stated in Green's (2013) work: Amenity-based, entrepreneurship, cluster, and regionalism development. Amenity-based development is founded upon the economic industrial activity reliant on natural resources in a rural. Secondly, entrepreneurship development emerges as a result of the limited availability of public amenities and public service facilities. The third, cluster development, involves an interdependence of businesses and institutions. A relationship based on complementarities and commonalities. Transportation is one of the key aspects of this kind of development. Lastly, regionalism emphasizes the scale of development connecting rural communities spanning over regions. Similar to interdependence, this type is often the product of not only shared interests but also shared challenges. Floods disrupt rural development and affect surrounding areas reliant on economic networks with neighboring districts and regions. Furthermore, rural development requires the consideration of surrounding special functions as well as the collaboration of all parties concerned.

AREA ORIENTED APPROACH

Borrowing a leaf from the Dutch area-oriented approach, area development must be holistic incorporating a complex range of needs, requirements, and possibilities (Heeres et al., 2012). In their work, Heeres et al (2012) explored the shift of road infrastructure planning from line-oriented to area-oriented planning. In other words, the shift from focusing on just the planned object to all surrounding elements and spatial functions connected to it. They describe this approach as an innovative way to incorporate other spatial policy sectors

namely housing, recreation, business, nature, water, and agriculture among others. From the institutional perspective, this approach is meant to foster the development of shared visions as well as collaborative efforts based on created networks of actors with intersecting interests in order to address uncertainty in planning (Heeres et al., 2012, p. 148).

An area-oriented approach counter acts the limitations of the line-oriented taking into account the vital aspect of sustainability. Sustainability implies meeting current developmental needs without compromising the capacity of the next generation to meet their own (Heeres et al., 2012, p. 149). The area-oriented approach combines the economic, social and ecological growth and development aspects. By taking into consideration the context or characteristics and prerequisites of specific areas, area-oriented planning combines top-down sustainable development policy objectives with bottom-up interpretations of the area situation through area-specific developments (Heeres et al., 2012). Heeres, et at., (2012) conclude that the implementation of the area-oriented approach is two dimensional: the first dimension being functional spatial plans and designs, and the second regards institutional organization providing structure to inter-actor collaboration with realistic considerations of money and time constraints. While this approach is based on the Dutch transport network and its development, the principles of cross-sectoral collaboration and synergies are applicable to addressing other issues such as flood risk management. This study looks at how this approach could be incorporated into addressing floods in the district of Chama as well as the possibilities of enhancing the planning process.

COLLABORATIVE PLANNING

In response to the highly unpredictable and uncertain future events, collaborative planning comes into the picture to help foster a common ground for society to collectively make sense and plan for the future amidst uncertainty (Allmendinger, 2017, p. 241). In times past, governments relied on technical-instrumental approaches to planning based on the assumption that certainty was easily attainable (de Roo et al., 2020, p. 1). However, long-term changes such as urbanization, climate change, and socio-economic, including demographic change (Wardekker, 2021, p. 4) has shown that this idea of designing living environments on demand is now obsolete.

Issues to do with environmental protection (Lafferty & Hovden, 2003, p. 6), fragmented courses of action, and multiple interests from multiple stakeholders (Van der Brugge et al.,

2005, p. 165) have drawn attention to the need for change in approaches to many issues including rural flood risk management. With the majority of natural resources being located in rural areas, environmental protection must be treated as a priority even over the course of the much-needed development. Governments have to deal with flood impacts on the one hand and development in a sustainable manner on the other. With regard to sustainability, there is a need to address contradictions and inconsistencies within policies (Lafferty & Hovden, 2003). Swift responses are often impeded by conflicts among policies which in turn intensifies the impacts of disaster (Wardekker, 2021, p. 6). In addition to contradicting policies, it becomes a challenge to attain a mutually supportive policy environment with shared benefits (Lafferty & Hovden, 2003, p. 6). Sectors often have individual aims and objectives with dedicated resources that tend not to cater to external goals. This makes it challenging to undertake cross-sectoral collaboration due to undefined roles and responsibilities as well as resource management, resource distribution, and accountability. Aside the institutional challenges, sectors may vary in how they prioritise environmental protection. A lack of coherent prioritization of protecting natural resources may lead to environmental degradation in the name of development. Collaborative planning presents an opportunity to address these challenges.

Planning for the long term amidst uncertainty is best handled collaboratively. Through the inclusion of multiple sectors and stakeholders in the process of knowledge production and policy creation, a shared understanding of the faced issues is cultivated and enhanced (Söderholm et al., 2018, p. 1384). As a result of the mutual learning and built capacity among involved parties, a possibility for adaptive management or adaptive planning is established. Adaptive planning as an approach deals with enhancing the positive effects of processes of change while minimizing the negative effects (de Roo et al., 2020, p. 3). On one hand, using this approach may lead to the incorporation of concrete interventions into the physical environment to either speed up or slow down processes of change. On the other hand, this approach may lead to supporting actors so as to adapt to the changes taking place. Borrowing from the Dutch water management approach, concepts such as transition management help illustrate adaptive planning and its aid in response to change (Van der Brugge et al., 2005, p. 167). With a combination of the multi-level concept of governance, transition management prescribes the pathway to adapting to long-term change in water management. Through redefining how the three levels of government (macro, meso, and micro) function and interact with each other, multiple actors and

concerned parties are brought together to learn and evolve in ways of water management. Applying this approach to rural area flood risk management creates the possibility for enhanced adaptation to climate change and other long-term challenges.

2.3. Rural areas and climate change

CLIMATE CHANGE

Climate change is a notion that was discovered and developed by the pioneers of the early 19th and 20th centuries: The likes of Joseph Fourier, John Tyndall, and Svante Arrhenius. Their collective work over the years helped formulate the understanding of climate change and global warming as a result of accumulated heat in the Earth's atmosphere (The Economist, 2019; Rodhe et al., 1997; Fleming, 1999; Jackson, 2020). Thanks to the foundation built on their work, definitions for the phenomena of climate change and global warming have been put in place.

Arising from the theories of the scientists mentioned above, global warming entails the rise in the average surface temperature of the earth due to an increase in greenhouse gas concentration in the atmosphere (UNDP Global, 2023). While the absorbed heat by these gases is what causes this temperature rise, it is the emission of GHGs that increases the atmosphere's capacity to absorb heat. Furthermore, the long-term effect of global warming paved the way for the prominent issue on many government tables today, climate change. Climate change implies alterations in natural climatic systems and weather patterns as a result of the temperature increment. This makes it difficult to predict the weather, disturbs ecosystems, and creates extreme weather events such as highly intense hurricanes, forest fires, sea level rise, droughts, and as discussed in this study, floods (UNDP Global, 2023; United Nations, 2023, Earth Networks, 2023).

Storms have become more intense as a result of the increased evaporation and accumulation of water in the precipitation cycle. In addition to heavier rainfall, strong winds have been noted to accompany these storm systems causing severe floods, cyclones, hurricanes, and other natural disasters (UNDRR, 2019; UNICEF, 2022; OCHA, 2022a; 2022b; United Nations, 2023).

IMPLICATIONS OF CLIMATE CHANGE ON RURAL AREA DEVELOPMENT

Because of the lack of sustainable energy sources, rural areas are mostly dependent on natural resources for their day-to-day energy needs. Inevitably, the combustion of materials such as wood leads to the emission of harmful Green House Gases (GHGs) (Thomas et al., 2022, p. 192). This creates a dilemma: on one hand, residents rely on wood for cooking and other economic activities, and on the other, deforestation contributes to the exacerbation of climate change impacts such as flooding. In addition, residents suffer from air pollution-related illnesses because of the inhaled emitted black carbon, carbon monoxide, methane, and other ozone-depleting gases.

Rural areas are susceptible to stunted economic growth due to climate change impacts. Natural catastrophes such as floods, droughts, cyclones, waterlogging, and riverbank erosion among others place a huge demand on rural economies (Bari et al., 2022, p. 175). Following the occurrence of floods, the destruction of vital public amenities such as road infrastructure is a major setback. Reconstructing or restoring damaged infrastructure comes at great costs. Mobility and economic transactions are also disturbed. Such was the case in Chama South Constituency in the district of Chama after the 2022 floods (ZANIS, 2022).

In light of the fairly young economies, rural areas stand a risk of falling into a system lock-in (Meadowcroft, 2009, p. 329). Due to the nature of reoccurring floods, such areas rarely have the time to recover economically. This, in turn, subjects them to rely on government intervention, maintain unsustainable environmental practices, or continue to depend on foreign aid (Mahmud et al., 2021, pp. 310-311). Without a good alternative to the experienced recurring vulnerability, local residents opt to maintain past economic activities to survive. Such is the case for the residents of Shyamnagar, a rural area located within a 10km buffer area past the Sundarban Reserve Forest shared between India and Bangladesh (Amin & Shammin, 2022, p. 71) Subsequently, this will cause prolonged vulnerability for the next generation who will have to depend on the same yet depleted natural resources.

Another factor is the dilemma of meeting the needs of the current generation while safeguarding the environment for the next generation to use. Factors of economies of scale, weak environmental profiles, and external effects come into play (Zuidema, 2016). Economies of scale entail multi-level governance (Macro, Meso, and Micro) and access to resources such as expert knowledge in the execution of government functions. Due to a lack of sufficient capacity, rural areas may not always have access to specialized knowledge or expertise to help address flood and climate impacts. However, just as in urban areas, implementation of national policies is expected of all governmental jurisdictions. This leaves

rural areas at a disadvantage in comparison to further developed areas with stronger economic influence. Weak environmental profiles refer to the difficulty to place a value on the environment. Not knowing the worth of natural resources inevitably leads to their misuse and depletion. Similar to a chain reaction, this leads to external effects which imply suffering the consequences of actions done outside the area of jurisdiction. Mass deforestation and cultivation along river banks in the upper land affects the naturally controlled flow of river water. This in turn intensifies the flow of rainwater down to the lower lands as is the case of the district of Chama.

From the identified implications, this study proceeds to look into possible responses rural areas can explore in order to mitigate climate impacts.

2.4. Administrative Capacities and rural area flood risk management

Flood Risk Management

As a general approach to dealing with floods, flood risk management entails all efforts made to avoid and reduce flood impacts: Efforts made are based on the aspects of flood prevention, protection, preparedness, as well as flood forecasts, early warning systems and the physical context (Franzi, 2012, pp. 233-234). In their work, Sayers et al., (2013) point out that flood risk management is a distinct and continuous process of adaptation. Furthermore, it is not merely an 'implement and maintain' approach based on traditional flood defence philosophy (Sayers et al., 2013, p. 5). Observations in times past show that flood management was mainly based on attaining reduced flood probability through implementing substantial structural defence mechanisms such as those of the Netherlands in Rotterdam, Huai River in China, or New Orleans in the United States. However, acknowledgement of non-structural measures as significant contributors to flood risk reduction is gaining recognition. Non-structural measures are basically measures that are not physical in nature. In other words, they are not infrastructure in nature. These non-structural measures encompass actions to reduce people's exposure to flood impacts as well as local economies and ecosystems such as the planning control in Cape Town South Africa; Other actions are aimed at vulnerability reduction through implementing safe havens, enhanced warning and evacuation planning, as well as timely flood forecasts (Sayers et al., 2013, p. 5). In addition to this, Franzi (2012) points out that implementing

these measures is challenging particularly because of the multidisciplinary nature of flood risk management: Strategies are a collaborative effort of practitioners and decision makers from different disciplines such as hydrology, geology, structural engineering, economics, politics, as well as social sciences. More on collaborative efforts is elaborated on in the collaborative planning section further on. Having appreciated an overview of flood risk management, this study takes a closer look into this approach, particularly at the risk aspect and its relevance.

Risk as an aspect of flood risk management, is a crucial factor in the decision-making process (Sayers et al., 2013, p. 4). It is associated with loss, the likelihood of flood occurrence, phenomenal intensity, the extent of the aftermath, and vulnerability (Franzi, 2012, p. 238). Franzi (2012) describes risk as:

"Potential losses associated with a hazard or an extreme event to a given place within a given period of time, which can be defined in terms of the adverse consequences (damage/losses) and the probability of occurrence".

Furthermore, this study looks into the aspect of risk and its composition. Some studies have shown that risk is the product of flood hazard and flood vulnerability or probability and consequence (Opolot, 2013, p. 1886; Sayers et al., 2013, p. 24). Other studies have added a third component of exposure (Franzi, 2012, p. 239). Risk has therefore been represented in a formula as:

$$\text{Risk} = \text{H x V x E}$$

Where H denotes hazard, V is vulnerability and E is Exposure.

Hazard entails the probability of occurrence of a flood in a given area, in a given time frame or period. Vulnerability relates to the extent of loss as a result of a flood taking into consideration the intensity of the flood. Lastly, exposure refers to all elements or components that are potentially subject to being lost as a result of the flood.

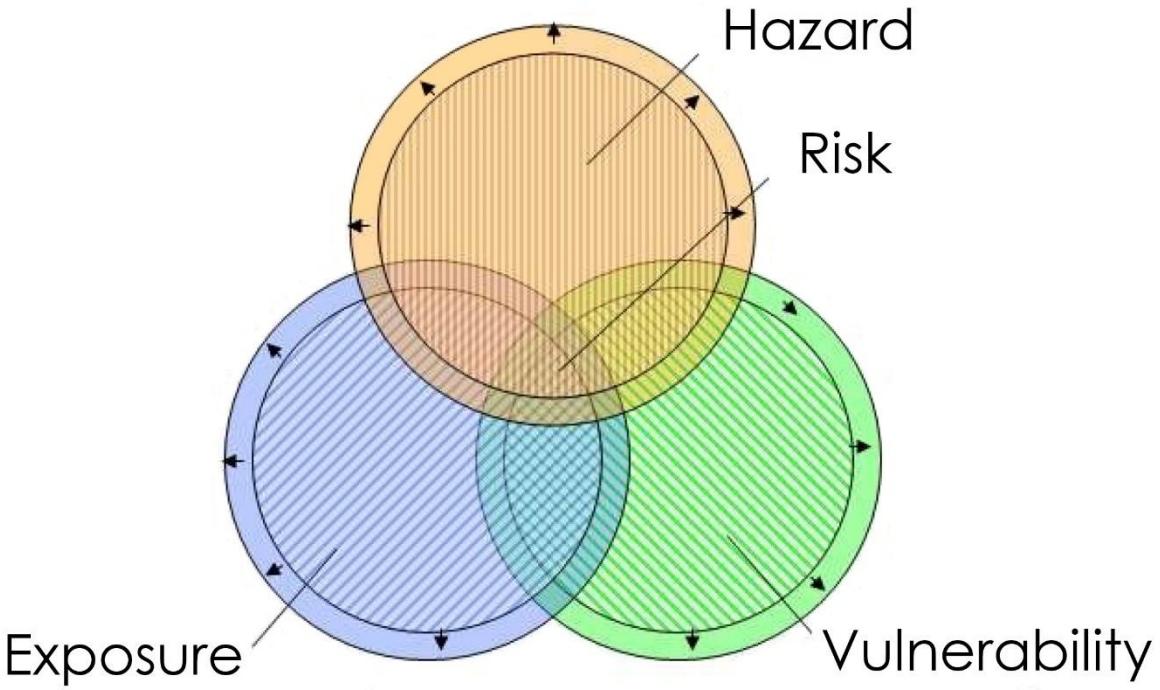

Fig. 2 Depiction of Risk and the elements that constitute risk. The arrows illustrate the effect of increase of hazard, exposure, and vulnerability (Franzi, 2012, p. 240).

Appreciation of the flood risk paves way for risk management. Risk management is a collaborative effort to coordinate action is response to the established risk (Franzi, 2012, p. 240). Initially, the potential of the risk has to be attained. Subsequently, the attained scope or extent of risk becomes the basis to guide responsive action. Franzi (2012) describes three instruments used in managing risk: Risk assessment, Risk evaluation, and Risk treatment.

RISK ASSESSMENT

Risk assessment deals with the estimation of the hazard, exposure, and vulnerability. Estimating the hazard is a three-step process: it involves firstly determining the flood design of a given location through the regression of available data or modelling hydrological processes. Next comes the task of hazard mapping to outline the potential flooded area. The last step is hazard ranking which involves mapping out the different hazard levels. Difference is hazard levels is determined by the depth, flood duration or water velocity (Franzi, 2012, p. 242).

Estimation of the exposure is dependent on the hazard levels, variation of exposure in time including uncertainty. The basis of estimating the exposure is identifying the overall number of receptors (Franzi, 2012, p. 245). Receptors refer to all societal elements susceptible to flood impacts; These can be static receptors such as infrastructure and dynamic receptors such as people, mediums of transport, wildlife or any other mobile elements (Sayers et al., 2013, p. 51). One of the common tools used for producing an overlaid representation of identified receptors is Geographic Information Systems (GIS). The overlaid representation is a combination of various spatial and socio-economic information based on the area subject to flooding (Opolot, 2013). The assessment includes Information such as residential housing, population statistics of residents, employees working in the affected area, commercial and industrial entities, and all other facilities or amenities within the area. Gathering this information is a collaborative effort among entities such as national statistics organizations, municipalities, and local administrations.

There exists a thin line between vulnerability and exposure. The main difference is that while exposure relates to the number of affected parties or receptors of an impact within a given locality, vulnerability relates to the repercussions to those directly affected both within and outside the location as a result of the impact. Vulnerability encompasses the structures, communities, and goods as well as their capacity to resist or recover from the impacts (Franzi, 2012, p. 244). Others have related vulnerability to physical, social, economic and environmental conditions that make given localities more susceptible to flood hazards (Opolot, 2013, p. 1886). Arising from the fact that each receptor is different in how it reacts to flood impacts, vulnerability comprehensively deals with the complex interconnections of communities, individuals, and structures including their capacities to surmount disasters (Franzi, 2012, p. 244). Three conditions are crucial for assessing vulnerability: First, the physical or material conditions relating to the quality of construction material and structural integrity as well as the physical state of residents within the area. Structural factors come into play such as infrastructural designs, building materials, lack of maintenance works, and dilapidation. The physical status of residents' concerns issues such as diet, predominant diseases, physical abilities, and age. Second is the organizational condition which deals with interconnections, structures, and management of communities. This relates to leadership structures, dissemination of information, local representation, preparation for unexpected disasters, and related matters. Lastly, attitudinal conditions refer to local culture and public awareness. Factors such as community resilience and dependence on external support are

cardinal in this condition. In an event of a flood, local cultures will determine how people will respond and cope with the impacts (Opolot, 2013). The study will investigate the Chama district local authority's efforts to undertake rural risk assessment.

RISK EVALUATION

Following the risk assessment, a technical process is undertaken to establish an acceptable level of risk. Doing so involves the collaboration of practitioners and specialists from various fields who will help determine what it will take to attain complete protection against the assessed risk. Risk evaluation is achieved when the measures for total risk elimination are weighed against what is prudently economically, ecologically, and socially achievable (Franzi, 2012, p. 246). The evaluation involves both technical and social advice for the purpose of advising decision makers on what is scientifically, economically, ecologically, and socially acceptable and tolerable. Technical instruments and methods such as flood risk mapping are particularly crucial for risk evaluation. Through the use of remote sensing and GIS, information on affected areas is made available on which to make informed decisions; Governments, Nongovernmental organizations, and other planning entities are advised on areas to prioritise (Opolot, 2013, p. 1888). Subsequently, this aids the evacuation exercises and the provision of relief. Information such as deteriorated road sections, crossing points, and amenities prove to be of great value in such instances. As is the case of the rural risk assessment, this study will explore the Chama district local authority's efforts to evaluate flood risk.

RISK TREATMENT

Following risk assessment and risk evaluation is the determination of the course of action or in other words, risk treatment. Franzi (2012) describes three forms of risk treatment; risk reduction, risk transfer, and risk retention. The first relates to prevention and protection from risk and involves the application of measures that reduce the three risk factors that is hazard, exposure and vulnerability. These may take the form of structural (Canalization, Levees and dams) or non-structural interventions (Community resilience building and promotion of climate adaptive behaviour) (Liao, 2014, p.724; Wardekker, 2021, p. 6). Risk transfer or sharing concerns relaying risk to other parties through instruments such as

insurance policies. Through financial incentives provided by such policies, victims subscribed to such interventions may recover post disasters using these interventions (Franzi, 2012, p. 249). Although this course of actions provides a relief during disaster, it cannot mitigate the impacts completely. The final type of action under risk treatment is more of an adaptive mechanism in which societies learn to live with the impacts that remain after risk reduction and risk transfer. Such an approach is described by Franzi (2012) as risk retention. It becomes therefore imperative that governments play the vital role of informing residents on these residual impacts and foster an environment that encourages adaptation. The rural area context will be studied to identify how the local authority undertakes this component of flood risk management. Doing so will establish a picture of the rural area local government's position in handling floods.

