

Coping and Adaptative Strategies for Building Community-Based Flood
Resilience

(A case study of the Niger Delta Region of Nigeria)

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Abstract

Flood-prone communities often employ coping and adaptive strategies to respond to the frequent flood events they experience. These coping and adaptive strategies are derived from their indigenous and experiential knowledge. Over time, flood-prone communities have learnt several ways to manage and adapt to flooding through their cultural and local ability and capacities. The Niger Delta communities in Nigeria are located in a deltaic region that is increasingly flood-prone. These communities have experienced frequent flood events for decades but still reside there as most residents have a sense of belonging and are unwilling to relocate permanently. Communities rely on their coping and adaptive strategies; however, with predicted increasing frequency and severity, these strategies need to be strengthened to ensure they are adequate to the risk they face, and there needs to be coordinated strategic planning or support to mitigate this increasing risk. Through critical evaluation of the existing coping and adaptive strategies of the Niger Delta communities, the research sought to create an operational framework for improving community-based flood resilience.

The research employed a mixed-method design, which included questionnaires, interviews, and focus group discussions with local communities and the responsible agencies. The research approach was interpretive. Data were collected in seven regional communities and analysed using descriptive statistics and thematic analysis.

Findings reveal that the Niger Delta communities have coping and adaptive strategies that they employ in managing frequent flood events, and these strategies should be documented as a means of storing knowledge of the coping and adaptive strategies of the communities. These strategies have enabled communities to stay in flood-prone locations where their livelihoods are and can be seen as adequate when the flood event is not severe. When the flood event is severe, it typically exceeds their coping and adaptive capacity, resulting in extreme impacts that can be categorised as a disaster. In these circumstances, the community members rely on

the reactive government flood management strategy that does not see their coping and adaptive strategies as a resource. The study also found that the Niger Delta communities have transitioned from coping to adaptation concerning their building methods and some of their food preservative methods. The novel community-based flood risk management framework developed in this study incorporates the local coping and adaptive strategies present in the communities to address both regular and severe flood events. The framework integrates community-based coordination activities and identifies complementary actions for the local and national government agencies. The community members validated the framework, which can be considered innovative and viable.

Keywords: coping strategies, adaptive strategies, community-based flood risk management, community resilience.

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Chapter 1: Introduction

1.1 Background to the study

Climate change has significantly impacted the increased severity and occurrence of flooding recently, impacting more African countries and, most significantly, flood-prone coastal regions (IPCC, 2023). The vulnerability of flood-prone communities can be attributed to the lack of resources and infrastructure to mitigate the effects of the increasing flood hazard (Rana et al., 2023). However, some flood-prone communities have experienced regular flooding for years, using coping and adaptive strategies to respond to predicted and expected flood events. To build on this experience in the face of increasing risk, it is essential to understand how they are currently coping and adapting to the flood situation and what may enable them to continue to manage and adapt. The research was therefore born from the first-hand experience of the researcher, who is a native of one of the Niger Delta communities and once resided there. Reflecting on how the community members in the Niger Delta have managed to still reside in this region with the frequent flood events, the researcher was interested in investigating and understanding the coping and adaptive strategies that are being practised in the Niger Delta communities and also provide a practical solution to the situation by developing a Community-Based Flood Risk Management (CBFRM) framework which currently does not exist. The research is also interested in the flood coping and adaptive strategies of deltaic regions in less economically developed countries exposed to flood risk with vulnerable communities.

Chapter 1 outlines the context of the study, aims and sub-aims, and the study's methodological approach. Section 1.1 summarises the rationale behind this research, including the relevance of community-based flood risk management, the importance of indigenous knowledge and the role of coping and adaptive strategies in Flood Risk Management (FRM). Section 1.2 outlines the research context and problem, discussing the flood situation of the Niger Delta communities in Nigeria and the need for relevant research to highlight and spotlight the unique coping and

adaptive strategies employed by the communities as well as the relevance of community-based flood risk management solutions. Section 1.3 then outlines the study's aims, followed by the sub-aims. The methodological approach used in this study is then summarised in section 1.4. Section 1.5 outlines the study's proposed contribution to knowledge, and the concluding section 1.6 outlines the overall summary of each thesis chapter.