CONDITIONS AND CONSTRAINTS OF FLOOD RISK MANAGEMENT

Having looked at flood risk management as a response approach to flooding, the following section looks at conditions that support flood risk management as well as its constraints. Based on the work of Sayers et al (2013), there are six conditions that enhance the successful implementation of flood risk management; Organizing tasks and funding, consistent coordination with other plans, adaptive management programme establishment, risk communication, collaborative work and stakeholder outreach, and lastly the institutional and legal framework. Constraining factors include inadequate capacity for plan adaptation, financial deviations, alterations in political leadership, alteration of national priorities, alterations in physical conditions or availability of resources, and lack of clarity on maintenance responsibilities (Sayers et al., 2013, p. 112).

On the hand of successful flood risk management, the first condition relates to the outline of the implementation process. Organizing tasks and funding aids in promoting the feasibility of flood risk management within a specific time frame and available resources (Sayers et al., 2013, p. 113). It is imperative to be as clear as possible on what is to be done when as well as the resources allocated to the task. Issues of inconsistent funding delay project completion and may lead to further impacts. Second, the coordination of plans in a consistent manner. Governments execute a significant number of plans across multiple sectors. By using an integrated approach, the gaps and conflicts between flood risk management plans and other sector plans are mitigated or reduced. Next, an adaptive

management programme is necessary for dealing with changes during the term of implementation. Alterations such as physical or political changes have significant impacts on the implementation of flood risk management plans as well as others. Reflexivity or monitoring and evaluation is at the core of adaptive management programs. This implies the need for adequate communication across the various levels of government to aid speeding up the decision-making process. Risk communication is the fourth condition and it entails enlightening government leaders and the public on the threat that exists. This condition is necessary for creating a sense of urgency and encouraging government leaders and the public to be proactive in responding to the risk. Activities such as evacuations become more effective with proactive participation. Professional input is imperative for the education of the masses as well as the decision-makers on such vital matters. Fifth, collaborative work and stakeholder outreach involve the inclusion of those living and working in the affected areas in the planning and decision-making process. In connection to risk management, this condition makes it easier to engage those in these areas prompting enhanced evacuations. Lastly, institutional and legal frameworks induce responsive behaviour toward risks. Through the use of legal instruments such as taxes, levies, property rights, duties, and obligations (Sayers et al., 2013, p. 115). By incorporating these conditions, this study seeks to develop insight into the status of flood risk management in Chama district whether.

In contrast to the enabling conditions above, the following are constrictions to flood risk management. First, linked to the first enabling condition, lack of resources tends to delay or in some circumstances, hinder successful flood risk management. Due to this predicament, the impacts of the disaster are prolonged and intensified (Sayers et al., 2013, p. 117). Second, budget and project funding alterations hamper successful implementation. Changes in project scope and unexpected changes during the course of implementation lead to shifts in resource allocation. Thirdly, changes in leadership. Implementation can be affected by such changes on the various levels of government (macro, meso, micro). Replacement leaders may not fully understand the plan as their predecessors as a result might not prioritize implementation due to gaps and lapses in local knowledge. Fourth, alteration of national priorities inhibits the implementation or completion of flood risk management. Aspects such as agriculture and industrialization tend to take the presidency in certain situations. As a result, commitments made to initiate flood risk management plans end up being abandoned and allocated resources transferred to other areas or

sectors. Fifth, alterations in physical conditions. An instance of such a situation is the change in climatic conditions. An increased rate of sea level rise may affect the successful implementation of plans made prior to such a change as was the case of the Afsluitdijk in the Netherlands. Following an assessment showing that the structure no longer met the safety standards due to projections of increased sea level rise, new designs and plans had to be met to mitigate the foreseen threat (Grotenberg & Van Buuren, 2018, p. 11). Lastly, clarification of roles and responsibilities for maintenance. Once the plan is implemented, there often lies behind it the aspect of maintenance. When the role to maintain the established operations is left undefined, even the achieved success is likely to be lost in the long run (Sayers et al., 2013, p. 117). By taking note of the constraints, the study looks into investigating whether these conditions have affected the successful implementation of flood risk management in the Chama district.

Part of the fundamental aspects of risk management is the capability of governments to take on this task which is the focus of the next section.

ADMINISTRATIVE CAPACITIES

Planning problems place a demand on a government's capacity to solve them or in other words, its capacity to innovate (Wegrich & Lodge, 2014). Due to the fact that planning problems are interconnected or linked to other issues, the solutions are not simple and straight forward. Complexity must be taken into account considering the evolving and reoccurring nature of planning issues (De Roo, 2016, p. 29). Furthermore, responding to these kinds of problems calls for innovation, "a degree of change that goes beyond the familiar and that is being replicated intentionally" (Wegrich & Lodge, 2014, p. 6). Innovation, as promising as it sounds, in planning problems is easier said than done. This section of the study will give a description of these capacities.

Based on Wegrich & Lodge's work (2014, p. 10), government administrative capacities entail the ability to realize and perpetuate governance innovations. From a broadened perspective, these are core organizational competencies developed over time through actor interaction and collaboration that subsequently creates routines necessary for joint efficacy (Grotenberg & Van Buuren, 2018, p. 5). There are four types of administrative capacities based on function: Delivery, coordination, regulation, and analytical capacities (Wegrich & Lodge, 2014). These administrative capacities are linked to governing resources which are

used to implement solutions: These resources are treasure, organization, authority, and nodality respectively (Hood, 1986).

Delivery capacity relates to governments ability to 'make things happen' or in other words, its ability to facilitate and maintain public service provision (Hood, 1986; Grotenberg & Van Buuren, 2018). Realising innovations is done with the use of government's 'treasure' resource: This relates to monetary forms of instruments such as grants and loans or other forms of government funding (Grotenberg & Van Buuren, 2018). Governments are by far the biggest individual purchasers world-wide (Hood, 1986, p. 41). By employing the use of monetary instruments like the aforementioned, governments can effect changes within the urban space, make changes to economic and industrial systems, and as is the case, respond to crisis. Rural area governments execute their public service functions using this resource.

Coordination capacity deals with 'bringing the necessary actors together to achieve problem-solving' (Lodge and Wegrich, 2014: 13). Apart from participating in collaborative governance, governments can spear head the organization of the process. Through the resource of 'organization', governments can prompt action from their subjects, their property, or even their environment (Hood, 1986, p. 73).

Regulatory capacity entails the government's capacity to 'prohibit or permit' activity be it economic, social, or otherwise (Wegrich & Lodge, 2014, p. 11). This capacity relates to the resource of 'authority'. While the type of government may depend on the national context (democratic, monarchy, etc.), authority is associated with policy instruments such as regulations, licenses, treaties, and political agreements among others (Hood, 1986, p. 54).

Analytical capacity involves information in government custody under government discretion (Wegrich & Lodge, 2014, p. 14). Information is particularly valuable as it is a vital element of the government's decision-making process. Subsequently, it necessitates the inception of policy development. This capacity is linked to the resource of 'nodality' which entails the government's access to networks of knowledge-producing entities such as experts, research institutions, and consultancies (Hood, 1986).

In line with the mentioned capacities, this study will investigate how these have affected flood risk management.

Table. 1 Administrative Capacities

ADMINISTRATIVE CAPACITY	DELIVERY	COORDINATION	REGULATION	ANALYTICAL
RESOURCE	Treasure	Organization	Authority	Nodality
INSTRUMENT	Grants, co-financing.	Partnerships	Permits, regulations,	Risk assessment reports, flood awareness campaigns, flood news briefs,

2.5. Conceptual model

Based on the theoretical frameworks of administrative capacities (Wegrich & Lodge, 2014) and flood risk management (Sayers et al., 2013), a conceptual model has been developed to aid in establishing an understanding of the relationship between the two. Administrative capacities, as discussed above, are the mediums through which government takes action in line with governmental functions and responsibilities. Flood risk management is but one of the many responsibilities on the government table. Arising from the multi-level and multi-sectoral nature of government and the type of cross-cutting challenges it has to address, collaboration is an imperative aspect of governmental action. The conceptual model depicts the foundation of this relationship.

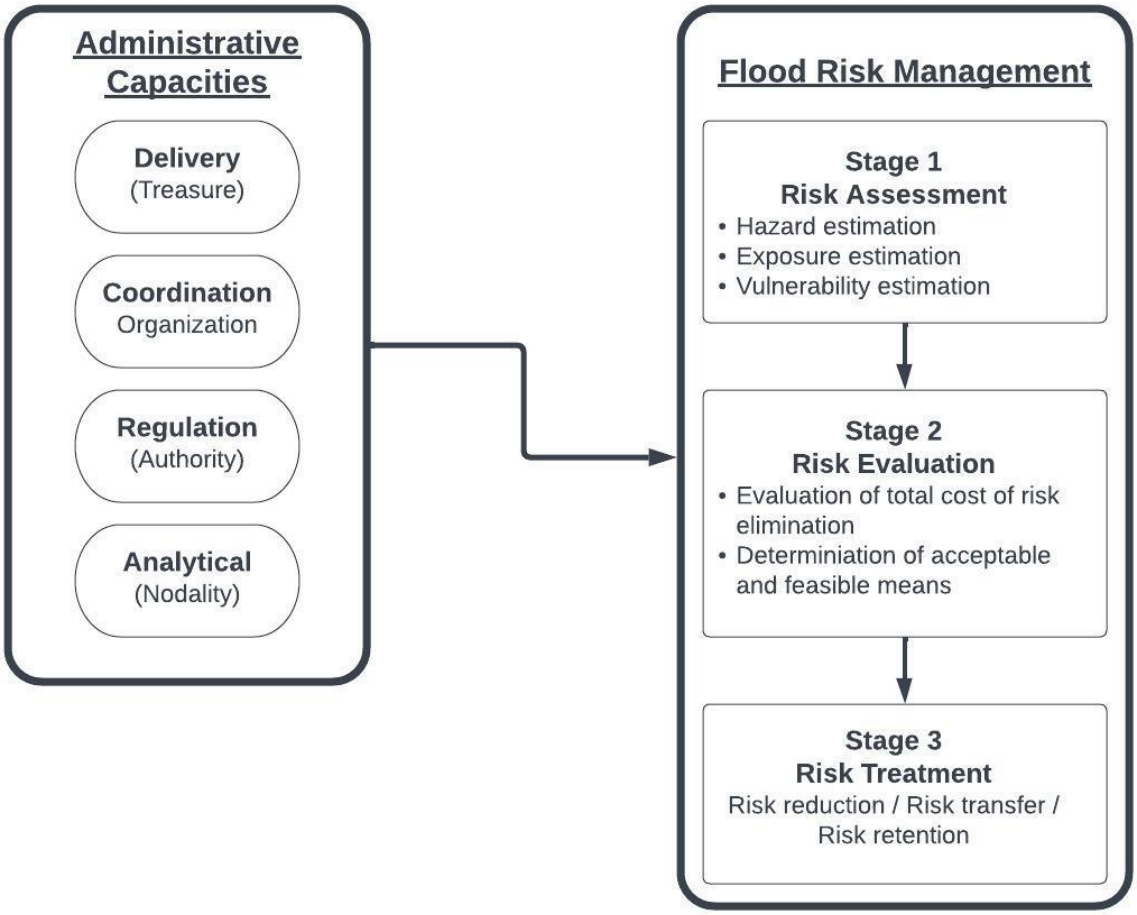

Fig. 3 Conceptual model of the relationship between government administrative capacities and flood risk management.

3. Methodology

3.1. Case study as a research methodology

Based on the lack of control over environmental behaviour and government action in response to the climatic impact of floods, this study applies a case study approach (Yin, 2018, p. 43). Considering the impossibility of mimicking the dynamics of the rural system in an experiment, this approach has been selected to analyze flood risk management within the district of Chama. The focus of this study is on flooding events that are recent over the past decade as well as governments response to these events through the local authority of Chama district. Furthermore, the interest is on establishing how the government responded to the natural catastrophe. With Chama district as the main case of the study, four other rural and developing districts will be analysed.

As a qualitative form of research, the case study approach will help create an understanding of how and why flood risk management is as it is within Chama district. By including four other developing rural districts across the globe, this study seeks to undertake an analysis and evaluation of government response to flood risk management in the rural district context (Yin,2018; Hay, 2000). Furthermore, through the comparison of the rural districts and their government response to floods, this study seeks to identify lessons from other places that can help generate an understanding of rural area flood risk management (Dolowitz & Marsh, 1996). In addition, part of the focus is on identifying possible solutions that may help address and enhance flood risk management in Chama district (Van Assche et al., 2020).

3.2. Case selection

Chama is one of the 116 districts in the Republic of Zambia whose local authority, Chama Town Council is mandated to work toward the nation "Vision 2030". The vision entails the nation becoming a successful middle-income nation by the year 2030 (The Republic of Zambia, 2006).In order to realize this vision, the local authority must prudently guide the process of development through the use of various administrative policy instruments. Planning is a vital part of the development process. As stated in the initial chapter, the district is subject to floods which are predicted to increase in intensity over the coming

years (IPCC, 2014). In the light of the increasing uncertainty that comes with climate change among other factors, this study seeks to establish insights of the district's rural area government capacity and how it handles the issue of floods.

In the interest of this investigation, four other districts have been identified: Charsadda in Pakistan, Lakhimpur Assam in India, Niphamari in Bangladesh, and Tsholotsho in Zimbabwe. These districts were identified on the basis of similar characteristics shared with the district of Chama. Despite significant variances in physical location, these districts are subject to river flooding, they are rural areas, and are undergoing development.

3.3. Research design

Executing this research is done in three phases that will be applied to each case. The first phase is implemented in chapter 4 and involves taking note of the context of the cases individually. This will involve the desk research approach as well as spatial analysis and mapping. Using published academic and newspaper articles, government and supranational websites, non-governmental organization sources as well as spatial database platforms, this study aims to gather information on the geographic circumstances of the districts. By collecting this information, a foundation will be laid for the next phase which is analysing the data based on the theoretical framework outlined in chapter 2. Due to constraints on financial resources and time, interviews will not be conducted.

For the second phase in chapter 5, the gathered data of the cases will be comparatively analysed. Through the use of a comparative approach, this study seeks to obtain a robust insight into the unique context factors regarding flooding and rural area development. In addition, based on the framework on flood risk management (Franzi, 2012; Sayers et al., 2013), the cases will be investigated so as to identify the assessed risk, evaluation of the risk, and how the risk was treated. In other words, the courses of response action taken by the local authorities or governments to address the situation. Furthermore, the investigation will proceed to identify which capacities were applied to facilitate the response action (Wegrich & Lodge, 2014). This will involve identifying which resources were applied as well as how they were applied. While the major focus is on the government's role, other details of interest include actors that were involved in the response action. Following the completion of the analysis, the findings will be discussed and concluded in chapter 5.

3.3.1. Units of analysis

In order to undertake this study, parameters have been set for the spatial boundary and theoretical scope (Hay, 2000; Yin, 2018). The focus of the spatial boundary is on the district and the theoretical scope is based on the literature on administrative capacities (Wegrich & Lodge, 2014) and flood risk management (Franzi, 2012; Sayers et al., 2013).

3.3.2. Procedures and techniques of Data collection

In this section, an explanation is given on the approach used to coherently associate the research questions and the collected information on the cases (Yin, 2018). Due to constraint on time and financial resources, this study has applied two methods of data collection namely literature review and desk study or desk research and has omitted the use of interviews. Below is a table elaborating on the use of these methods as well as the answers to be addressed.

Research Questions

1. How can a theoretical perspective on rural area administrative capacities in flood risk management be conceptualized?
2. What is the effect of the rural area institutional context on flood risk management?
3. What is the significance of the relationship between administrative capacities and flood management in a rural area like the Chama district?
4. How can adopting an area-oriented planning approach in flood risk management influence rural development in the Chama district?
5. What are the rough spots of adopting a collaborative approach in flood risk management in the case of the district of Chama?

Table. 3 Research questions, source of information, and methods of analysis

RESEARCH QUESTION	**TYPE OF INFORMATION**	**SOURCE OF INFORMATION**	**METHOD OF ANALYSIS**
Question 1	Literature review		

Question 2	Secondary Data	• Published journals and articles • News articles • Academic literature	• Multiple regression analysis
Question 3 Question 4 Question 5	Case studies Secondary Data	• Published journals and articles • News articles • Academic literature • Assessment reports • Acts of Parliament (Legal documents)	• Qualitative analysis through ATLAS ti • Spatial analysis with ArcMap

LITERATURE STUDY

As the starting point of this research, literature study was used on the premise of two reasons: First, it is the source from which the two main concepts of administrative capacities and flood risk management where derived. This method set the direction of the investigation of the contextual situation in an intellectual domain that this study seeks to address. Secondly, literature study laid the foundation on which the research questions are based. By doing so, a guide was created on how to conduct the research (Hay, 2000, p. 87). Applying this method was not merely a compilation of published knowledge, but it involved critical understanding and interpretation of concepts imbedded in the literature. Subsequently, the interpreted knowledge was incorporated as the theoretical framework in chapter 2.

Gathering of information was done through the use of various portals namely: Google Scholar, SmartCat, and other research-based websites which included Sage Journals and ResearchGate websites. In order to navigate the broad spectrum of available knowledge provided, key words were used during the search to narrow down to the information of interest. Examples of key words used include 'Flood Risk Management', 'Community Resilience', 'Climate Change Adaptation', 'Risk Management', 'Administrative Capacities', among others. For the purpose of developing the theoretical framework, the most recent

sources of literature dating back to 2000 were used. Exceptions were made only for supporting references for elaborating arguments.

DESK RESEARCH

While literature study is limited to academic, scientific research publications and documents, desk research involves non-scientific documents such as policy documents and news reports among others. This approach was applied to Chapter 4 to find data relating to the contexts of the cases studied. Its application was for the purpose of explaining the situations which subsequently led to the analysis of the cases. Below is a table of the cases and sources of information explaining their contexts.

CASE (District)	**DOCUMENT**	**SOURCE**
Chama, Zambia	Disaster Management Act 2010	https://www.parliament.gov.zm/node/3486
Charsadda, Pakistan	National Disaster Management Act 2010	https://www.preventionweb.net/publication/pakistan-national-disaster-management-act-2010
Lakhimpur Assam, India	Disaster Management Act 2005	https://ndma.gov.in/Reference_Material/DMAct2005
Nilphamari, Bangladesh	Standing Orders on Disasters 2019	https://www.preventionweb.net/publication/standing-orders-disaster-2019
Tsholotsho, Zimbabwe	Civil Protection Act 1989	https://zimlii.org/akn/zw/act/1989/5/eng@2016-12-31

3.3.3. Data analysis procedures and methods

Preceding the collection of data, analysis was conducted through the use of software namely Atlas.ti and ArcMap (Version 10.8.1). Atlas.ti is considered a qualitative data analysis

(QDA) software particularly used for qualitative research (Hwang, 2008). While the software can be used for numerous kinds of research, it was applied to the comparative case study in this instance, particularly policy analysis. In order to undertake the policy analysis of the cases using the QDA software, administrative capacities were identified among government functions at district level as prescribe by the various respective disaster management legislations or Acts. This process is otherwise known as coding (Hay, 2000, p. 355). A compilation of a theme based on these capacities was created to help guide the coding process as well as the analysis of the data. This compilation is referred to as a codebook (Hay, 2000, p. 363). Following the coding process, the information was then analysed in chapter 5.

Table 4. CODEBOOK

ADMINISTRATIVE CAPACITY	**DEFINITION**
Coordination	With reliance on the organization resource, this capacity focuses on bringing together the necessary actors so as to address or solve problems (Hood, 1986, p. 73).
Delivery	Delivery capacity relates to governments ability to 'make things happen' or in other words, its ability to facilitate and maintain public service provision (Hood, 1986; Grotenberg & Van Buuren, 2018).
Regulatory	Regulatory capacity entails the government's capacity to 'prohibit or permit' activity be it economic, social, or otherwise (Wegrich & Lodge, 2014, p. 11)
Analytical	Analytical capacity involves information in government custody under government discretion (Wegrich & Lodge, 2014, p. 14).

While Atlas.ti deals with the qualitative aspect of the study, ArcMap is a spatial analysis tool that was used to compile information on the physical context of the cases particularly flooded areas. Due to the focus of the studying on the qualitative side of the governments in the mentioned countries, spatial analysis in this study was limited to the Identification of flooded areas within the districts. The limitation is also due to time constraint as an in-depth analysis takes much longer than the prescribed time period. For the compilation of

spatial data, datasets of floods were downloaded from the Earth Explorer USGS United States government website (USGS EarthExplorer, 2013; USGS, 2023). Dataset information on various spatial characteristics is compiled in a number of formats. Information on physical attributes is compiled in what is known as bands. Flood band 5 from the Landsat (Landsat 8-9) was used for identifying flood areas. Assessment was done for floods that occurred over the past 10 years specifically from 2013 to 2023.

3.3.4. Ethics

Due to the use of two methods to conduct the research, the researcher ensured enhanced transparency, confirmability, and dependability (Hay, 2000, p. 11). By using multiple trusted sources of academic literature as well as national government websites and news platforms, a basis was created for the replication of the study as well as its transferability. Multiple references were used to confirm the applied concepts through triangulation. Inadequacies during the research process such as time and financial constraints are openly disclosed. In addition, measures to enforce relevance and authenticity have been incorporated through the use of recent sources in academic scientific literature.