1.2 Research Rationale

There has been a significant increase in flooding experienced in most African countries in recent decades, which is anticipated to rise as more countries become susceptible to flooding (Yves. et al., 2021). African countries are experiencing increased coastal flooding and loss of wetlands due to relative sea-level rise in low-lying coastal areas. Rivers are being affected by climate change, which accounts for nearly 50% of coastal wetlands lost due to the combination of extreme climate events, human activities, and sea level rise (IPCC, 2023; Hinkel et al., 2023). Human activities such as groundwater and sediment extraction, dams, and reservoir construction are contributing to the experience of sea level rise in coastal regions, which leads to flooding (Seeger et al., 2023). According to IPCC (2022), human activities such as groundwater extraction increase sea levels, mostly in coastal and deltaic regions. In agreement, Yang et al. (2017) and IPCC (2022) argue that deltaic areas are increasingly prone and vulnerable to pluvial floods due to rising sea levels and dense river networks. Climate change is projected to increase, affecting the frequency of flood events across the deltas, leading to increased flood experiences (Alfieri et al., 2017).

According to Sapiains et al. (2021), African response to the effect of climate change, including flooding, is considered insufficient and experienced within and between countries, making multi-stakeholder participation inadequate. Therefore, it is relevant for future research to investigate how the collaboration of various stakeholders within and between communities can contribute positively and effectively to developing community-based flood risk management.

According to Reid (2014), community-based flood risk management can improve governance outcomes as involving community members in decision-making will increase the community's capacity to respond. Community-based flood risk management is an alternative to top-down and technocratic flood risk management. It bridges the gap of the community, which feels detached from the solutions to the flood events they experience (United Nations Disaster Risk Reduction (UNDRR), 2022). Community-based flood risk management entails actively engaging flood-vulnerable communities in identifying, analyzing, responding to, and evaluating the flood risk present in their communities to reduce vulnerability and improve resilience (Tanwattana and Toyoda, 2018). Community-based flood risk management is, therefore, in line with one of UNDRR's (2021) seven global targets of significantly increasing the number of national and local disaster risk reduction strategies. Community-based flood risk management, therefore, involves prevention, mitigation, preparedness, emergency response, and recovery, which ensures that community members are at the center of flood decision-making by identifying and prioritizing the problems they experience, as well as creating solutions that they think are appropriate to address the problems (Tanwattana and Toyoda, 2018; UNDER, 2022). In making their solutions, communities use their indigenous and local knowledge. According to IPCC (2022), there is a wide range of applications of indigenous and local knowledge in responding to climate change, which is being observed in coastal communities as communities across Africa are increasingly applying their indigenous and local knowledge in coping, adapting, and managing the flood events they experience (IPCC, 2022). Indigenous knowledge is present in communities that experience frequent flooding as, over time, they have developed knowledge based on their cultural practices on coping and adapting to flooding. According to Trogrlić (2015), considering local knowledge is essential for community acceptance and involvement in implementing solutions to build flood resilience. However, there is still a challenge in making the bottom-up approach more effective and coping

or adapting to a changing future (Laituri, 2010). Community-based flood risk management, therefore, ensures that communities actively channel their daily practices and activities towards flood hazard mitigation. (United Nations Disaster Risk Reduction (UNDRR), 2011). According to Jingyan et al. (2023), with community-based flood risk management, the local communities can deal with flood prevention and mitigation as a basic unit, which implies that activities and actions are considered and implemented collectively in collaboration rather than doing so individually. The collaboration between stakeholders also encourages community-based flood risk management, which is relevant in enabling communities to be more resilient in the flood risk management process. Collaboration is relevant in community-based flood risk management because it creates an opportunity for the various stakeholders to share their understanding of the problem and possible solutions, which are most of the time based on their experience and knowledge (Söderholm et al., 2018). The flood-prone communities' solutions could sometimes be in the form of coping and adaptive strategies. The coping and adaptive strategies existing in a community could be based on previous flood experiences of the communities. Therefore, if developed, it can empower the community to be actively involved in flood risk management and foster collaboration between various stakeholders in the community (Hooli, 2016).