4. Comparative Case Studies

4.1. Chama District, the Republic of Zambia

4.1.1. Background of Chama district

Location

As earlier stated, the district of Chama is located between latitudes 100 15′ to 120 10′ south and longitudes 320 40′ to 330 10′ east in the Eastern Province of Zambia. The district is surrounded by six others and shares a border with the neighboring country of Malawi. Surrounding districts include Mafinga, Chinsali, and Isoka to the north, Shiwang'andu to the west, Mpika to the southwest, and Lundazi to the south (Chama Town Council, 2021).

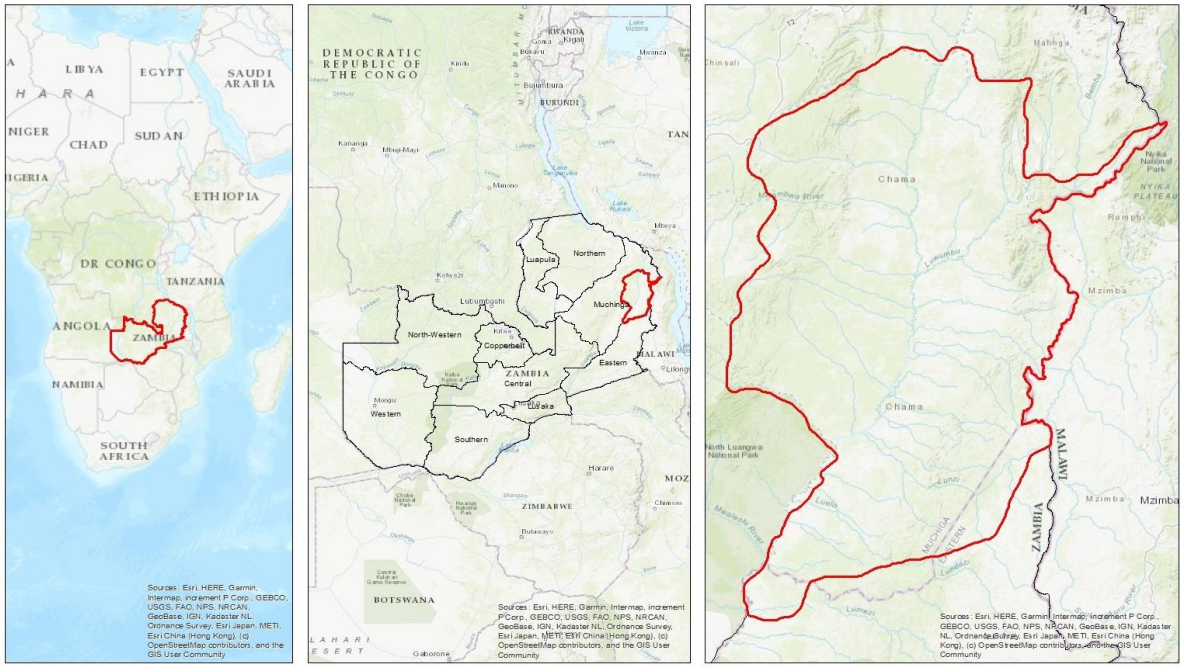

Fig. 1 Location of Chama district

Physically, the whole district is located within a game management area with an escarpment, the Muchinga escarpment to be specific, running parallel to the Luangwa River. The Luangwa River is a significant feature of the terrain as it demarcates the low lands of the valley from the high lands of the plateau (Chama Town Council, 2021).

In terms of the weather, Chama district is mostly a hot district with three definite seasons: A dry hot season from mid-August to mid-November, a wet rainy season from mid-November to April, and a cool dry season from May to mid-August (Chama Town Council, 2021; World Bank, 2023). Zambia's annual average rainfall varies from 600 mm in the south

to 1,300 mm in the north. This is a result of the influence of the movement of the Inter-Tropical Convergence Zone (ITCZ) and the El Nino/Southern Oscillation (ENSO) phenomenon (World Bank, 2023).

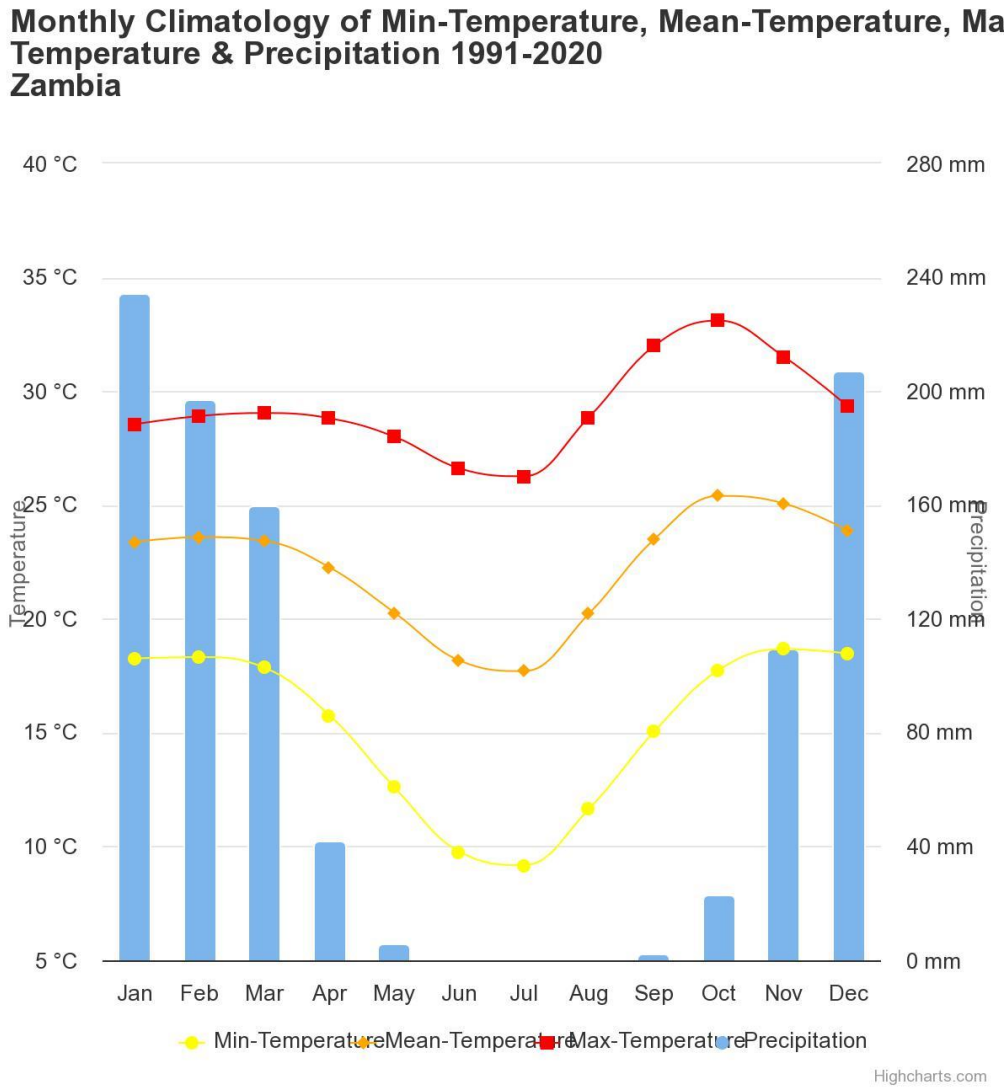

Fig. 4 Temperature and precipitation chart of the Republic of Zambia (World Bank, 2023).

Demography and administration

Chama district has a population of 140,326 residents from both North and South constituencies as of the year 2022 (Zambia Statistics Agency, 2022). This population is split between 48.9 % male (68,710) and 51.1 % female (71,616) residents. Administratively, the district is managed by two facets of government; the district town council under local government and the district administration under central government (Chama Town Council, 2021). Both sides work together to provide public services to the local residents

with varying roles and responsibilities based on policies under local and central government. Based on the Local Government Act Cap 281 of the Laws of Zambia, the council is comprised of elected representatives whose responsibility is to present and provide for the needs of the local residents (The Republic of Zambia, 1991). On the other hand, the office of the district commissioner oversees the implementation of district administration in line with policies sanctioned by the central government. In addition to state government, traditional leadership is recognized in administrative matters of the district. The district of Chama has seven chiefs in total who preside over their respective cheifdoms; Cheifs Mulilo, Lundu, Chibale, and Senior chief Kambombo in the north constituency, and chiefs Tembwe, Chikwa, and Chifunda in the south constituency (Chama Town Council, 2021).

Economic activities

The foundation of economic activity within the district is agriculture and tourism. Majority of the land is fertile arable land coupled with a network of streams. As such, this supports the cultivation of crops such as rice, maize, groundnuts, and cotton among others the likes of sorgum, soya beans, tobacco, and mango. Animal husbandry is practiced alongside cultivation with the common forms being chicken, goat, and cattle raring. Fish farming is also practiced on a smaller scale compared to the others (Chama Town Council, 2021).

Attributed to its location, the district is home to a number of exotic wildlife species: These include elephants, hippos, eland, buffalo, zebra, roan antelope, waterbuck, bushbuck, warthog, bushpig, kudu, among others. The area is also home to predators the likes of the lion, leopard, spotted hyena, wild dog, reptiles such as the snakes, crocodile, Mozambican spitting cobra, water monitor lizard, puff adder, and other mammals such as the baboon, velvet monkey, night ape, etc. The presence of these species creates great economic value for local tourism. This is handled by the Department of National Parks and Wildlife (DNPW) (Chama Town Council, 2021).

In addition to agriculture and tourism, local residents take part in small scale trading and mining. Through local shops, formal, informal, and mobile markets, households participate in the district economy. As it stands, only one market in the district centre has been formally established. Residents living in far flung areas of the district travel significantly long distances to gain access to the market while those closer to Isoka district in the north constituency and Malawi to the east make use of the markets closer to their locations. The

district is also endowed with mineral resources, an opportunity that the locals have taken up on a small scale. Previous mining explorations in the district have identified the presence of minerals such as red garnet, uranium, gold, and a variety of emeralds. (Chama Town Council, 2021).

4.1.2. Implications of floods in the district

Despite there being a number of flood occurrences over the past decade in the district of Chama, this study took note of three events based on available information: Events include 2018 floods in Chama and Petauke districts, 2019 Chama South constituency floods, and 2022 Chama district floods. Based on the Actalliance report (2018), the floods in 2018 left behind it about 2,140 households affected from both Chama and Petauke districts and washed away the Kampemba and Chama-Lundazi bridges. About 901 families in Chama district were left homeless affecting 491 households which led to the evacuation of 377 community members. The floods also escalated human-wildlife conflicts in the affected areas (Actalliance, 2018a; 2018b).

The 2019 floods significantly impacted Chifunda and Mapamba areas in the Chama South constituency. According to a news report by the Lusaka Times (2019), 4 deaths and 11 collapsed houses were recorded. The devastation included swept-away harvests, a damaged bridge, and infrastructure damage.

Following a spell of heavy rain, the floods of 2022 left behind notable impacts with the most affected wards being Mwalala, Kaozi, Mphalausenga, Mabinga, and Chilenje. 199 houses collapsed and approximately 750 hectares worth of crops were washed away affecting 2,335 households and 2,594 farmers (ZANIS, 2022; DMMU, 2022).

4.1.3. Flood Risk Management

While the district does not possess an explicit flood risk management plan, inferences were made based on the collected available data. Furthermore, Risk assessment showed that both constituencies in the district possessed flood-prone areas that needed government

attention in response to future flood events. An evaluation of the flood risk indicated that food supplies, basic shelter, utilities, health care services, water sanitation, and hygiene infrastructure were needed to mitigate the impacts. In addition, there was also a need to create livelihood activities, provide protection services as well as ensure adequate nutrition for the affected population (Actalliance, 2018a; 2018b). In response to the impacts, the government's risk treatment through the Disaster Management and Mitigation Unit (DMMU) involved the establishment of three relief camps that accommodated 884 households. The government also evacuated 377 affected members to the relief camps. Additionally, relief services were provided to the affected residents: The government distributed insecticide-treated mosquito nets, blankets, clothing as well as tents for temporary shelter (Actalliance, 2018b).

4.1.4. Administrative capacities

Although responsive action was taken by the DMMU on behalf of the government of the Republic of Zambian, no explicit mention of the source of funding in the available reports was made. However, as prescribed under the Disaster Management Act of 2010 (Govt. Republic of Zambia, 2010), the government of the Republic of Zambia through the Ministry of Finance could exercise its delivery capacity and make use of the 'treasure' resource by providing the DMMU with the resources to carry out its operations. The government put into use its coordination capacity by organizing a collective response that involved the DMMU, Central government District commissioners, government Ministries, non-governmental organizations (NGOs), and other stakeholders (Actalliance, 2018a; 2018b; Lusaka Times, 2019; ZANIS, 2022). The Disaster Management Act made way for the regulatory capacity and gave authority to evacuate the affected community members as well as ensure their safety within relief camps among other necessary response actions (Govt. Republic of Zambia, 2010). Through reports and news briefs, the government exercised its analytical capacity and made use of the resource of information to inform its risk treatment and the general public.

4.2. Charsadda District, Pakistan

4.2.1. Background of district

Location

The district of Charsadda is located between latitudes 34°03′ to 34°38′ north and longitudes 71°53′ to 71°28′ east (Farish et al., 2017). Charsadda district is part of the Khyber Pakhtunkhwa Province and is 32 km away from Peshawar district which is the provincial capital. In terms of the physical landscape or geography, the district covers a total area of 996 km^2 and is demarcated into two areas; Hashtnagar meaning eight villages and Doaaba, an area surrounded by rivers and streams. Regarding climate, Pakistan's location within a temperate zone as well as its varied topography play a significant role in the experienced weather (World Bank, 2023). Areas along the Indus River lowland plains and the coast are hot and dry while the Himalayas and northern uplands are generally cooler. Four seasons are experienced, these include dry cool winters from December to February, dry hot springs between March and May, the rainy seasons or southwest monsoon period occurs from June to September and lastly the retreating monsoons last from October through to November. Pakistan generally receives meager amounts of rainfall with an exception of the regions in the north receiving 200 mm per month from July to September. Variations is weather patterns are as a result of the influence of the El Nino cycle (World Bank, 2023). Charsadda district in particular receives an annual rainfall of 400 to 600 mm (Farish et al., 2017, p. 30). Irrigation sources include a number of rivers and canals: River sources are Kabul and Swat while canals sources comprise of the Lower Swat, Michini Dalazak Canal and Doaaba.

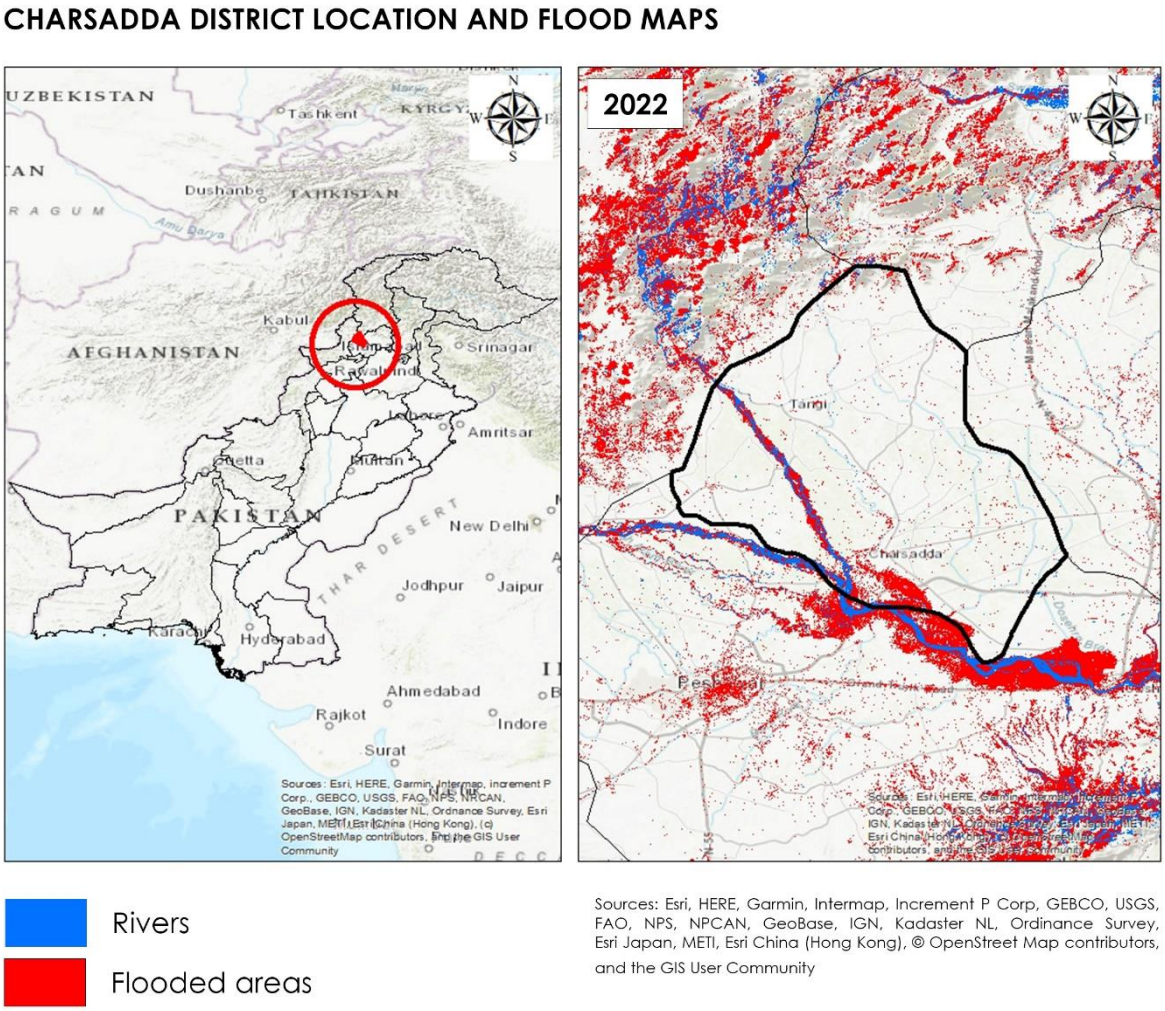

Fig. 5 Location and flood map of Charsadda district

Demography and administration

As of the year 2023, Charsadda has a population of 1,610,960 with the majority of 83.2% (1,340,756) living in rural areas while 16.8% (207,204) reside in urban areas (Pakistan Bureau of Statistics, 2023). Administratively, the district is divided into three tehsils or as referred to in India, administrative areas: Charsadda, Tangi, and Shabqadar (Farish et al., 2017). Regarding the district's governance structure, there are two levels of government responsibility; The first level is the District Level headed by the District Commissioner and aided by the Deputy Commissioner. The second level is the Tehsil level headed by the Tehsil Mayor who is aided by the Assistant Commissioner. (Government of Khyber Pakhtunkhwa, 2021). The district level oversees the operations undertaken at the tehsil level.

As part of the tehsil level, the tehsil municipal administration is comprised of the tehsil municipal officer, municipal officers and other office-bearers within the local council service. The tehsil municipal administration is under the jurisdiction of the Nazim Tehsil Council that is responsible for ensuring that tehsil municipal administration's mandate is carried out in line with the Khyber Pakhtunkhwa Local Government (Amendment) Act, 2019 (Provincial Assembly of Khyber Pakhtunkhwa, 2019). Some functions of the tehsil municipal administration include the supervision and monitoring of government offices within the tehsil as well as hold them accountable for reporting to the district government. Other functions involve the preparation of spatial land use plans, management of development plans, law enforcement, database maintenance, and collecting taxes among others.

Economic activities

Similar to Chama district, the prominent economic activity in Charsadda district is agriculture (Pakistan Bureau of Statistics, 2023; Khan et al., 2013). Attributed to fertile soils, the district is known for cultivation of various crops such as wheat, maize, rice, sugarcane, tobacco, and vegetables. Besides cultivation, local residents also practice livestock farming: Local farmers rear sheep, cattle, goats, as well as poultry. This in turn supplies them with meat, milk, including dairy products. Charsadda also has a reputation for traditional handcrafted artifacts (Abdullah et al., 2020). Local craftsmen create complex embroidered designs, rugs, carpets, and fabrics. Other economic activities include small scale industries such as mills and textiles, wholesale and retail trade, as well as transportation. Public service amenities within the district include hospitals, schools, banks, hotels, and other service-based forms of trade (Pakistan Bureau of Statistics, 2023).

4.2.2. Implications of floods in the district

For this case, two flood year events were studied based on the available flood event information: the 2010 Charsadda floods and the 2022 Charsadda and Nowshera district floods. Attributed to the severe rainfall, melting ice and snow, overgrazing, and deforestation of catchment areas leading to the overflow of natural levees, the 2010 floods left the Charsadda and Utmanzai areas of the district devastated (Yousaf & Naveed, 2013; The Tribune, 2010). Impacts included the destruction of about 3,900 houses, damage of 34 schools, partial damage of 125 mosques, 68 washed away shops, and 5 deaths. The impacts

left 24,135 families of approximately 166,300 people affected in the Charsadda district. 5,500 families were displaced as a result.