Coping and adaptive strategies are the key concepts that underpin this study and are discussed in detail in Chapter 2 (session 2.1.5). The idea of coping and adaptive strategies underpins this study because, in agreement with Fatemi et al. (2020), the researcher believes that the impact of flooding can be reduced or increased based on the effectiveness of a community's coping and adaptive strategies. Adequate flood coping and adaptive strategies employed by a community could result in the impact of their flood experience being porous, and inadequate coping and adaptive strategies could result in severe flood impact. Therefore, it is relevant to understand the scale and dynamics of the local coping and adaptive flood strategies present in

a flood-prone community and incorporate them into the communities' flood risk management. The geographical setting of each community may be different; therefore, understanding the flood situation and the solution to the flood events from the perspective of the local communities and their indigenous knowledge through their coping and adaptive strategies provides a unique approach to identifying and confronting the flood risk the community experience, as well as understanding the specific solutions appropriate to them (UNDRR, 2022).

Despite all of the predictions of the effects of climate change in Africa, numbers of locally based researchers are amongst the lowest globally, and the research being published has a limited focus on local priorities (IPCC, 2022). Therefore, it is relevant for African studies to focus on understanding the local strategies and knowledge in flood-prone communities and how these strategies and knowledge can contribute to community flood resilience. This study, therefore, argues that incorporating the coping and adaptive strategies that a community employs in community-based flood risk management is relevant in improving the community's flood resilience.

1.3 Research Context and Problem

According to the Centre for Research on the Epidemiology of Disaster (CRED, 2023), in 2022, flooding caused 603 deaths in Nigeria. It resulted in an economic cost of US\$ 4.2 billion in Nigeria, which made the country to be rated among the top 10 countries for disaster mortality in 2022. The effects of climate change, high risk and vulnerability to flooding, and poor flood risk management are some factors informing the ranking. The Niger Delta region of Nigeria (which is a low-lying coastal plain) is contributing to this statistic. Flooding in the Niger Delta region of Nigeria has increased in recent years due to heavy rainfall and poorly planned infrastructural development resulting in increased vulnerability (Daniel et al., 2023). Severe

flooding in 2012 across coastal and riverine communities in the Niger Delta destroyed many homes and had significant impacts on local economies as many of the communities engage in climate-sensitive (rain-fed) agriculture (Odemerho, 2015). There is a rise in the frequency of flood events in the Niger Delta region, which could be attributed to its location as a coastal area and a deltaic region. The communities are, therefore, being exposed and vulnerable to flood hazards in their quest and dependence on the rivers for their livelihood, as most of them are settled along the banks of rivers. They are faced with the hazard of flooding, especially with the forecast of an increase in river flow (Merritts, 2010; Clegg et al., 2019). Understanding the cause of flood losses and providing a solution to the flood risk and hazard is more effective than merely responding to the aftermath of a flood disaster through post-event recovery, which is the current practice of the Nigerian government. This includes management of the risk through community-based flood risk management, a perspective that is rarely articulated in the Niger Delta region of Nigeria (Soneye, 2014).

The Niger Delta communities have their flood response practices in place as they have been experiencing flood events for years. It is, therefore, relevant to identify these practices to strengthen their capacity to respond to flood events, as they are usually the first respondents (Jingyan et al., 2023). It is also relevant to understand the coping and adaptive strategies that the Niger Delta communities are using to manage the frequent flood events they have been experiencing over the years. These coping and adaptive strategies are usually aimed at enabling the communities to cope and adapt to flood events before any external help is offered. Also, understanding the coping and adaptive strategies practised by the Niger Delta communities concerning their indigenous knowledge and experiential learning is relevant as the Niger Delta communities have been actively interacting and reacting with their environment from past experiences and knowledge based on their capacity and understanding. The residents of the Niger Delta communities have a strong sense of belonging to their communities. They are not

willing to ultimately relocate. However, the flood events have to be addressed. The impact of flood events can be mitigated through risk management, including community-based flood risk management, where the community is ardently involved with the flood risk management process. However, this is not the case, as there is currently no formal flood risk management plan for the Niger Delta communities. Thus, a need to build an effective community-based flood risk management system with consideration of the local coping and adaptive strategies of the Niger Delta communities is pertinent, which then leads to the aim and sub-aims of this study articulated below.

1.4 Aim of the Research

This study is aimed at designing a Community Based Flood Risk Management Framework that can improve the community resilience of the Niger Delta communities and critically evaluating how the existing flood coping and adaptive strategies can contribute effectively to this framework which is informed by the research.

1.4.1 Sub Aims of the Research

The sub-aims of this research are,

1. To critically evaluate the relevance of community-based disaster risk management in mitigating flood disasters and building resilience.
2. To identify the existing coping and adaptive strategies of the Niger Delta communities and to develop an in-depth and critical understanding of these strategies.
3. To create a household and community flood response action guide for the Niger Delta communities.
4. To develop a practical framework for effective Community-Based Flood Risk Management (CBFRM) in the Niger Delta region by critically contextualising coping and adaptive strategies practised in the communities.

5. To validate the Flood Risk Management (FRM) framework developed.

1.5 Research Approach/ Methodology

A research approach and methodology are determined by factors such as the research aim and sub-aims, the study setting, and the timescale allocated for the study (Creswell, 2009). The methodology also entails the justification of the research design adopted to achieve the research aim and sub-aims (Saunders et al., 2009). Therefore, a research methodology should reflect the researcher's philosophy and theoretical perspective, the method and types of data to be collected and how the data will be analysed. This research, therefore, adopted an interpretive philosophy and a concurrent mixed methods design to meet the aims and sub-aims described above. Using a concurrent mixed methods design means the study employed qualitative (individual interviews, focus group interviews) and quantitative (questionnaire) data collection methods. However, the study adopted an interpretive approach. Adopting an interpretive approach to the mixed methods design allowed for the study to use a case study approach to explore and understand flooding in the Niger Delta Region (NDR) of Nigeria through the lived experience of the communities and the people residing in them. An interpretive approach also enabled the researcher to understand and interpret how the residents of the Niger Delta communities interact with their natural environment by making sense of their experiences while living in that environment (Bercht, 2021). As mentioned earlier, the researcher had a keen interest in the Niger Delta region (a deltaic region that has experienced years of flood events but still has people living there), and that was why it was chosen as the case study. The researcher visited seven communities in the region for data collection, and these communities were selected based on their accessibility and the researcher's safety.

1.6 Proposed Contribution to Knowledge

This research seeks to contribute to knowledge by systematically discovering the existing coping and adaptive strategies in communities in the NDR. This is a significant contribution in four aspects:

1. The Niger Delta is an under-researched region, even though the region experiences severe seasonal flooding annually (Ologunorisa and Adeyemo 2005). Most studies on flood disasters in Nigeria are carried out in the country's southwest, in cities such as Lagos, Ibadan, and Ondo. These states have cities where significant socio-economic activities occur (Obafemi et al., 2012). Although there are studies on effective Disaster Risk Reduction (DRR) for flood disasters in the NDR community. Most address how the government can manage regional flood events by providing recommendations. A survey by Adedeji et al. (2012) evaluated community flood coping and adaptive strategies of most cities in Nigeria and then presented some recommendations on how the government and local authorities can capitalise on these strategies to make policies towards mitigation of flood disasters. This study is, however, intended to provide specific and actionable findings within the under-researched Niger Delta Region.
2. This study will go beyond evaluating the existing coping and adaptive strategies of the NDR communities to assessing how the communities can collectively practice these strategies as a means for community-based flood risk management. This study will contribute to knowledge by providing more information on how communities in the NDR can be jointly and intentionally involved in the activities and strategies necessary to improve their resilience to flooding and reduce their vulnerability to flood hazards.
3. Research regarding the Niger Delta regions (Dan-Jumbo, 2017; Barry, 2018; Ezeji, 2019) concentrates on the deficiency of the policymakers, the impact (cost and damage