The 2022 floods affected Charsadda and Nowshera districts (IRC, 2022). Due to the increase in severity of the monsoon rain season in June 2022, floods were experienced that led to the damage of 47 water sources, 11 shops, partial damage of 5 schools, and 2 health units with one health unit completely damaged. The floods also destroyed 193 acres of crops and left 70% of houses without electrical power (IRC, 2022, p. 9; The Nation, 2022; Bol News, 2022).

4.2.3. Flood Risk Management

Following a risk assessment of the aforementioned flood events, the Agra, Hisar Yasinzai, and Daulat Pura areas in the Charsadda district were identified as the most affected by 2010 flood impacts (Hamidi et al., 2022, p. 10). Following a joint risk evaluation of the 2022 floods by the International Rescue Committee (IRC), Pakistan Village Development Program (PVDP), Environmental Protection Society (EPS), and Health Education and Development Society (HEADS), priority needs identified were food, shelter, health care, monetary or financial aid, water, sanitation and hygiene (WASH) services, educational services as well as livestock aid and medical supplies (IRC, 2022). Although the assessment was not directly conducted by the government, it did involve collaborative work with the government hence its inclusion in this study. With regard to the risk treatment, measures implemented involved both short and long-term. Short-term measures included relief and rescue operations conducted at Shabara and Majoki which involved the rescue of about 400 people, providing food and basic utility items, and medical services, conducting health and hygiene awareness campaigns, and establishing temporal relief shelters (IRC, 2022; ARY News, 2022). Long-term measures involved the construction of retention reservoirs, embankments, and dams (Khan et al., 2013; Muhammad et al., 2017; Power Technology, 2019; The News International, 2021; Pakistan Engineering Services, 2012; Dawn, 2012; Graan, 2022).

4.2.4. Administrative capacities

Though there is no explicit mention of the government exercising its delivery capacity to respond to the 2010 and 2022 floods in the found sources of information, the coordination capacity was exercised through the organization of joint efforts with various stakeholders: Through the joint assessment by the International Rescue Committee (IRC) and others mentioned in the previous section (IRC, 2022), the government obtained information on the flood impacts and needs as well as a basis for response action. Responding to the disaster involved the Provincial Disaster Management Authority of Khyber Pakhtunkhwa, other government departments, UN agencies, international and local NGOs, media agencies, and other humanitarian organizations. The collaboration paved the way for both immediate response action and long-term countermeasures such as the construction of the Mohmand and Palai dams (Khan et al., 2013; Muhammad et al., 2017; Power Technology, 2019; The News International, 2021; Pakistan Engineering Services, 2012; Dawn, 2012; Graan, 2022). The government did however engage its delivery capacity with the dam construction projects by dedicating about 1.2 billion USD and 3.6 million USD to the projects respectfully. Based on the National Disaster Management Act of 2010 (NDMA Pakistan, 2010), the government made use of the regulation capacity and authority to evacuate affected residents, establish relief camps, and provide relief services (Yousaf & Naveed, 2013; ARY News, 2022). As a result of collaborating with the various stakeholders, the government was able to obtain information as well as disseminate flood warnings through its analytical capacity.

4.3. Lakhimpur Assam District, India

4.3.1. Background of district

Location

Situated in the state of Assam in India, the district of Lakhimpur lies between latitudes 26°48′ and 27°53′ north and 93°42′ and 94°20′ longitudes east. With its name believed to have originated from that of the goddess of prosperity, Lakhimpur district has two subdivisions that is Dhakuakhana and North Lakhimpur as a result of reorganization in 1989. (Lakhimpur District, 2023). The district occupies an area of 2,277 km^2 of which 2,257

km^2 is rural and 20km^2 is urban. Lakhimpur has four major rivers: The Brahmaputra which denotes the southern boundary of the district, Subansiri which originates from Tibet and discharges at Bhimpara Ghat, the Ranganadi stems from the Dafia hills of Arunachal Pradesh and discharges its water up stream of the National Highway-52, and last Dikrong which also originates from the Dafia hills of Arunachal Pradesh and discharges its water down stream of the National Highway-52 (Lakhimpur District, 2023).

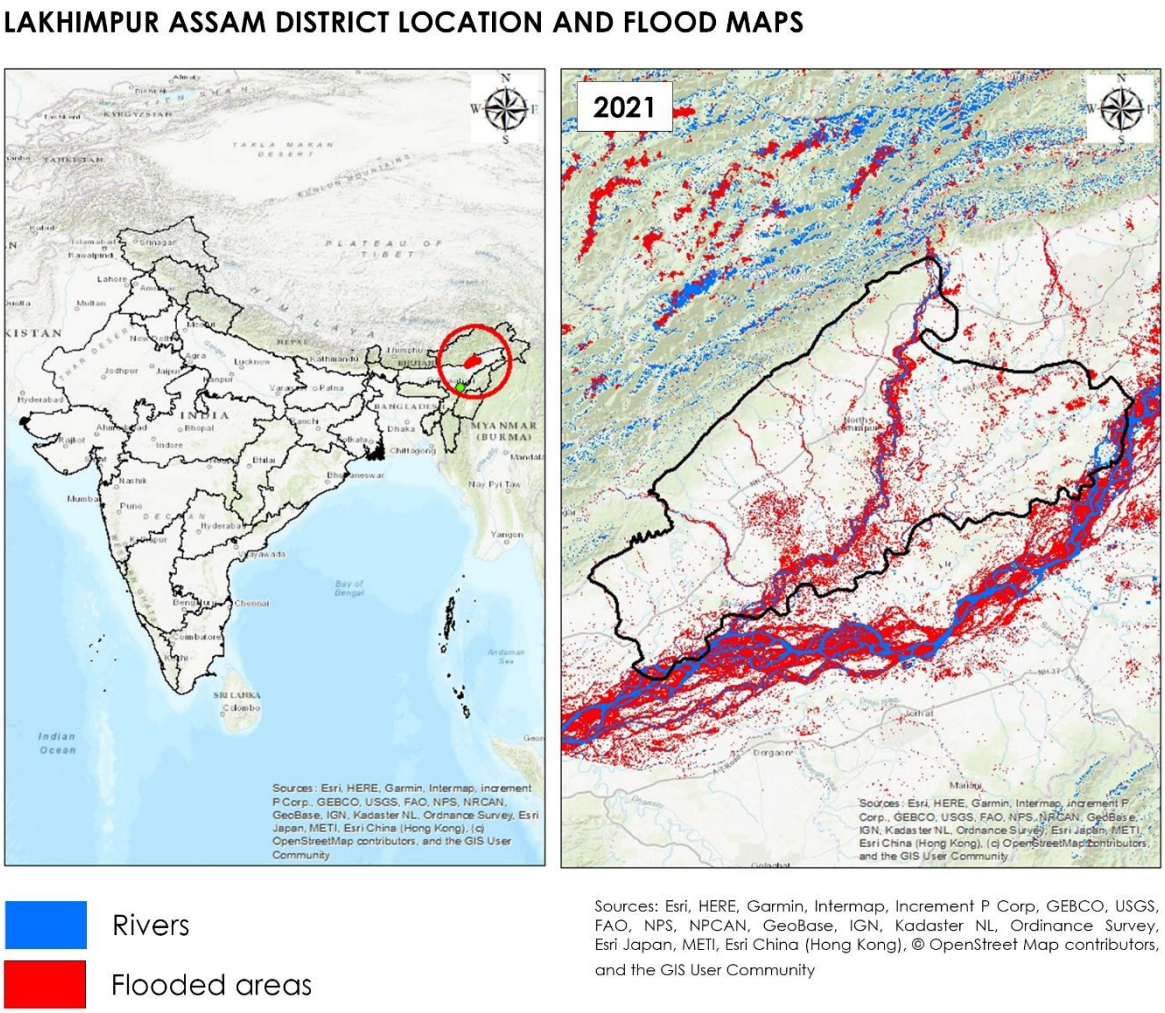

Fig. 6 Location and flood map of Lakhimpur district

India is among the largest countries on the planet and as such has a unique weather profile. The country experiences six major subtypes of climate: Examples include desert climate type in the west, glaciers and alpine tundra in the northern region, and tropical rainforests in the southwest. India experiences winter between the months of January to March with the coldest months being December and January when average temperature is about 10^o to 15^{o}C. Pre-monsoon or summer season occurs between the months of March to June

with the western and southern regions experience the hottest weather in April. Average temperature range is between 32° to 40°C. The rainy or monsoon season is experienced from June to September. Characterised by thunderstorms and heavy rainfall, the low-pressure region spawned by southeast trade winds from the southern Indian Ocean creates a conducive environment for monsoons. Post monsoon season takes place from October through to December with the southern part of the country receiving the most rainfall. Temperatures range from 28° to 34°C (New World Encyclopedia, 2022). The state of Assam is at the receiving end during the monsoon season. This is due to the flowing waters that flow from its seven neighbouring states into its territory (Bordoloi et al., 2019).

Demography and administration

In terms of population, the district of Lakhimpur has 1,042,137 inhabitants with 50.8% males (529,674) and 49.2% female (512,463). Administratively, the district is headed by the office of the Deputy Commissioner who presides over the two administrative subdivisions (Lakhimpur District, 2023). Also included in the governance structure are the police administration and local government. The district also has political representatives for the two constituencies namely Lok Sabha and Vidhan Sabha constituencies. In addition, the district has thirteen government branches, a District Magistrate, and Zila Sainik Board through which government functions are carried out. The functions to do with flood control and development planning fall under the development branch.

Economic activities

Lakhimpur's economy is supported mostly by agriculture with the prominently cultivated crop being paddy or wetland rice. Paddy covers 67% of the cultivated area in the district. Soils are alluvial and fertile in nature needing no use of fertilizers, hard labour or artificial manures. Other crops cultivated include jute, wheat, mustard, and pulses (edible seeds that fall in the legume family) (Lakhimpur.assamonline, 2023). Other economic activities include rearing livestock such as goats, ducks, broilers, and pigs. The locals also have a practice of creating handloom articles and designs as well as handcraft artefacts and weaved items (Lakhimpur District, 2023; Lakhimpur.assamonline, 2023).

4.3.2. Implications of floods in the district

Lakhimpur district suffered losses to floods in the years 2013, 2015, 2016, 2018, and 2020 based on available information. The 2013 floods submerged 4,200 hectares of farmland and 77 villages forcing 37,000 affected residents to leave their homes. 260 villages suffered the impacts of the floods (Times of India, 2013). Subsequently, the 2015 floods affected Lakhimpur among 21 other districts affecting about 17,00,000 people, causing 100,00 hectares of crop loss cultivated by 2,000 villages, 25 fatalities, and disruption of power supply and transportation services (Sphere India, 2015a, p. 4; 2015b; Floodlist, 2015; The Times of India, 2022). The 2016 floods affected 24,366 people in more than 50 villages (Sphere India, 2016, p. 1). The 2018 floods affected 18 villages in the Lakhimpur district (Sphere India, 2018, p. 1; India Today, 2018). In 2020, Lakhimpur among 26 other districts suffered flood impacts that affected approximately 2.2 million people. Based on India Today's (2020) news report, 2,763 villages were submerged along with 103,806.15 hectares of crops. Other impacts were 17,81,920 affected animals, damaged embankments, bridges, roads, culverts, and other infrastructure (India Today, 2020).

4.3.3. Flood Risk Management

With regard to risk assessment, the district of Lakhimpur is subject to floods in most of its areas. The risk evaluation indicated the need for both short and long-term measures to mitigate flood impacts (Sphere India, 2015a). Both types of measures incorporated the provision of water sanitation and hygiene services, temporary relief shelter, relief food rations, basic health care services, as well as social protection for flood victims. While the short-term measures focused on the immediate needs of flood victims, the long-term measures were meant to mitigate flood impacts over longer periods of time. As was the case with the risk evaluation, the risk treatment involved both short and long-term types of measures. In the short term, the government in collaboration with other stakeholders provided relief aid through food rations namely rice, salt, dal, and tarpaulin, among others (Sphere India, 2015a, p. 6; 2015b, p. 1). The government also established relief camps, undertook rescue operations, and provided farmers with supplies for their livestock (Sphere India, 2015a, p. 6; 2015b, p. 1). Considering the recurring floods and their impacts, the

government sought to implement long-term remedies in the form of dam management, rehabilitation, and reconstruction of flood protection infrastructure (Kipgen & Pegu, 2018, p. 313; The Sentinel, 2023). In addition, the government made efforts to enhance flood preparedness measures, early warning systems, flood forecasts, and community sensitization and awareness campaigns (ASDMA, 2023). Local communities contributed to the government's efforts by applying traditional knowledge systems of adaptation to floods (Kipgen & Pegu, 2018, p. 308).

4.3.4. Administrative capacities

The government of the state of Assam in collaboration with other stakeholders and organizations responded to the flood impacts through the use of the delivery capacity's 'treasure' resource (Sphere India, 2015a; 2015b; 2016). Through the mobilization of funds from various parties, relief aid was provided in the form of relief food supplies, the establishment of relief camps, rescue operations, as well water sanitation and hygiene services. For mitigating flood impacts in the long term, the government through the Public Works Department invested Rs 318.3 crore (38.6 million dollars) on road works and embankment structures (The Sentinel, 2023). Implementation of the response to the flood impacts involved collaboration capacity. Through the resource of 'organization', joint efforts were made by the government of India through the Assam State Disaster Management Authority (ASDMA), the State of Assam, Central Water Commission (CWC), the Ministry of Water Resources, North Eastern Space Application System (NESAC), Public Works Department (PWD), National Disaster Management Authority (NDMA), District Authorities, District Administration, Media Agencies, and other organizations. By employing the Disaster Management Act of 2005, the government exercised its regulatory capacity through the resource of 'authority' provided by the instrument of law (Government of India, 2005). This was particularly the case for evacuation operations and social protection of flood victims. Joint assessments and coverage by media agencies made it possible for the government to gather and disseminate information on the flood situation. By engaging the analytical capacity, the government was able to embark on enhancing flood early warning systems, flood forecasts, and community awareness and sensitization campaigns (ASDMA, 2023).

4.4. Nilphamari District, Bangladesh

4.4.1. Background of district

Location

Nilphamari district is located in the northern part of Bangladesh between 25°44′ and 26°19′ north latitudes and between 88°44′ and 89°12′ east longitudes (Banglapedia, 2021). It covers an area of 1,580 km^2 and shares borders with the West Bengal state of India to the north, Rangpur district to the south, Lalmonirhat district to the east, as well as Dinajpur and Panchagarh districts to the west. The district has four major rivers namely Jamuneshwari, Ghagat, Tista, and Buri Tista.

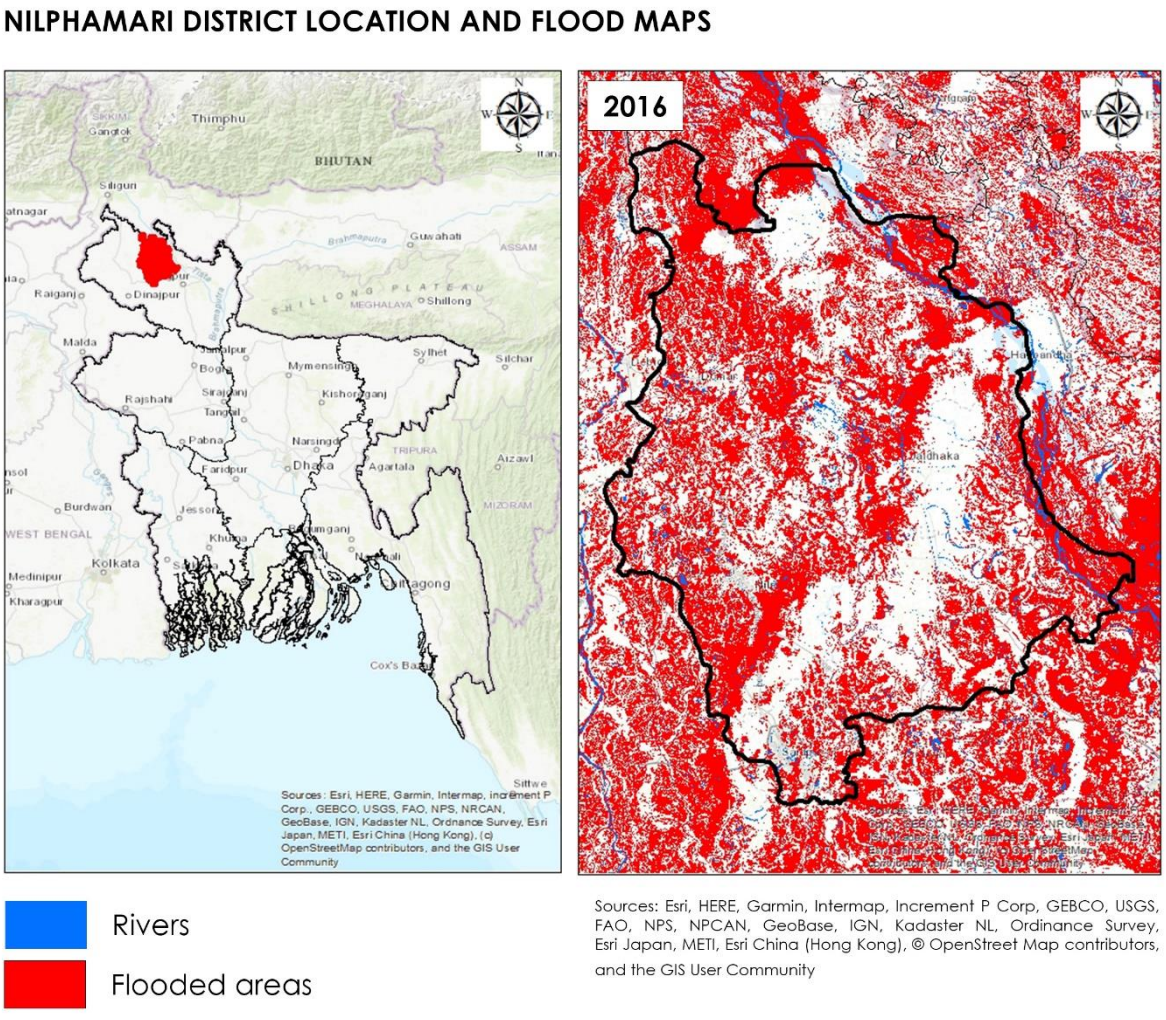

Fig. 7 Location and flood map of Nilphamari district

Bangladesh's climate is heavily influenced by the pre-monsoon, monsoon, and post-monsoon circulations originating from the Indian Ocean. With average temperatures of

about 26°C between 15°C and 34°C, the most experienced country weather is heavy precipitation and tropical cyclones. The rainy season is the warmest period which occurs between April to September. The cold and dry winter season last from December to February. This makes Bangladesh a generally wet country with an average of 2,200 mm of rainfall received annually. While most areas of the country receive 1,500 mm of rainfall, others in the north-eastern regions experience up to 5,000 mm of rainfall annually (World Bank, 2021). The monsoon season lasts from June to October with relatively high levels of humidity.

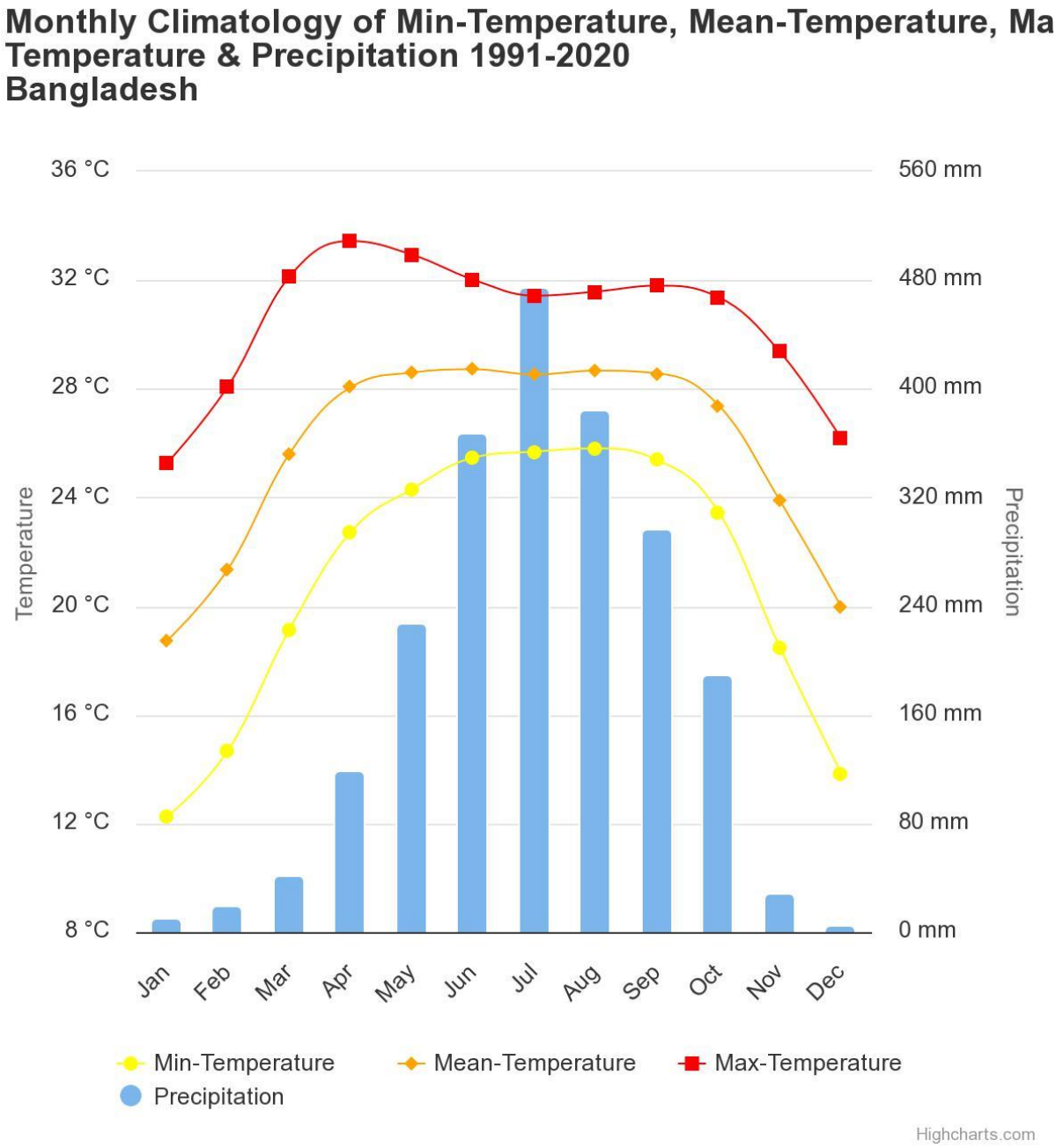

Fig. 8 Temperature and precipitation chart of Bangladesh (World Bank, 2023)

Demography and administration

Nilphamari district has a population of 1,571,690 inhabitants split 51.5% male (810,268) and 48.4% female (761,422). Of the total population 15% live in Urban areas while the rest reside in Rural areas (Banglapedia, 2021). Administratively, the district has 6 Upazilas or administrative divisions, 3 municipalities, 61 Unions, and 370 villages. The largest of the six Upazilas is Nilpamari Sadar (373 km^2) and the smallest is Saidpur (121.68 km^2).

At the helm of the district is the Deputy Commissioner which is the highest position at district level. Another government portfolio is that of the District Council Chairman, an elected official charged with the responsibility for local governance and development planning. Another senior position within the district is that of the Chief Executive Officer who oversees the implementation of development projects as well as the coordination of administrative functions (Govt. Nilphamari, 2017).

Economic activities

Similar to the other districts, Nilphamari's prominent economic activity is agriculture. The fertile soils create the conducive environment for the cultivation of various crops such as paddy, Jute, rice, wheat, maize, vegetables, sugarcane, and other varieties of fruit (Bangladesh National Portal, 2023). Both commercial and subsistent farming are practiced within the district. The district has an established but growing industrial sector with activities comprised of small-scale production units, agro-based product manufacturing, and clothing industry. In addition, the district also participates in trade and commerce which includes exchanging agro-products, locally manufactured goods and other articles and items.

4.4.2. Implications of floods in the district

In the past decade, Nilphamari district was at the receiving end of floods attributed to heavy rainfall causing river overflows that devastated the area. Based on reports and past records, floods were experienced in the years 2013, 2014, 2016, 2017, 2019, and 2020. In 2013, 20,000 households were affected (NIRAPAD, 2013, p. 1; Govt. Bangladesh, 2014, p. 20). The 2014 floods left 7,500 people devastated, about 120,000 were displaced, food insecure, and exposed to water-borne diseases (ACAPS & Network, 2014, p. 2; IFRC, 2014, p. 2; FAO et al., 2014). Additionally, fish farms were washed away, fresh waters were

submerged and contaminated creating a need for sanitation facilities. Subsequently, the 2016 floods impacted the Dimla and Jaldhaka areas the most affecting 820,000 people leaving 46 people dead, collapsing the Padma River embankment, partially destroying 27,522 hectares of land while 35,194 hectares were destroyed (NIRAPAD, 2016, p. 3; Govt. Bangladesh et al., 2016). The aftermath included damaged roads, railways tracks, and culverts as well as exposed women and children to abuse and gender-based violence. Records of the 2017 floods show an escalation in the magnitude of the impacts: 6.7 million people were affected, 121 deaths were recorded by the government, and about 160,734 people were displaced. 101,683 houses were fully destroyed with 619,834 partially damaged. The transportation network equally suffered heavy blows as 382.5 km of road was fully damaged while 4,432 km was partially destroyed, 500 bridges and culverts in the northwest were dreadfully damaged, including the destruction of about 7.66 km of embankments was fully damaged, and 96.26 km was partially destroyed (NIRAPAD, 2017, p. 1; UN Resident Coordinator in Bangladesh, 2017a, p. 1; 2017b, p. 1). The agony continued in the 2019 floods when floods hit Nilphamari district along with 27 other districts. Nilphamari was among 15 most affected districts: The impacts left 600,000 damaged houses, 300,000 people displaced, 114 deaths, and the destruction of 532,000 hectares worth of crops (IFRC, 2021, p. 1; CARE, 2019; Bangladesh Red Crescent, 2019, p. 1). Following the covid 19 pandemic outbreak, the 2020 floods were salt to the wound affecting 18 districts including Nilphamari. Cyclone Amphan caused devastating impacts displacing about 2.4 million people, waterlogging 548,819 houses, and causing 54 deaths (UN RC Bangladesh, 2020, p. 1; IFRC, 2020a; Dhaka Tribune, 2020a; 2020b).

4.4.3. Flood Risk Management

Risk assessment of past flood events shows that the Nilphamari district is among the most flood-prone districts in northern Bangladesh due to extensive river channels, geographical location, and climatic conditions (World Bank, 2021; Mondal et al., 2021, p. 1). Based on the risk evaluation, both short and long-term measures were required to help mitigate the impacts (NIRAPAD, 2017; CARE, 2019; IFRC, 2021; Bangladesh Red Crescent, 2019; IFRC, 2020b; IFRC, 2022a; UN RC Bangladesh, 2020; UN RC Bangladesh, 2017a). The short-term measures were based on five categories of needs: First is livelihood and basic needs which

entails the provision of food and cash grants. The second is providing temporary shelter which is complimented by the third, water sanitation and hygiene services (WASH). WASH services involve establishing access to clean water for consumption. Basic health services make up the fourth category and lastly, Protection Gender and Inclusion (PGI) for the welfare of flood victims within the relief camps and resettlement areas. Long-term measures encompassed the re-establishment of communication systems, the repair of shelters and WASH facilities, the reconstruction and rehabilitation of schools, as well as supporting the development of a strategy for Bangladesh's immediate recovery of critical infrastructure.

With regard to risk treatment, just as was the case with the risk evaluation, short and long-term measures were applied. Short-term measures included mobilizing volunteers as first responders, the distribution of 88.44 million BDT (USD $ 1.1 million), 27,045 MT of rice, and 71260 worth of dry food packets to the affected districts by the government (UN RC Bangladesh, 2017b). In addition, the government also provided 31,980 bundles of corrugate iron including BDT 95.9 million (USD $ 1.2 million) for the reconstruction of houses (UN RC Bangladesh, 2017a; IFRC, 2021). Bangladesh Red Crescent Society (BDRCS) aided in mitigating the impacts by complementing the government's efforts. BDRCS assisted about 66,000 flood victims with food packages, basic needs, cash grants, WASH services, volunteer training, and psychosocial first aid amongst others listed in Appendix 11. The National Disaster WASH Response Team (NDWRT) was part of the collaborative effort. They helped train volunteers and provide WASH services to the affected communities. Long-term measures took the form of structural and non-structural: Structural measures included the application of flood adaptation initiatives namely the Indigenous intervention through building on elevated platforms (BBC Future Planet, 2020). The government took on projects to set up embankments and fortify flood walls through the Coastal Embankment Rehabilitation Project and the Coastal Embankment Improvement Project (CEIP) (The World Bank, 2022; The Government of Bangladesh, 2023; Delta Context, 2021). Non-structural flood mitigation measures involved enhancing flood forecasting, community-based early warning systems as well as integrated water and flood management (IFRC, 2021; Islam et al., 2017).

4.4.4. Administrative capacities

For the facilitation of response action to the flood impacts over the past decade, the government allotted 88.44 million BDT (USD $ 1.1 million) along with 27,045 MT of rice and 71,260 worth of dry food packets to the affected districts following the 2017-2018 floods. In addition, the government also provided 31,980 bundles of corrugate iron sheets along with BDT 95.9 million (USD $ 1.2 million) for the reconstruction of houses as well as BDT 43,00,000 cash support following the 2013 floods (UN RC Bangladesh, 2017b, p. 2). The aforementioned efforts constitute the government's delivery capacity and use of the 'treasure' resource. The BDRCS and Climate Investment Fund complemented the government's efforts by providing Multipurpose Cash Grants (MPCG) and investing 25 million USD for Coastal Embankment Improvement Project (CEIP). UNICEF allocated USD 60,000 for immediate education service support (UN RC Bangladesh, 2017b, p. 3).

Through the collaborative capacity, the government was able to work with other parties in response to the flood impacts: Efforts made involved the Government of Bangladesh, Bangladesh Red Crescent Society (BDRCS), Bangladesh Water Development Board (BWDB), Flood Forecasting and Warning Center (FFWC), Government of the Netherlands (Technical assistance with the CEIP), as well as other departments, ministries, and organizations (IFRC, 2021; IFRC, 2014; CARE, 2019).

Through the Standing Orders on Disaster 2019 (The Government of Bangladesh, 2019), the government exercised its regulatory capacity by using its resource of 'Authority' to conduct relief services such as evacuations, rescue operations, setting up relief camps, and protect flood victims among others (IFRC, 2021, p. 3; IFRC, 2020b, p. 3).

Lastly, the Analytical capacity was exercised through the various departments and organizations that undertook joint assessments and published reports and disseminated early flood warnings as well as news briefs (CARE, 2019; The Daily Star, 2019; Dhaka Tribune, 2020a; IFRC, 2020a; UN RC Bangladesh, 2020; Islam et al., 2017; UN RC Bangladesh, 2017b; UN RC Bangladesh, 2017c; IFRC, 2021; Bangladesh Red Crescent, 2019).

4.5. Tsholotsho District, Zimbabwe

4.5.1. Background of district

Location

Located in the Matabeleland North Province of Zimbabwe, Tsholotsho is one of the seven districts that constitute the province (Tshuma et al., 2023). The district is north-west of Bulawayo, the second largest city in Zimbabwe. It covers an area of 7844 km^2. Tsholotsho district shares boarders with Luopane to the north, Bulilima situated in the south, Hwange to the northwest, and Umguza to the east. The eastern part extends into the Gwayi River while the west channels its waters into the Manzamnyama River.

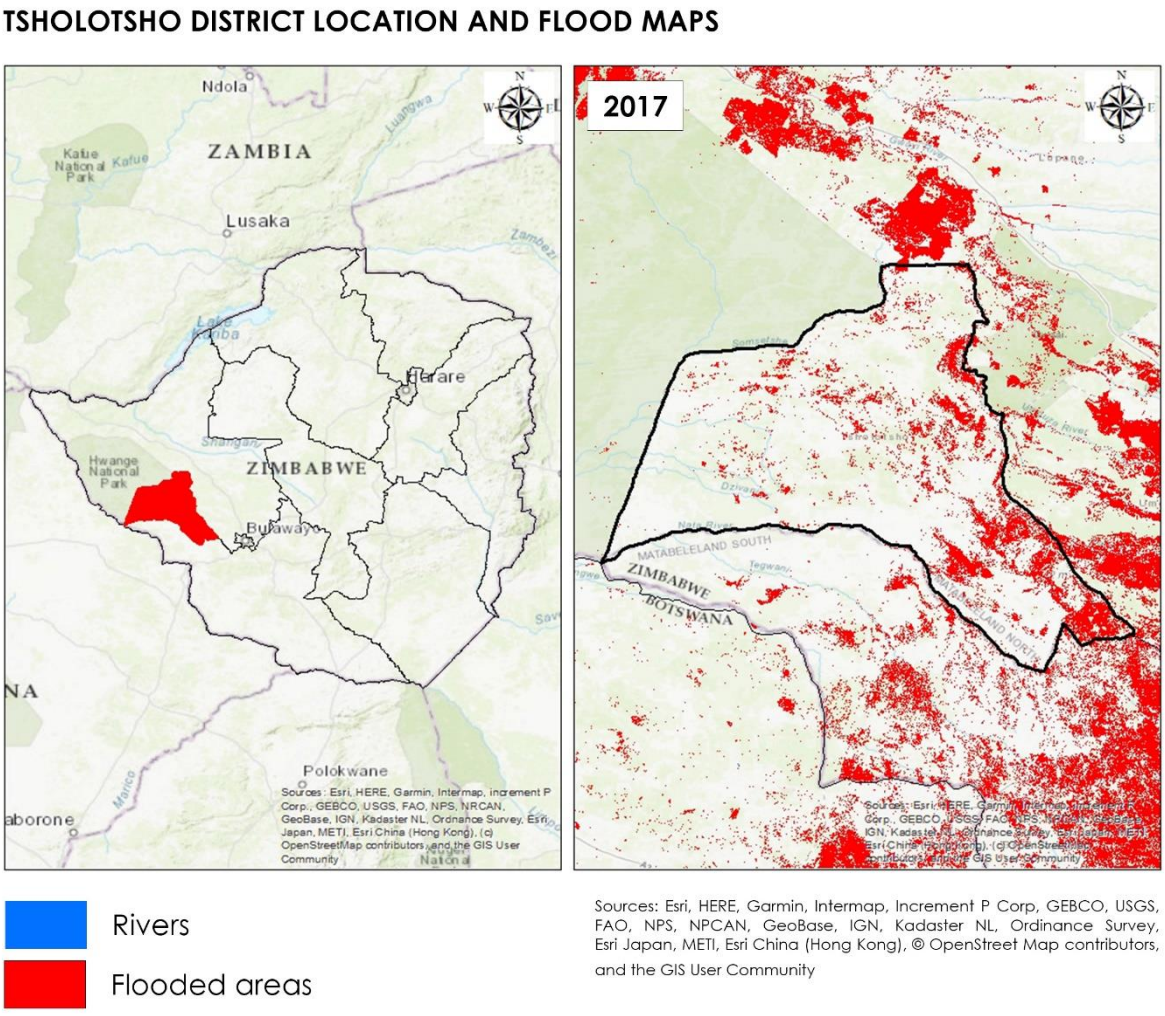

Fig. 9 Location and flood map of Tsholotsho district

Zimbabwe experiences two main seasons annually; hot rainy season from October to March and cold season from June to August. The average temperature experienced annually falls

within the range of 15°C and 25°C (World Bank, 2023). Much like its neighbour Zambia, Zimbabwe's weather is also influenced by the movement of the ITCZ. The country's average rainfall is 670 mm with variations during the year. Less than average rainfall is received during the warm phase (ENSO or El Nino) from October to March and more than average during the cool phase (ENSO or La Nina) in the rainy season (Tshuma et al., 2023; World Bank, 2023).

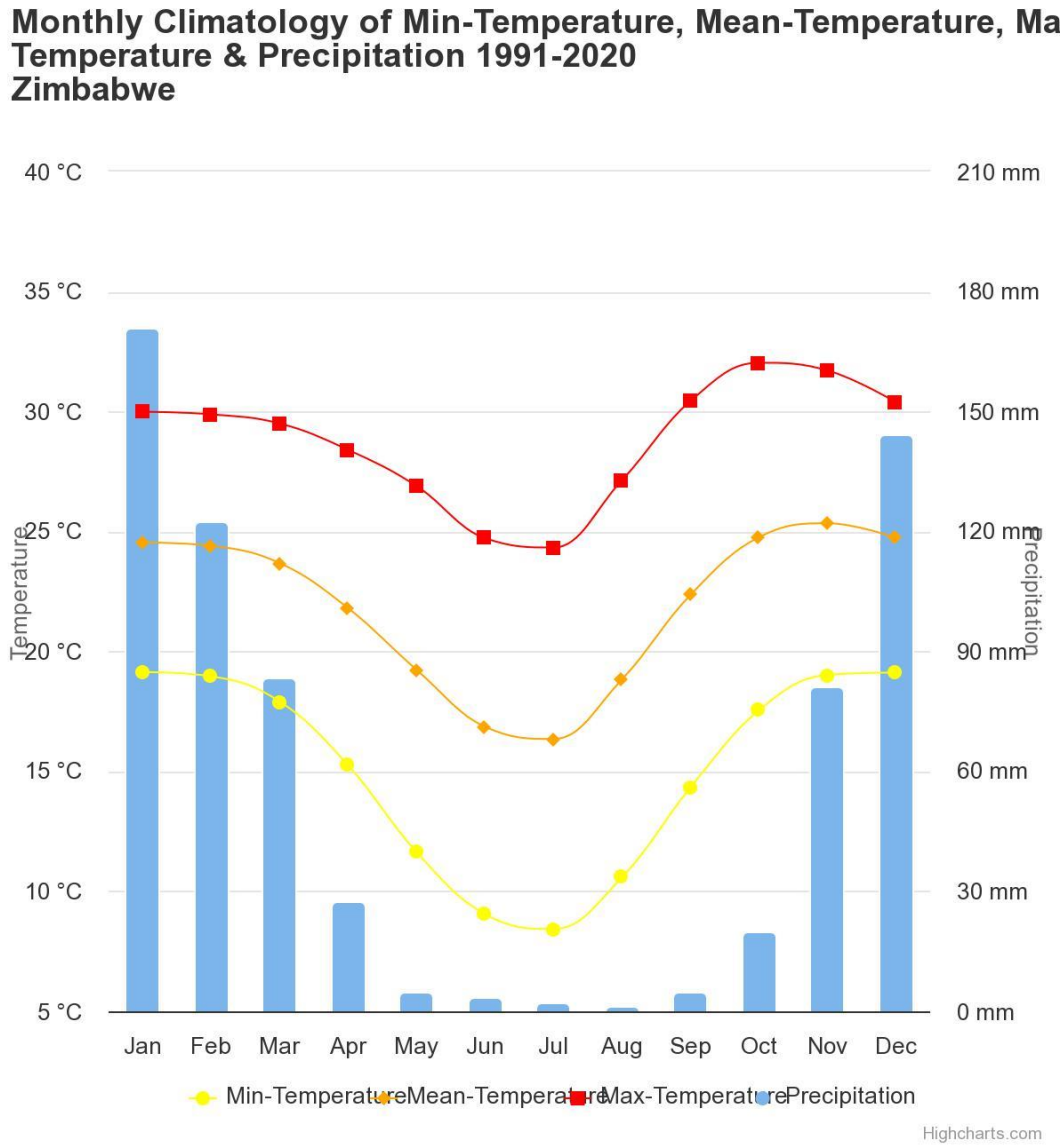

Fig. 10 Temperature and precipitation chart of Zimbabwe (World Bank, 2023).

Flooding usually takes place between late November and April during short and strong episodes of rainfall. Heavy rainfall recorded in the past has been between the months of December and March. These events have been linked to the movement of ITCZ and tropical cyclones (Tshuma et al., 2023).

Demography and administration

Tsholotsho district is home to 115,782 residents split 46.5 % male (53,813) and 53.5 % female (61,969). This population is spread out across 22 wards within the district. Administratively, the district is overseen by state government and traditional leadership. On the side of the state government at district level, government functions are performed by the District Administrator and District Council (ZimLII, 2023). As a creation of the central government, the office of the District Administrator is responsible for coordinating and implementing policies and programs of the government. As a product of the Rural District Councils Act, District Councils are composed of elected officials who represent and aid government in matters of district development (High Court of Zimbabwe, 2013). On the other side are the traditional leaders whose authority is recognized by the state (ZimLII, 2016a). Chiefs and their Headmen exercise their authority by presiding over their respective areas of jurisdiction so as to uphold and promote traditional values.

Economic activities

In terms of its economy, Tsholotsho district's main activity is farming particularly animal husbandry or herding (IOM, 2018). Despite agricultural practices being the main economic activity, soils in the district are generally bad for cultivation excluding the area along the Gwayi River close to Sipepa ward endowed with fertile black clay soil. Crops grown in the Matabeleland North include groundnuts, sugar beans, cowpeas, and millet, which is the most consumed crop (Chingarande et al., 2020). Kapenta fish, mopani worms, and fish chunks are major protein sources. Due to the food deficit in Matabeleland North, locals rely on Bulawayo as a reference market for bulking and distribution. Due to the lack of market integration within rural areas, local residents are forced to walk about 20 km to the nearest food distribution point at the ward center.