of the disaster) and generic recommendations on flood mitigation. There is a gap in communication between the communities and policymakers. This study, therefore, addressed the gap in knowledge by understanding the actions the communities in NDR employ to cope and adapt to the flood situation and how these can be harnessed to develop a framework for community-based risk management.

4. This study will also contribute to knowledge by evaluating how the communities' experiences and knowledge of living with floods can be harnessed to improve their coping and adaptive strategies, which may further enhance their resilience to flooding through collective actions and collaboration within and between communities. The study will also provide insights into other exposed deltaic regions in less economically developed countries with vulnerable rural communities.

1.7 Summary of Chapters

The thesis is outlined and presented in 7 chapters. Below is a summary of what is investigated and discussed in every chapter.

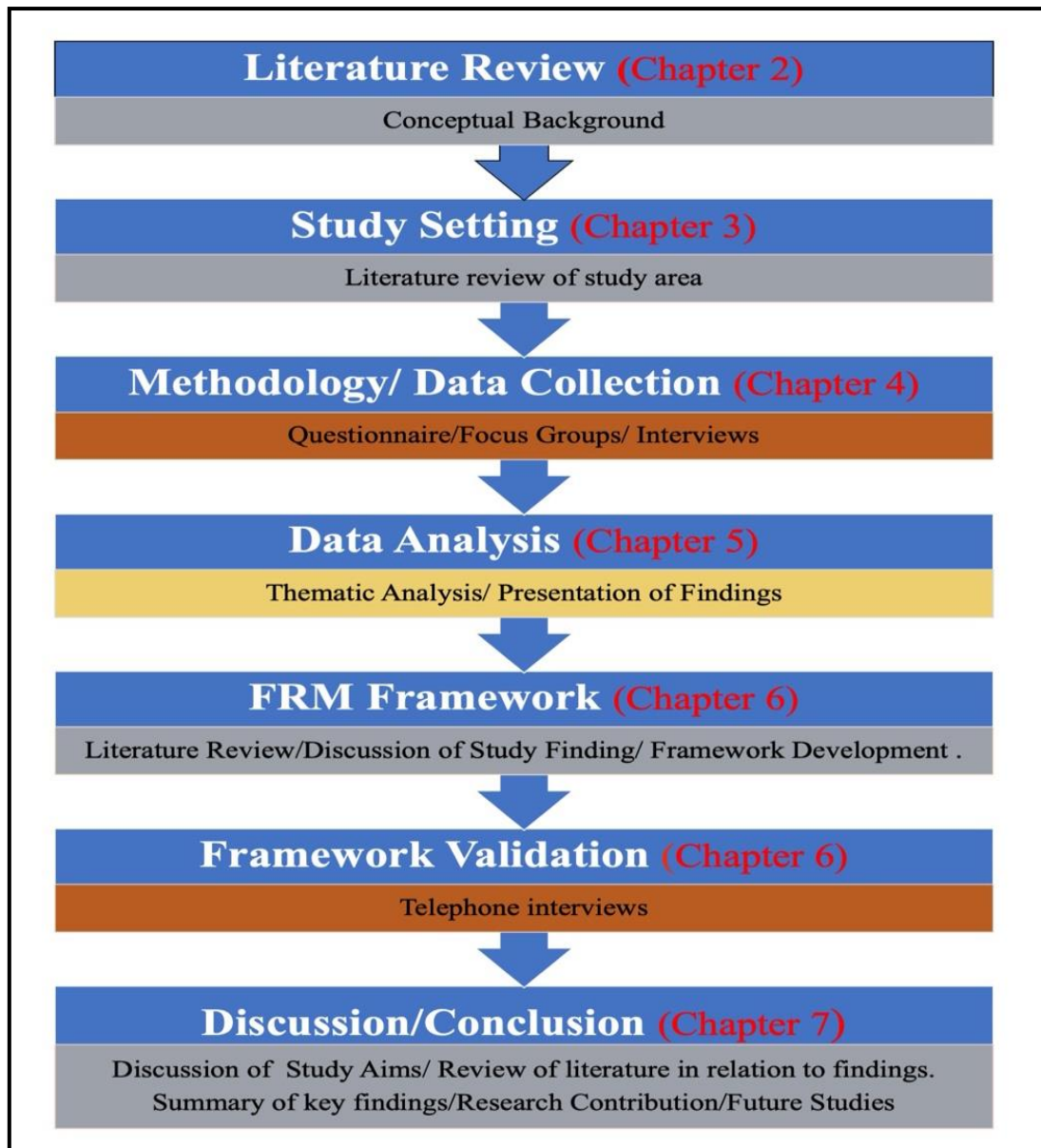


Figure 1. 1: Thesis Outline

Chapter 1: This chapter provides the introductory background of the thesis. It establishes the justification for the study, the research problem aims and sub-aims, the proposed contribution to knowledge, and the thesis outline.

Chapter 2: This chapter reviews and discusses relevant literature on flood hazards, flood disasters, coping, and adaptive strategies. It highlights how understanding flood hazards, vulnerability, and resilience is appropriate for developing Flood Risk Management in communities.

Chapter 3: This chapter is about the study setting. The background of flooding in Nigeria and the Niger Delta region of Nigeria is discussed based on the literature. Current practices of flood risk management in the Niger Delta and the various flood risk management stakeholders in the Niger Delta Communities are discussed here. The local practices of the people who live in the Niger Delta region and how they have developed their strategies for flood risk management to mitigate the effects of flood events is provided in this chapter. This chapter also provides an understanding of the communities by providing information about the current situation and practices concerning the research problem.