Another form of economic activity is petty or small-scale trading (Chingarande et al., 2020). Local residents engage in the buying and selling of goods through local shops, food vending, retail stores, and informal markets where various items are sold. Art and craft artefacts are part of commodities produced by the locals taking advantage of the tourism industry. In addition, cross-border labour migration has added to the local economy due to the proximity of neighboring countries, South Africa and Botswana.

Besides agriculture, and small-scale trading, the district takes part in small scale mining and the ecotourism industry (Zingi et al., 2022; Chingarande et al.,2020). Minerals such as coal,

limestone, gold, and methane gas have been identified within Matabeleland North. This adds to the economic opportunities for the locals. Regarding ecotourism, activities undertaken include safari operations, rural tourism and trophy hunting. Safari hunting operations are conducted at the Mutupa and Lodzi hunting camps located in the Tsholotsho Rural District Council.

4.5.2. Implications of floods in the district

Tsholotsho district suffered the impacts of heavy rainfall and Tropical Cyclone Dineo over the past decade. Despite there being several flood events, this study covers only the years 2013, 2017, and 2018 due to the availability of information on risk evaluation. In 2013, heavy rainfall brought about floods that affected Matabeleland North, Midlands, Mashonaland Central, Masvingo, Manicaland, and Matabeleland South of which Tsholotsho district is part (IFRC, 2013; OCHA, 2013; RSSING, 2013). The floods left behind 125 deaths, damaged infrastructure, disrupted agricultural activities, and affected about 9,700 people.

Subsequently, the 2017 floods affected 36 districts of which Tsholotsho is part (Nyoni et al., 2019; IFRC, 2017; UN RC Zimbabwe, 2017; Govt. Zimbabwe, 2017; Floodlist, 2017a; Floodlist, 2017b; The Sunday Mail, 2018). 251 deaths and 128 injuries were recorded and about 2,000 people were displaced as a result of the impacts: over 140 dams were destroyed including approximately 2,600 houses, roads, 388 schools, and health institutions (UN RC Zimbabwe, 2017). Victims were exposed to water-borne diseases, particularly typhoid. The Ministry of Health reported 1,934 suspected cases, 59 confirmed, and 5 deaths.

The 2018 floods were a result of Cyclone Dineo which occurred in the 2016-2017 rainy season (IOM, 2018). These floods affected the Tsholotsho district leaving 476 Individual Displaced Persons (IDPs) households which amounted to about 2,300 displaced individuals.

4.5.3. Flood Risk Management

The risk assessment of Tsholotsho district shows that areas subject to flood impacts include Mbamba, Mhalaba, Tamuhla, Jimila (ward 6), Sipepa (ward 5), Mbanyana, Mahlosi, and

Mapili (Govt. Zimbabwe, 2017, p. 4). Risk evaluation categorized the necessary measures for flood mitigation into two: The first category is short-term measures which involved the provision of emergency relief services of food and nutrition, health, WASH, education, and social protection. More details are provided in Appendix 14 (Govt. Zimbabwe, 2017; UN RC Zimbabwe, 2017; IOM, 2018; Nyoni et al., 2019). Next, the second category relates to long-term measures both structural and non-structural in nature. Structural measures included the completion of the Gwayi and Ziminya Dams in the Matabeleland North Province (Madamombe, 2004; ZimFACT, 2022; Chronicle, 2020; Zimbabwe Situation, 2021). Non-structural involved the enhancement of flood forecasting, rescue operations, incorporating disaster management in the school curriculum, finalizing the Disaster Management Bill, as well as creating an infrastructural policy on building standards (Actionaid Zimbabwe, 2023; Madamombe, 2004, p. 4) among others listed in Appendix 14.

The government took on both short and long-term measures as risk treatment to the flood impacts. For short-term measures, the government through government departments, ministries, and with the help of other organizations, reached out to 144 households in the district (IFRC, 2013). Food supplies were provided to 855 flood victims at the Sipepa relief camp (UN RC Zimbabwe, 2017). Additional efforts included the training of 66 health workers as well as 281 village health workers in identifying and treating acute malnutrition (Govt. Zimbabwe, 2017; UN RC Zimbabwe, 2017). Relief items and services such as temporary shelter (tents), Insecticide Mosquito nets, WASH and NFIs, clothing, and footwear were provided to the flood victims. Partners such as UNICEF and UNFPA provided aid by establishing a counselling center at Sipepa camp, reaching out to 557 children and 62 women, and distributing dignity kits to 500 women and girls (UN RC Zimbabwe, 2017, p. 5). UNICEF also provided child protection training for 36 government emergency response actors in the Sipepa camp.

Long-term structural measures included the continuation of the construction of the Gwayi-Shangani and Ziminya Dams in Matabeleland North Province (Zimbabwe Situation, 2021; Chronicle, 2020). Non-structural measures involved efforts to enhance flood forecasting by the Meteorology Services Department of Zimbabwe as well as Rescue operations by the Zimbabwean government in collaboration with other partners (Govt. Zimbabwe, 2017; Madamombe, 2004, p. 3).

4.5.4. Administrative capacities

The government of Zimbabwe invested and received financial aid for addressing flood impacts in the Tsholotsho district. Through the delivery capacity's 'treasure' resource, the Government Special Cabinet Committee of Zimbabwe allocated 35 million USD for the 2017 emergency (UN RC Zimbabwe, 2017, p. 2). The efforts were complimented by International Aid from the People's Republic of China (1 million USD), the Republic of India (1 million USD), Algeria (100,000 USD), Botswana (Building materials), Namibia (Fish), UN family (Emergency relief fund), Zimplats and Econet, German Agro Foster and Bankers' Association of Zimbabwe (UN RC Zimbabwe, 2017, p. 2; The Sunday Mail, 2018). For the implementation of structural flood measures, the Zimbabwean Government set aside ZWL$ 10 billion Zimbabwean Dollars for the development of 10 Dam projects (Gwayi-Shangani Dam USD 600 million in 2004, USD 20 million in 2017, USD 122 million in 2020; Ziminya Dam was allocated USD 132 million) (ZimFACT, 2022).

In terms of its coordination capacity, the government through the 'organization' resource, was able to bring together a collective response by working together with various departments, ministries, and organizations: The collective response involved the Ministry of Local Government, Public Works and National Housing, Air Force of Zimbabwe, The Ministry of Environment, Water and Climate, Civil Protection Zimbabwe, Sipepa Rural Health Centre, Sipepa Secondary School, The Meteorological Services Department of Zimbabwe, Zimbabwe National Water Authority, Zimplats, Econet, Bankers' Association of Zimbabwe, Media Agencies, and other local organizations (UN RC Zimbabwe, 2017, p. 7; The Sunday Mail, 2018; IFRC, 2013; OCHA, 2013; Govt. Zimbabwe, 2017, p. 5; Madamombe, 2004, p. 3). International aid was rendered by foreign governments and organizations namely the People's Republic of China, the Republic of India, Algeria, Botswana, Namibia, the UN family (Emergency relief fund), German Agro Foster, and other governments and organizations.

The authority to exercise the regulatory capacity was provided by the Civil Protection Act of 1989 (ZimLII, 2016b). Despite other existing legislative instruments and laws that can be used to respond to floods, the Civil Protection Act was enacted to specifically address public safety during disasters. On this basis, the National Civil Protection Committee and its underlying structures were formed and granted the capacity to carry out civil protection

functions (ZimLII, 2016b, p. 3). The government through the aforesaid ACT and committee undertook rescue operations, evacuations, and established relief camps.

Through the joint efforts of the above-mentioned parties in collaboration with the government, the analytical capacity was engaged, and the resource of 'information' was used in responding to the flood impacts. Sources of information included assessment reports, early flood warnings, and news briefings (Floodlist, 2017b; Floodlist, 2017a; Govt. Zimbabwe, 2017; IFRC, 2017; IFRC, 2013; IOM, 2018; OCHA, 2013; RSSING, 2013; The Sunday Mail, 2018; UN RC Zimbabwe, 2017).

5. Results of Analysis

In this chapter, the findings of the policy analysis are presented together with interpretations of what they mean in line with the theoretical framework in Chapter 2.

5.1. Chama district

The government of the republic of Zambia enacted the Disaster Management Act 2010 to establish a response system to disasters in the nation. As provided for under the Act, guidance on roles and responsibilities has been defined through a hierarchical structure: at the overall or macro level is the National Disaster Management and Mitigation Unit, the meso level has the Provincial Disaster Management Committees, and at the micro level is the District and Satellite Disaster Management Committees (Govt. Republic of Zambia, 2010, pp. 81,89,91).

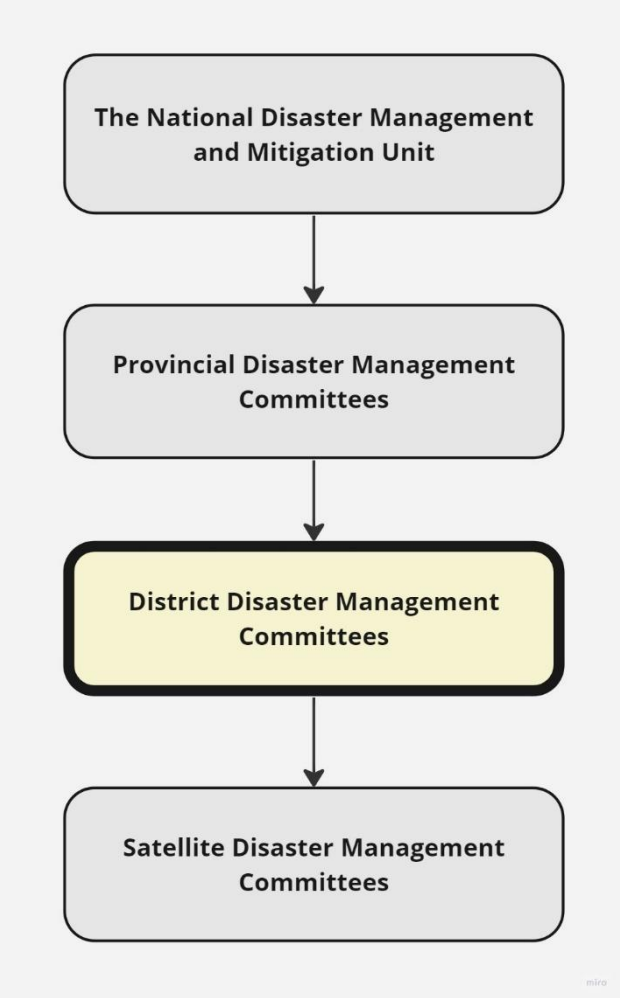

Fig. 11 National Disaster Management structure of the Republic of Zambia

Regarding the district level and its functions, the analysis showed that the ACT emphasizes on the coordination capacity the most followed by regulatory, analytical, and delivery capacities. The District Disaster Management Committee (DDMC) is a product of the organization resource and consists of diverse parties at the micro level both within and outside government. DDMC through the Regulatory capacity has been given authority to manage disasters at district level within their means and report to the Provincial Disaster Management Committee (PDMC). The Analytical capacity involves the collection and dissemination of information through report, early warning services, and news briefs. The delivery capacity for disaster response depends on national funding through the National Disaster Relief Fund which is overseen by the Ministry of Finance and locally generated

resources within the district (Govt. Republic of Zambia, 2010, p. 95).

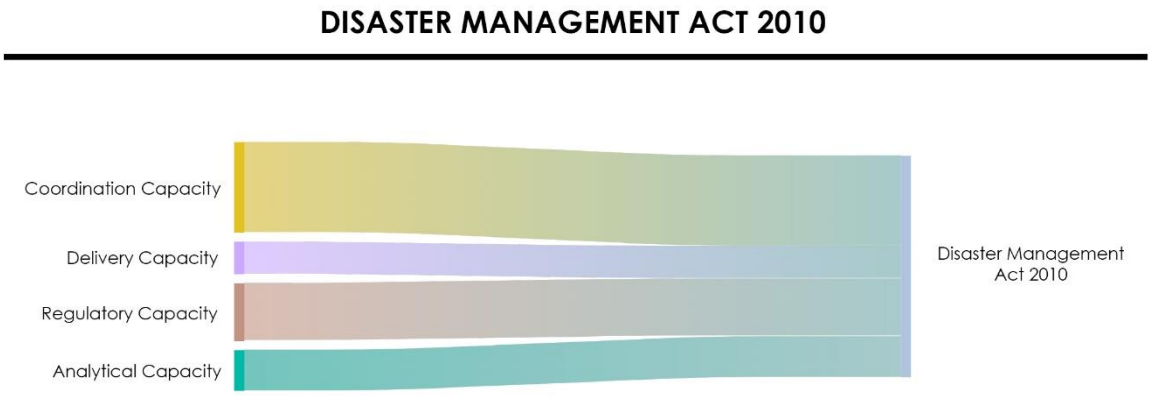

Fig. 12 Analysis of the district functions under the Disaster Management Act 2010

In light of the risk evaluation and risk treatment of the floods over the past decade, the government of the Republic of Zambia has been successful at engaging the capacities as the policy analysis showed: The most prominent capacity was the coordination through organizing stakeholders within and outside the district. Through the regulatory capacity, three relief camps were established in Chama North constituency. With the help of government departments such as the DMMU and organizations such as Actalliance and media entities, information through reports and news briefs was generated thus the government making use of the analytical capacity. The delivery capacity was not directly engaged as the provided assistance was rendered through government departments, ministries, and organizations and not directly to the beneficiaries.

Despite having engaged all capacities, measures implemented where for the short-term immediate response to the floods and not long-term. Issues of damaged infrastructure were not addressed and are still subject to subsequent disasters. In addition, not all flood affected areas were attended to. The Chibale area in the north had no relief camps. Other areas particularly, Chikwa and Chifunda in Chama south Constituency had human wildlife conflicts (Actalliance, 2018a, p. 1).

5.2. Charsadda district

Pakistan's disaster response is guided by the National Disaster Management Act 2010. Its structure is also hierarchical in nature with the National Disaster Management Authority (NDMA) at the Macro level, the Provincial Disaster Management Authorities (PDMA) at the meso, and Disaster management Authority (DDMA) at the micro (NDMA Pakistan, 2010, pp. 735,737,740).

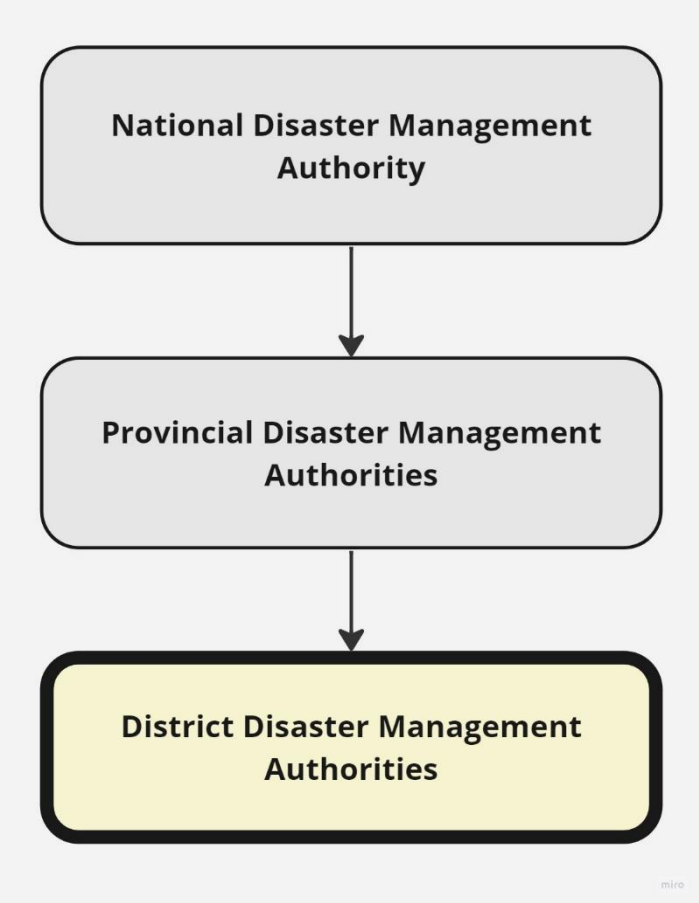

Fig. 13 National Disaster Management Structure of the Republic of Pakistan

Following an analysis of the Act, it was established that the most prominently emphasised capacity was the coordination capacity followed by the regulatory, delivery, and lastly analytical. The DDMA consists of government department and ministry representatives. As such, the functions performed are carried out with the use of the coordination capacity. In second place of emphasis, the regulatory capacity grants authority for express decisions and actions that can be exercised but subject to an "ex-post facto approval by the district authority" (NDMA Pakistan, 2010, p. 741). The delivery capacity follows the regulatory. It is closely linked to implementing mitigative measures. The last is the analytical capacity linked to the acquisition and distribution of information on the disaster situation.

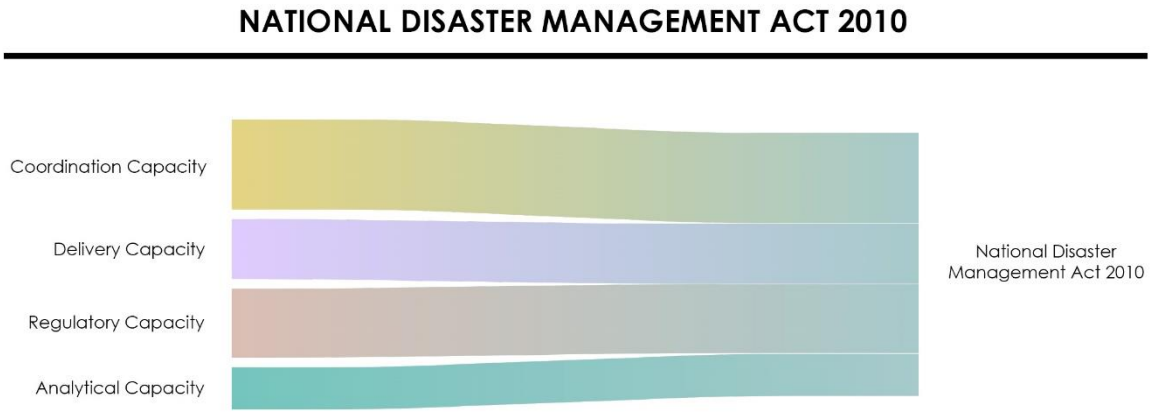

Fig. 14 Analysis of the district functions under the National Disaster Management Act 2010

The risk evaluation indicated that the focus of the government was on immediate response to the flood impacts. Risk treatment illustrates that the government was able to engage all its administrative capacities.

Challenges faced included addressing the destruction of infrastructure which led to the displacement of residents, long-term food insecurity, exposure to water borne diseases, increased social vulnerability of flood victims (Yousaf & Naveed, 2013; IRC, 2022).

5.3. Lakhimpur district

India's response to disasters is guided by the Disaster Management Act 2005. The Act prescribes a hierarchical structure of roles and responsibilities: The National Disaster Management Authority (NDMA) presides at the macro level, the State Disaster Management Authority (SDMA) at the meso, and the District Disaster Management Authority at the micro (Government of India, 2005, pp. 5,9,13).

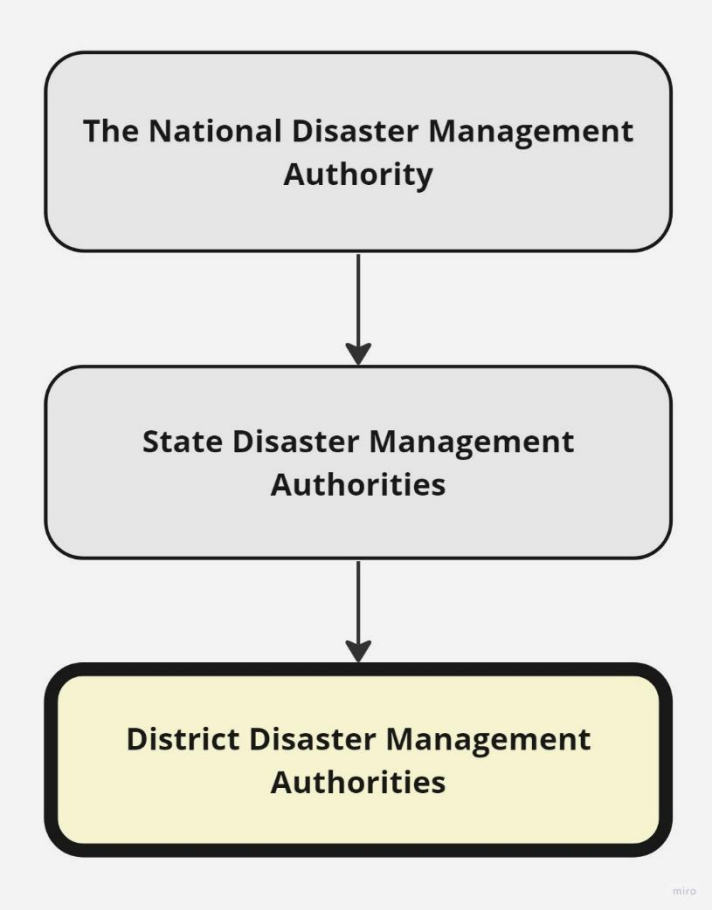

Fig. 15 National Disaster Management Structure of the Republic of India

Based on the analysis of the Act, the regulatory capacity is the most pronounced or emphasized among the DDMA's roles, responsibilities and functions seconded by the coordination, then delivery and analytical (Government of India, 2005).

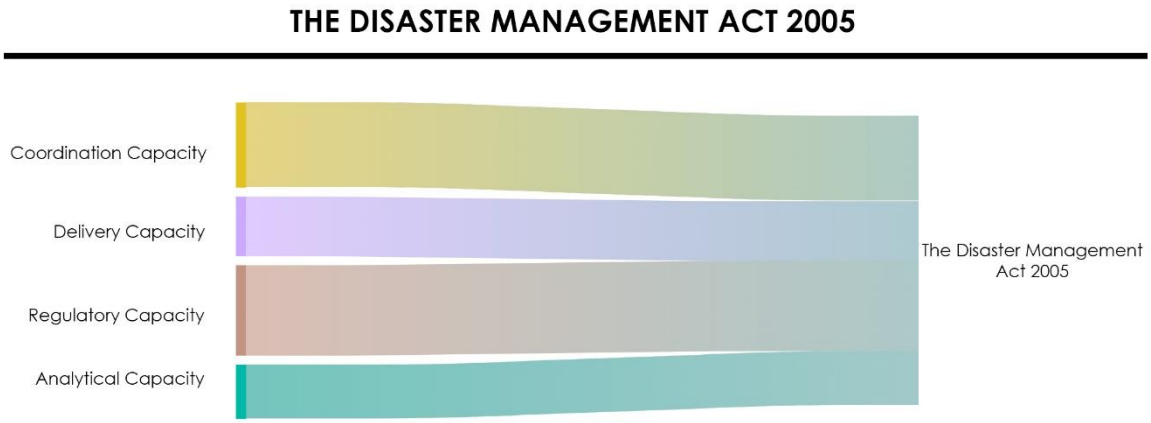

Fig. 16 Analysis of the district functions under the Disaster Management Act 2005

As indicated in Appendix 8, Lakhimpur's risk evaluation and risk treatment incorporated both short and long-term measures. The government was able to address a good number of needs from the risk evaluation. In addition, all capacities were engaged in its response action to flood impacts. A critical analysis of the risk evaluation and risk treatment indicates a dominance of the coordination and regulatory capacities (Sphere India, 2015a, pp. 5-6; 2015b, pp. 1-2). Major response efforts involved government departments and ministries which were complimented by NGOs.

5.4. Nilphamari district

Despite not having a specific Act to guide response to disasters, the government of Bangladesh utilizes the Standing Orders on Disasters 2019: A legislative culmination of the Disaster Management Act 2012, National Disaster Management Policy 2015, and National Plan for Disaster Management 2016-2020 (The Government of Bangladesh, 2019). Within the instrument is a prescribed structure of roles and responsibilities in response to disasters: At the macro level is the National Disaster Management Council (NDMC) and the Disaster Management Committees at local or micro level.

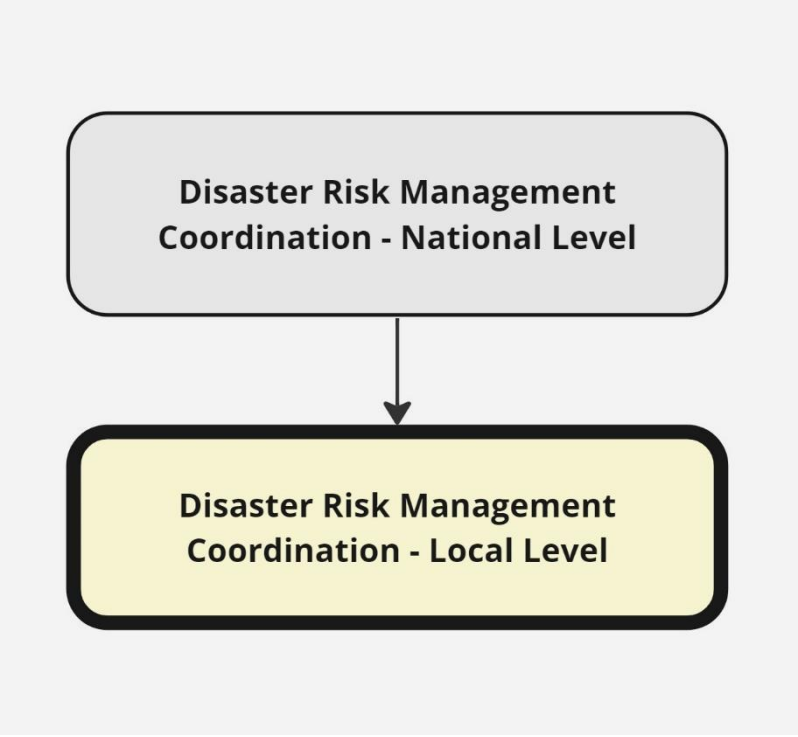

Fig. 17 National Disaster Management Structure of Bangladesh

The most emphasised administrative capacity within the districts functions in the standing orders is the coordination capacity seconded by the delivery capacity, then regulatory and last, analytical capacity. A number of functions of the district require the organization and treasure resources hence the outcome of the analysis.

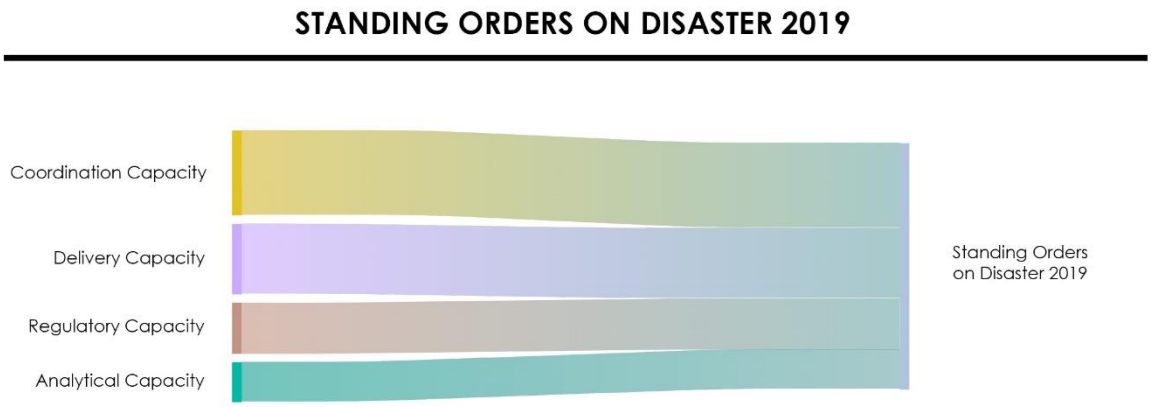

Fig. 18 Analysis of the district functions under the Standing Orders on Disaster 2019

A look at Nilphamari's risk evaluation and risk treatment illustrates that the government's response was significant and employed all capacities in its response. However, not all needs were met. The government managed to address some of the crucial short-term needs and are in the process of implementing long-term measures too. Majority of response efforts were directed toward short-term impact mitigation. Both coordination and delivery capacities were prominent in the government's response to flood impacts.

5.5. Tsholotsho district

Just as the latter cases, the government of Zimbabwe enacted the Civil Protection Act 1989 to address public safety regarding disaster eventualities. In terms of the structure of roles, responsibilities, and functions, the National Civil Protection Committee (NCPC) presides at the macro level, the Provincial Organization of Civil Protection (POCP) are at the meso level, and the Area Organization of Civil Protection (AOCP) are at the micro level (ZimLII, 2016b).

Fig. 19 National Disaster Management Structure of Zimbabwe

An analysis of the Civil Protection Act showed that the most emphasised administrative capacity among the roles, responsibilities and functions of the district or AOCP was the regulatory, succeeded by delivery, followed by coordination and last, analytical. A reason for this is established within the Act: The Minister of Local Government, Rural and Urban Development establishes civil protection areas as well as appoints officers to the take-on responsibilities in the AOCP. Functions are performed in a hierarchical fashion hence the strong need for authority and bureaucratic procedure.

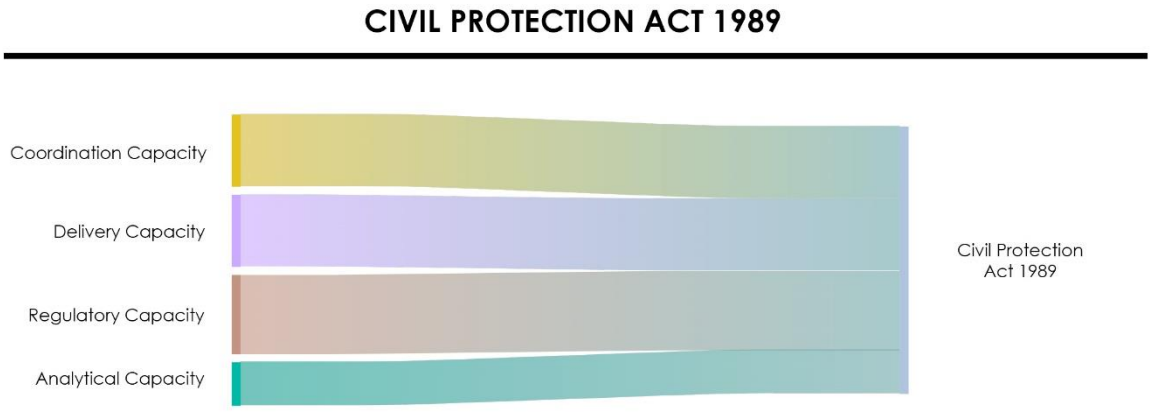

Fig. 20 Analysis of the district functions under the Civil Protection Act 1989

The Zimbabwean government's risk evaluation and risk treatment to flood impacts employed both short and long-term measures. All capacities were engaged with the prominent being coordination, delivery, and regulatory. Response to flood impacts involved government departments, ministries as well as NGOs.

6. Discussion and Conclusion

This study set out to establish a link between government administrative capacities and flood risk management in a rural area context of the Chama district in the Eastern Province of Zambia. In line with the aforementioned, this study sought to answer the main research question:

'What is the impact of the relationship between governmental administrative capacities and flood risk management in the rural area of the district of Chama?'

Furthermore, this inquiry was guided by a number of secondary research questions:

5. *How can a theoretical perspective on administrative capacities in flood risk management be conceptualized?*
6. *What is the implication of the physical and institutional context in flood risk management?*
7. *How can the adoption of an area-oriented approach in flood risk management influence rural development in the Chama district?*
8. *What are the possible implications of employing a collaborative approach in flood risk management in the case of the district of Chama?*

The local authority has a dilemma on its hands; on one hand, the district faces recurring floods whose impacts are projected to intensify due to climate change. On the other, the district still needs development to attain the nation's vision 2030 of becoming a prosperous middle-income nation by the year 2023. This study sought to create a basis for addressing this dilemma as well as link administrative capacities and flood risk management in a rural area context thereby addressing a knowledge gap. Below are summarized interpretations of the key findings of this study.

INTERPRETATION OF THE FINDINGS

'What is the impact of the relationship between governmental administrative capacities and flood risk management in the rural area of the district of Chama?'

From the obtained results, it was found that the coordination capacity has the most influence on flood risk management as creates a possibility to collaborate with others and

compensate for weaker capacities. The coordination capacity was supported by the delivery, regulatory, and analytical capacities. Having observed the aforementioned, it was also noted that the capacities are closely linked and cannot be isolated completely when executing government functions. As the case of the Chama district showed, coordination helped compensate for weaknesses in the delivery and analytical capacity. The regulatory capacity was limited due to the level of hierarchy involved; the DMMU controlled response action at the provincial level and as such, the district had little influence with some situations like establishing relief camps and dealing with human-wildlife conflicts.

What is the implication of the physical and institutional context in flood risk management?

Chama's terrain and climate is the main reason for the flooding. Some of the other cases experience severe and more frequent flooding due to particular physical characteristics such as the natural landscape and climatic conditions.

Regarding the institutional setup, addressing flood impacts in rural areas such as the Chama district is handled at the macro and meso levels. Relief funding is channelled down from the government through the hierarchical structure within the DMMU to the district as seen from the flood events studied (Govt. Republic of Zambia, 2010). However, the challenge is that government could not address all affected areas. As such, the district had to find means and ways of addressing unattended matters.

For districts Lakhimpur and Nilphamari, floods are more frequent and severe since times past. Not only have the governments presiding over these areas developed actor networks to help mitigate and adapt to flood impacts, but the locals have also embraced traditional knowledge systems to cope with the situation (Kipgen & Pegu, 2018, p. 308).

How can the adoption of an area-oriented approach in flood risk management influence rural development in the Chama district?

Based on the findings, the Chama district did not implement any long-term risk reduction measures. Considering the young local economy, structural measures such as dams and embankments could not be feasible and such large-scale projects are mostly handled at higher levels of government. In the cases where such were implemented, some projects were not located within the actual district such as the Mohmand dam and Palai dam West

of the Charsadda district (Power Technology, 2019; Pakistan Engineering Services, 2012), and the Gwayi-Shangani dam north of Tsholotsho district (Zimbabwe Situation, 2021). An area-oriented approach was employed to attain flood mitigation or flood risk reduction for not only Tsholotsho districts but other districts subject to flooding.

Risk transfer was not used in the measures implemented. The closest form of risk transfer was the provision of funds to flood victims in the case of floods in the Nilphamari district (UN RC Bangladesh, 2017a; IFRC, 2021). Though risk transfer shares a similarity with such an intervention, flood victims had not subscribed to any policy giving them a right to claim such aid.

The majority of efforts made involved risk retention or helping flood victims cope with the flood impacts. Governments were mostly focused on providing short-term mitigation measures through a number of relief services.

What are the possible implications of employing a collaborative approach in flood risk management in the case of the district of Chama?

In the case of the Chama district, the top-down short-term measures worked well for immediate responses to flood impacts. However, long-term measures would require a more collaborative approach as they are more sensitive and deal with uncertainties over longer periods of time. The inclusion of traditional knowledge systems into future flood risk management plans would enhance community resilience to floods.

LIMITATIONS AND RECOMMENDATIONS FOR FURTHER STUDY

Due to constraints on time, interviews with key personnel from the districts could not be undertaken. As a result, the in-depth essence of understanding the position of the districts regarding flood risk management could not be fully attained. Conducting semi-structured interviews would best aid fill in information gaps that the reports could not cover (Hay, 2000, p. 150).

Due to the nature of administrative capacities, clear boundaries could not be placed as they were used simultaneously in most instances. For this study, the focus was on the main capacities that played key roles in influencing flood risk management. Furthermore, for future research, the capacities could be further investigated so as to gain a clearer insight into their effects.

Regarding the policy analysis, functions described at the district level were reviewed in categories based on administrative capacities. However, the majority of flood response action taken in the cases studied was mostly influenced by the meso level of government. This made it difficult to get a conclusive picture of the impact of the district. By incorporating interviews in future studies, this limitation can be addressed and results can be further refined.

In addition, information reports on flood events were subject to and are still subject to revision as assessments for the districts are still in progress. This in turn may affect the findings of the study if carried out in the future. The best approach for future investigations would be to refer to updated reports.

Some of the data sources aren't publicly accessible which may make it difficult for fact-checking.

An aspect also attributed to limited time is the spatial analysis using GIS. As opposed to methods such as flood simulation (Opolot, 2013, p. 1887), this study used the data band 5 of the Landsat dataset provided by the USGS earth explorer (USGS, 2023). The bands were used to generate maps of the affected areas based on available data. While maps were successfully produced, factors such as cloud cover and missing updates hindered the production of coherent maps linked to all flood events. An in-depth spatial analysis may be conducted for a more thorough investigation.

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Appendix

Appendix 1 – Flood events in Chama district

Flood Year	Affected areas	Flood impacts
2018	Chikwa and Chifunda villages in Chama district (Actalliance, 2018a)	• Kampemba bridge was washed away • 901 families were left homeless • Issues of human-wildlife conflicts were recorded • 491 HHs were affected • 377 community members were evacuated
	Petauke and Chama districts (Actalliance, 2018a; Actalliance, 2018b)	• About 2,140 households from both districts were affected • 901 families were left homeless in Chama district while 847 lost their homes in Petauke district • The Chama Lundazi bridge was washed away
2019	Chifunda and Mapamba areas in Chama district (Lusaka Times, 2019)	• 4 deaths were recorded • Harvest was swept away • Damaged bridge • Destroyed road infrastructure • 11 houses collapsed

2022	Most affected wards in the district include Mwalala, Kaozi, Mphalausenga, Mabinga, and Chilinje (ZANIS, 2022; DMMU, 2022)	• Overall, 2,335 households were affected in the district • 199 houses collapsed • Approximately 750 hectares of crops was damaged affecting 2,594 farmers

Appendix 2 – Flood risk management assessment in the Chama district

RISK ASSESSMENT	RISK EVALUATION	RISK TREATMENT
Areas were affected in both Chama North and Chama South Constituencies in Chama district (Actalliance, 2018a; Actalliance, 2018b)	• Provide relief food • Provide basic shelter and utilities • Basic health care facilities • Drinkable water including sanitation and hygiene infrastructure • Create livelihood activities • Provide protection services • Provide adequate nutrition	• 377 members of the community were evacuated to relief camps setup in schools, churches and camps • Government established three relief camps that hosted 884 Households (201 HHs in Katangalika, 192 HHs in Kapalakonje, and 491 HHs in Camp 1) • Provision of relief services: Distribution of insecticide Mosquito nets, blankets and clothing • Provided tents for shelter • Established temporary settlement camps at schools and churches

Appendix 3 - Analysis of administrative capacities used in Chama district

	DELIVERY	**COORDINATION**	**REGULATION**	**ANALYTICAL**
FLOOD RISK MANAGEMENT (Risk Assessment, Risk Evaluation, Risk Treatment)	• Government of Zambia, Ministry of Finance (Govt. Republic of Zambia, 2010)	• Government of Zambia (DMMU) • Central Government through District Commissioners • Ministry of Health • Act alliance Zambia Forum • Faith-based groups (United Church of Zambia (UCZ), Caritas Zambia, Church of Central Africa Presbyterian (CCAP), Swedish Diakonia, Norwegian Church Aid (NCA), Czechoslovakia Diakonia (CzD), and Dan Church Aid (DCA))	• The Disaster Management Act, 2010	• Flood reports • News briefs and publications

		• Zambia Red Cross Society • Media Agencies		

Appendix 4 - Flood events in Charsadda district

Flood Year	Affected areas	Flood impacts
2010	Charsadda and Utmanzai areas in Charsadda district (Yousaf & Naveed, 2013; The Tribune, 2010)	• 24,135 families of about 166,300 people were affected in Charsadda • Five deaths were recorded • About 3,900 houses were destroyed • 5,500 families were displaced, 3,091 from Charsadda and 2,409 from Utmanzai • 34 schools were damaged • 125 mosques were partially damaged • 68 shops were washed away while 104 were partially damaged •
2022	Charsadda and Nowshera districts (IRC, 2022, p. 9; The Nation, 2022; Bol News, 2022)	• 47 water sources were damaged • 5 schools were partially damaged while 1 was completely destroyed • 2 health units were partially damaged while 1 was completely destroyed • 70% of houses were left without electricity • 11 shops were destroyed • 193 acres of crops was destroyed

Appendix 5 - Flood risk management assessment in the Charsadda district

RISK ASSESSMENT	RISK EVALUATION	RISK TREATMENT
The most affected areas include Agra, Hisar Yasinzai, and Daulat Pura in Charsadda district (Hamidi et al., 2022, p. 10; IRC, 2022; ARY News, 2022; Khan et al., 2013; Muhammad et al., 2017; Power Technology, 2019; The News International, 2021; Pakistan Engineering Services, 2012; Dawn, 2012)	• Food • Shelter • Health care • Monetary aid • Water, Sanitation, and Hygiene (WASH) services • Access to education • Livestock medical supplies and aid	SHORT TERM MEASURES • Relief and rescue operations were conducted at Shabara and Majoki where about 400 people were rescued • Provision of food items and basic utility items • Relief medical services and rescue operations • Establishing temporal relief shelter • Health and hygiene awareness campaigns LONG TERM MEASURES • Retention reservoirs and embankments (Causes, Effects and Remedies paper)

		• Dam construction (Palai and Mohmand Dams)

Appendix 6 - Analysis of administrative capacities used in Charsadda district

	DELIVERY	**COORDINATION**	**REGULATION**	**ANALYTICAL**
FLOOD RISK MANAGEMENT (Risk Assessment, Risk Evaluation, Risk Treatment)	Emergency response to floods • Government and stakeholders Structural Measures • Mohmand Dam construction. Rs 309.56 billion (About 1.2 billion USD) • Palai Dam construction. Rs 998 million (3.6 million USD)	• Government of Pakistan through the Provincial Disaster Management Authority, Khyber Pakhtunkhwa • Government departments, UN agencies, international and local NGOs, including other humanitarian organizations • Media Agencies Mohmand dam construction • Government of Pakistan through the Water and Power Development Authority (WAPDA), the federal public	• The National Disaster Management Act 2010	• Flood reports (Early Need Identification Report, 2022, Flood Emergency Response situation report, 2022) • News brief ()

		sector development programme of Pakistan, and WAPDA's equity and investments both local and international Palai Dam construction • Federal government sanctioned the project		