Chapter 4: This chapter presents the research methodology and design employed. It discusses the researcher's philosophical stance and how the study will be conducted to interpret the flood experiences of the residents of the Niger Delta communities. The chapter also justifies using mixed method research design as the most appropriate approach. The data collection technique, which includes interview, focus group and questionnaires and their relevance are presented here. The use of mixed methods and various data collection techniques and how they can contribute to the validity and reliability of the research are all explained in this chapter.

Chapter 5 presents the interview results, focus groups and questionnaire administered. The flood experiences of the community members who participated in the data collection process and the lessons they learned from their past flood experiences are outlined here. The chapter also presents an understanding of the communities' flood coping and adaptive strategies and the indigenous knowledge relevant to flood response in the Niger Delta (ND) communities. The chapter further considered the communal activities practised by the communities in mitigating flood disasters, how they develop flood resilience, and their narrative and perspective on the flood situation.

Chapter 6 presents the framework development and validation, the rationale, and the framework's relevance to the flood situation of the ND communities and Nigeria. It also

introduces the concepts and resolutions in building community-based flood risk management, stakeholders' roles and responsibilities in the framework, and how the framework was validated. The chapter also discusses some of the study's findings from the results that link it to the literature.

Chapter 7: This chapter presents the discussion of the results of the study in the context of literature. The chapter evaluates the research aims and sub-aims, how they have been achieved throughout the research process, and topics that may have emerged during the data collection. The chapter also discusses the findings of the data collection concerning how communities in the Niger Delta region can improve their resilience to floods. This chapter also concludes the study, providing a summary of the study's key findings, thesis contribution to knowledge, a reflection of the research process by the researcher and recommendations for future research.