Appendix 7 - Flood events in Lakhimpur district

Flood Year	Affected areas	Flood impacts
2013	Assam state (Including the Lakhimpur district) (Times of India, 2013)	• 260 villages suffered the impacts • 4,200 hectares (Ha) of farmland was submerged in water • 37,000 people were forced to leave their flooded homes • 17,000 people in 77 villages were submerged in flood waters
2015	22 districts including the district of Lakhimpur (Sphere India, 2015a, p. 4; 2015b; Floodlist, 2015; The Times of India, 2022)	• Affected population is above 17,00,000 • Loss of 100,000 hectares (1 lakh hectares) of crop accumulatively cultivated by 2,000 villages • 25 recorded fatalities • Cut of power supply • Transportation disruption
2016	Lakhimpur district among 6 other districts were affected (Sphere India, 2016, p. 1)	• Accumulatively about 165,000 people were affected • 24,366 were affected in Lakhimpur district including more than 50 villages
2018	Lakhimpur district among others was affected (Sphere India, 2018, p. 1; India Today, 2018)	• 18 villages in Lakhimpur district were affected
2020	Lakhimpur among 26 other districts (India Today, 2020)	• About 2.2 million people were affected • 2,763 villages were submerged underwater • 103,806.15 hectares of crop area was damaged

		• Embankments, bridges, roads, culverts among other infrastructure was destroyed • 1,781,920 domestic animals were affected

Appendix 8 - Flood risk management assessment in the Lakhimpur district

RISK ASSESSMENT	**RISK EVALUATION**	**RISK TREATMENT**
Lakhimpur district (Sphere India, 2015a, p. 6; 2015b, p. 1; Kipgen & Pegu, 2018, p. 313; The Sentinel, 2023; ASDMA, 2023)	SHORT TERM MEASURES WASH Recommendations • Provide safe drinking water • Provide at least one water purification unit per community • Chlorinate water sources • Provide hygiene kits particularly water purification tablets prior to setting up water source Shelter • Emergency Shelter Kit (Temporary shelter on a raised platform) • Provide necessities such as blankets, cooking utensils, solar lamps, among others. Food & Nutrition • Provision of rations to the most affected population • Provide aid for fodder and animal health camps Health	SHORT TERM MEASURES • Provided relief aid in the form of rice, salt, dal, tarpaulin, chira, candles, wheat, gur, barn, and lactogen. 2016 – government provided Lakhimpur district with 11.90 Quintal Rice (110,000 kg), 2.03 Quintal Dal, and 0.61 Quintal salt • Established relief camps • Undertook rescue operations. • 1 boat was deployed and 34 people were evacuated • State Disaster Response Fund (SDRP) and National Disaster Response Force

	• Basic health care services • Decontamination of water points and water sources • Provision of Minimum Initial Service Package (MISP) kits through trained staff teams Protection • Create a child friendly environment • LONG TERM MEASURES WASH Recommendations • Establish at least 1 water source per 500 people • Create user committees for each hand pump installed • Equip shelter locations with sanitary facilities with particular attention paid to the needs of women and young girls Shelter • Advocate for the restoration and reconstruction of shelters	(NDRF), and the army were deployed to carry out rescue operations • Provided additional materials such as baby food, matchboxes, candles, tarpaulin, mosquito nets, soaps, biscuits, masks, cattle feed, drinking water, and wheat bran LONG TERM MEASURES • Dam management • Rehabilitation and reconstruction of damaged infrastructure • Enhance flood preparedness measures: Early warning systems, flood forecasts, and community sensitization

	• Develop disaster risk reduction measures • Advocate for relocation of residents to safer locations Food & nutrition • Provide support for rabi crops (Winter crops) Health • Control of Vector borne diseases (Malaria, dengue fever, lyme disease) • Prevention of diarrheal diseases • Provide reproductive, adolescent and child care health care	and awareness campaigns • Applying traditional knowledge systems to adapt with floods (Physical Adaptation Strategies, food storage systems, social relationships

Appendix 9 - Analysis of administrative capacities used in Lakhimpur district district

	DELIVERY	**COORDINATION**	**REGULATION**	**ANALYTICAL**
FLOOD RISK MANAGEMENT (Risk Assessment, Risk Evaluation, Risk Treatment)	SHORT TERM • Provision of resources for relief aid and services LONG TERM • Public Works Department took on Rs 318.3 crore (38.6 million dollars) worth of work on road and embankment structures	• Government of India through the Assam State Disaster Management Authority • The State of Assam • Central Water Commission (CWC) • Ministry of Water Resources • North Eastern Space Application System (NESAC) • Public Works Department (PWD) • National Disaster Management Authority (NDMA) • District Authorities • District Administration	• The Disaster Management Act, 2005	• Flood reports • News briefs

		• Media Agencies • Other organizations		

Appendix 10 - Flood events in Nilphamari district

Flood Year	Affected areas	Flood impacts
2013	12 Unions in Dimla and Jaldhaka Upazilas (NIRAPAD, 2013, p. 1; Govt. Bangladesh, 2014, p. 20)	• 20,000 households were affected
2014	Nilphamari (ACAPS & Network, 2014, p. 2; IFRC, 2014, p. 2; FAO et al., 2014)	• 7,500 People were affected • Food insecurity both short and long term • Freshwaters were submerged by flood water leaving them contaminated • Lack of sanitation facilities and settlements • Increased risk of exposure to waterborne diseases • Washed away fish farms
2016	Dimla and Jaldhaka (NIRAPAD, 2016, p. 3; Govt. Bangladesh et al., 2016)	• 40,860 people were affected • Collapse of Padma River embankment • 43 people in total were killed • Floods destroyed partially 27,522 hectares and completely destroyed 35,194 hectares of land. The main crops destroyed were aus rice, sugarcane, jute, and vegetables • Exposure of women and children displaced by floods to abuse and gender-based violence. • Damaged roads, railway tracks, embankments, and culverts.

2017	31 Districts including Nilphamari (NIRAPAD, 2017, p. 1; UN Resident Coordinator in Bangladesh, 2017a, p. 1; 2017b, p. 1)	• 6.7 million people were affected by the floods. • 121 deaths were confirmed by the government and 160,734 people were displaced • 71,628 houses were fully destroyed with 548,175 partially damaged • About 382.5 km of road was fully damaged while 4,432 km was partially destroyed • 265 bridges and culverts in the northwest were dreadfully damaged • About 7.66 km of embankments was fully damaged, and 96.26 km was partially
2019	28 districts including Niphamari (IFRC, 2021, p. 1; CARE, 2019; Bangladesh Red Crescent, 2019, p. 1)	• 300,000 people were displaced • 600,000 houses were damaged • 114 deaths were recorded • 532,000 hectares of crops were destroyed • Embankments were damaged • Struggle with the onset of the covid 19 pandemic •
2020	18 districts including Nilphamari (UN RC Bangladesh, 2020, p. 1; IFRC, 2020a; Dhaka Tribune, 2020a; 2020b)	• Outbreak of the covid 19 pandemic • Cyclone Amphan occurred causing devastating impacts on 26 districts • 2.4 million people were affected

		• 548,819 houses were waterlogged • 54 deaths were recorded (UN RC Bangla 2020)

Appendix 11 - Flood risk management assessment in the Nilphamari district

FLOOD YEAR	RISK ASSESSMENT	RISK EVALUATION	RISK TREATMENT
	Kumargari, Dimla, and Jaldhaka upazilas in Nilphamari district (World Bank, 2021; Mondal et al., 2021, p. 1) (NIRAPAD, 2017; CARE, 2019; IFRC, 2021; Munyai et al., 2021; UN RC Bangladesh, 2017b; UN Resident Coordinator in Bangladesh, 2017a; UN RC Bangladesh, 2020; UN RC Bangladesh, 2017a) (UN RC Bangladesh, 2017b) (UN RC Bangladesh, 2017a; IFRC, 2021) (BBC Future Planet, 2020) (The World Bank, 2022; The Government of Bangladesh, 2023; Delta Context, 2021) (IFRC, 2021; Islam et al., 2017)	SHORT TERM MEASURES LIVELIHOOD AND BASIC NEEDS • Distribution of dry/cooked food to 10,000 people • Provide Multi-Purpose Cash Grant (MPCG) (each HH would receive 4,500 BDT) assistance along with seeds support to 5,000 House Holds (HHs) SHELTER • Provide Tarpaulins and tents along with technical orientation to 2,000 HHs WASH • Provide safe drinking water through mobilizing 6 water treatment units (including distribution of jerry cans) • Provide safe drinking water through repairing 200 units of damaged water points	SHORT TERM MEASURES • BDRCS' mobilized volunteers as first responders • Government allocated 88.44 million BDT (USD $ 1.1 million), 27,045 MT of rice and 71260 worth dry food packets to the affected districts • Government also provided 31,980 bundles of corrugate iron along with BDT 95.9 million (USD $ 1.2 million) for the reconstruction of houses • BDRCS assisted 66,270 people with dry food packages among 5,750 flood-affected households.

		• Construct 100 units of emergency latrines for communal use • Mass awareness for 2,000 HHs on hygiene promotion and provide hygiene parcels HEALTH • Mass awareness of COVID-19 for 25,000 people • Provide PPE for 200 frontline volunteers and staffs • Provide emergency health service to 500 people through BDRCS health centers • Provide First aid and psycho-social support service to 200 people PROTECTION, GENDER, AND INCLUSION (PGI) • Ensure Minimum protection, gender and inclusion (PGI) standards throughout the operation Provide assisting devices and associates to address the special need of people with disabilities.	• BDRCS deployed six water purification units and the National Disaster WASH Response Team (NDWRT) and trained staff provided 78,460 litres of safe drinking water and distributed 4,428 jerry cans among flood-affected people. • In addition, BDRCS trained volunteers and staff disinfected 320 tube wells and constructed 52 temporary latrines for flood-affected people. • BDRCS also mobilized and distributed hygiene parcels to 8,900 households along with orientation and distribution of information, education

		LONG TERM MEASURES • Re-establish communication system: repair and reconstruction of roads, embankments, and culverts • Support the repair and reestablishment of shelters and WASH facilities • Repair schools damaged by the floods and by being used as collective centers so classes can resume • Support the Government of Bangladesh in developing a strategy for immediate recovery of critical infrastructure	and communication (IEC) materials on safe hygiene practice. • Four mobile medical teams mobilized and provided medical assistance to 4,480 flood-affected people. • BDRCS produced and distributed 650,000 awareness leaflets in 250 schools and to the general public. • Dengue patients were treated at Holy Family Red Crescent Hospital and other BDRCS hospitals. • BDRCS blood centres also provided blood and platelets to dengue patients nationwide. BDRCS volunteers also

			assisted dengue patients in six major hospitals in Dhaka city by providing Psychosocial First Aid (PFA) and Psychosocial Support (PSS). • BDRCS provided tarpaulins and shelter toolkits to 2,000 flood-affected households (1,250 covered from EA and 750 covered by Shelter Box). In addition, BDRCS provided shelter toolkits to 5,000 households from this EA and tents among another 700 flood-affected households supported by UNHCR. • BDRCS provided Multipurpose Cash Grant (MPCG) in Kurigram,

			Gaibandha, Bogura, Sirajganj, Tangail, Jamalpur, Sunamganj and Sylhet districts to more than 12,000 flood-affected households. • For the cold waves, BDRCS distributed 36,450 blankets and 19,700 chadars (shawl/warm cloths) countrywide LONG TERM MEASURES Structural measures • Flood adaptation: Indigenous Intervention (Building on elevated platforms) • Embankments and fortified walls such as the Coastal Embankment Rehabilitation Project (CERP) and the Coastal

			Embankment Improvement Project (CEIP) • Non- Structural measures • Enhanced flood forecasting • Community based early warning systems • Integrated water and flood management

Appendix 12 - Analysis of administrative capacities used in Nilphamari district

	DELIVERY	**COORDINATION**	**REGULATION**	**ANALYTICAL**
FLOOD RISK MANAGEMENT (Risk Assessment, Risk Evaluation, Risk Treatment)	• Government allocated 88.44 million BDT (USD $ 1.1 million), 27,045 MT of rice and 71,260 worth dry food packets to the affected districts following the 2017-2018 floods • Government also provided 31,980 bundles of corrugate iron sheets along with BDT 95.9 million (USD $ 1.2 million) for the reconstruction of houses	• Government of Bangladesh • Bangladesh Red Crescent Society (BDRCS) • Bangladesh Water Development Board (BWDB) • Flood Forecasting and Warning Center (FFWC) • Government of the Netherlands (Technical assistance with the CEIP) • Food and Agriculture Organization (FAO) provided technical assistance to the World Bank	• Standing Orders on Disaster 2019	• Flood reports • Early Warning Flood Announcements • News briefs

	• Government provided BDT 43,00,000.cash support following the 2013 floods • BDRCS provided Multipurpose Cash Grant (MPCG) in Kurigram, Gaibandha, Bogura, Sirajganj, Tangail, Jamalpur, Sunamganj and Sylhet districts to more than 12,000 flood-affected households. • Climate Investments Funds provided 25 million USD for the Coastal Embankment	• Ministry of Disaster Risk Management • Ministry of Agriculture was to provide farmers with inputs • Department of Livestock Services sought emergency support from the government • Directorate General of Health Services (DGHS) • Humanitarian Coordination Task Team (HCTT) • International Federation of Red Cross and Red Crescent Societies (IFRC) • Oxfam		

	Improvement Project (CEIP) • UNICEF allocated USD 60,000 for immediate education service support	• World Vision provided health care services • World Food Programme (WFP) • Armed Forces Division deployed 11 platoons to support flood victims • The Government of Canada • UNICEF • Other partners included ActionAid Bangladesh, Concern Worldwide, Care International, Handicap International, Relief International, HelpAge International, as well		

		as Save the Children and Plan International • Media Agencies		

Appendix 13 - Flood events in Tsholotsho district

Flood Year	Affected areas	Flood impacts
2013	Matabeleland South (Tsholotsho district included), Matabeleland North, Midlands, Mashonaland Central, Masvingo, and Manicaland. (IFRC, 2013; OCHA, 2013; RSSING, 2013)	• 125 deaths were recorded • About 9,700 people were affected • Damage to infrastructure (schools, bridges, clinics, and roads), livestock, shelter and crops. •
2017	36 districts were affected including Tsholotsho district (Nyoni et al., 2019; IFRC, 2017; UN RC Zimbabwe, 2017; Govt. Zimbabwe, 2017; Floodlist, 2017a; Floodlist, 2017b; The Sunday Mail, 2018)	• About 2,000 people were displaced in Tsholotsho district • More than 140 Dams were destroyed • Other damages included roads, schools, and health institutions • 251 deaths and 128 injuries were recorded • About 2,600 houses were destroyed • 388 schools were destroyed • Increased risk of water borne diseases, typhoid in particular. The Ministry of Health reported 1,934 suspected typhoid cases, 59 confirmed, and 5 deaths since January. • •
2018	Tsholotsho district (UN RC Zimbabwe, 2017) (IOM, 2018)	• About 476 Individual Displaced Persons (IDPs) households, that is about 2,343 individuals were displaced •

Appendix 14 - Flood risk management assessment in the Tsholotsho district

RISK ASSESSMENT	RISK EVALUATION	RISK TREATMENT
Area of impact includes Mbamba, Mhalaba, Tamuhla, Jimila (ward 6), Sipepa (ward 5), Mbanyana, Mahlosi, and Mapili in Tsholotsho district (Govt. Zimbabwe, 2017, p. 4) (Govt. Zimbabwe, 2017; NIRAPAD, 2013; UN RC Zimbabwe, 2017; IOM, 2018; Nyoni et al., 2019) (Madamombe, 2004; ZimFACT, 2022; Chronicle, 2020; Zimbabwe Situation, 2021) (Actionaid Zimbabwe, 2023; Madamombe, 2004, p. 4) (IFRC, 2013) (UN RC Zimbabwe, 2017) (Govt. Zimbabwe, 2017; UN RC Zimbabwe, 2017) (UN RC Zimbabwe, 2017, p. 5) (Zimbabwe Situation, 2021; Chronicle, 2020) (Govt. Zimbabwe, 2017; Madamombe, 2004, p. 3)	SHORT TERM FOOD AND NUTRITION • Relief food supplies (UN RC Zimbabwe, 2017 p2) EMERGENCY HEALTH SERVICE • Establish treatment centers within the relief camps (UN RC Zim p4) • • Sensitize 700 affected families on waterborne risks and diseases • Sensitize 700 affected families on the use of Insecticide Treated Nets (ITNs) • In addition, distribute 1,400 insecticide-treated mosquito nets (ITNs) to 700 families WATER, SANITATION, AND HYGIENE PROMOTION • Provide clean water to 700 affected households	SHORT TERM INTERVENTIONS • 144 Households in Tsholotsho district were among the 1,034 households reached by the Zimbabwe Red Cross Society (ZRCS) • Food supplies were provided to 855 people lining in a relief camp (UN RC Zimbabwe, 2017 p2) • 66 health workers were trained to identify acute malnutrition • 281 village health workers received training in screening and treating children with malnutrition • Assistance with temporary shelter and basic household items

	• Reach 700 households with hygiene promotion activities • Encourage the construction of 200 pit latrines • Distribution and training of households in the use of water treatment products • Distribute essential basic household items (Buckets, jerry cans EDUCATION SERVICES • Need to rehabilitate school infrastructure and sanitation facilities • Provide learning materials SOCIAL PROTECTION • 5,000 women and children needed immediate protection services to mitigate exposure to gender-based violence and abuse (UN RC Zimbabwe, 2017 p2). LONG TERM	• Provided aid with health, water, and sanitation promotion activities. • Government-established relief camps (Govt. Zimbabwe, 2017) • Provision of temporary shelter, Insecticide Mosquito nets, WASH and NFIs, clothing, and footwear. • UNICEF established a counseling centre at Sipepa camp and reached out to 557 children and 62 women (UN RC Zim, 2017 p5) • UNFPA distributed dignity kits to 500 women and girls at the Sipepa camp • UNICEF provided child protection training for 36

	STRUCTURAL MEASURES • Gwayi-Shangani Dam in Matabeleland North Province. Not yet completed. • Ziminya Dam in Matabeleland North Province. Not yet completed NON-STRUCTURAL • Flood forecasting • Rescue operations • Reconstruction and rehabilitation of Disaster Risk Management (DRM) systems • Incorporating disaster management in the school curriculum • Share the progress of the process of finalizing the Disaster Management Bill with concerned stakeholders • Acquire earth-moving equipment and all-terrain transportation vehicles • Finance and setup modern early warning systems	government emergency response actors in the Sipepa camp LONG TERM INTERVENTIONS STRUCTURAL MEASURES • Gwayi-Shangani Dam in Matabeleland North Province. Not yet completed. • Ziminya Dam in Matabeleland North Province. Not yet completed NON-STRUCTURAL • Flood forecasting by the Meteorology Services Department of Zimbabwe • Rescue operations by the Zimbabwean government in collaboration with other partners •

	• Setup social and child protection systems to protect against loss of sensitive information such as identity documents, health cards, and monetary transaction modalities • Create an infrastructural policy on building standards	

Appendix 15 – Analysis of administrative capacities used in Tsholotsho district

	DELIVERY	COORDINATION	REGULATION	ANALYTICAL
FLOOD RISK MANAGEMENT (Risk Assessment, Risk Evaluation, Risk Treatment)	Government Special Cabinet Committee of Zimbabwe allocated 35 million USD for the 2017 emergency (UN RC Zim 2017 p2) • International Aid from the People's Republic of China (1 million USD), the Republic of India (1 million USD), Algeria (100,000 USD), Botswana (Building materials), Namibia (Fish), UN family (Emergency relief fund), Zimplats and Econet, German Agro Foster and	• Government of Zimbabwe • Ministry of Local Government, Public Works and National Housing • Air Force of Zimbabwe • The Ministry of Environment, Water and Climate • Civil Protection Zimbabwe • Sipepa Rural Health Centre • Sipepa Secondary School • The Meteorological Services Department of Zimbabwe	• The Civil Protection Act 1989	• Flood reports • Early Warning Flood Announcements • News brief () • Press briefing

	Bankers' Association of Zimbabwe • Zimbabwean Government set aside ZWL$ 10 Billion Zimbabwean Dollars for the development of 10 Dam projects (Gwayi-Shangani Dam USD 600 million in 2004, USD 20 million in 2017, USD 122 million 2020; Ziminya Dam was allocated USD 132 million) • Governmentset aside USD 10.7 billion for dam infrastructure development in the 2021 budget. The	• Zimbabwe National Water Authority • Media Agencies •		

	Gwayi-Shangani and Zimunya dams were part of the dams included in the funding.			