Chapter 2 : Flood Risk Management: A Review of Flood Disaster, Coping and Adaptive Strategies, Flood Risk Management Strategies and Community Based Flood Risk Management Concerning Community Flood Resilience

Floods can strike by surprise or be a seasonal hazard every year. In both cases, communities can provide a valuable framework for analysing patterns of vulnerability to environmental change and identifying opportunities for reducing these vulnerabilities.

(UNDRR, 2011)

2.0 Introduction

Flood disasters are argued to be one of the most prevalent disasters worldwide, affecting the most significant amount of people (UNDRR, 2002). According to the Centre for Research on the Epidemiology of Disaster (CRED, 2018 pg. 2), "Floods have affected more people than any other type of disaster in the 21st century". However, understanding people's vulnerability to floods and how disasters occur, managing the risks that confront people, and building resilience to flood disasters are relevant. The chapter discusses an overview of flood hazards, vulnerability, resilience, coping, and adaptive strategies employed by people using their available resources to make strategic decisions and actions. It also discusses community-based flood risk management and community flood resilience. The chapter further discusses frameworks for community flood resilience, which informs the understanding of developing a relevant community-based flood risk management framework in this study.

2.1 A Review of Flood Hazard and Flood Disaster Coping and Adaptive Capacity Strategies

This section reviews flood hazards and how they contribute to disasters. It also examines vulnerability to flood hazards, resilience, coping, and adaptive strategies to flooding.

2.1.1 Flood Hazard

Floods are argued to be one of the most catastrophic natural hazards, causing death, property loss, and infrastructure damage worldwide (Gangrade et al., 2019). Hazards can be described within various contexts. However, in a natural setting context, the UN (2017) defines hazard as a natural process or phenomenon that can disrupt human activities, potentially leading to loss of life and damage or loss of properties. However, the United Nations Disaster Risk Reduction (2015) argues that natural hazards do not exist in isolation as human involvement is required for any natural hazard to cause a disruption or lead to loss or damage, which can further be described as a disaster depending on the scale of the impact. UN (2007) also argues that for a natural hazard to lead to disasters, there has to be vulnerability, a consequence of the political, social, and economic environments. According to Rottach (2010), a disaster has to occur in the presence of a hazardous event with vulnerable people; in other words, a disaster cannot happen if there are hazards but no vulnerable people or if there are vulnerable people but no hazardous events. Therefore, when considering how flood disasters can be effectively managed, it is relevant to consider both the natural and human impact of flood hazards. According to Blaikie et al. (2014), flood hazards can be described as any phenomenon or process leading to excess water disrupting human activities and the loss of life or damage of properties. Flood hazard can also be defined as a dynamic process involving water flow that could threaten people, their possessions, assets, and activities that could lead to injury, damage, and destruction (Gregg and Paton, 2013).

2.1.2 Flood Disaster

Flood disaster defined by the Centre for Research on the Epidemiology of Disaster (CRED, 2019 pg. 2), a flood disaster is "a situation or flood event that overwhelms local capacity, necessitating a request at the national or international level for external assistance; an

unforeseen and often sudden event that causes great damage, destruction, and human suffering". United Nations Disaster Risk Reduction (2015) also defined a flood disaster as "a hazardous flood event interacting with conditions of exposure, vulnerability, and capacity in the society or community, leading to one or more of the following: human, material, economic and environmental losses and impacts". These two definitions reflect that for a flood disaster to occur, humans must be exposed to flood hazards, and they do not have adequate resources to respond and deal with the flood situation without external interventions. The definitions also show that loss, damage, and destruction must be experienced for a flood event to be termed a disaster. Therefore, the severity of a flood disaster is determined by the degree to which loss, damage, and destruction is experienced by the society or community impacted. Although CRED (2019) has stated in their report that for an event to be recorded as a disaster, there has to be one or more of these factors: at least ten or more people must be killed, 100 or more people reported, a state of emergency declaration, and assistance from international aid requested and received. However, this may only be the standard in some countries. Deciding what is considered a disaster then leads to the discussion on vulnerability to flood disasters, as the vulnerability of people or society to flood disasters influences the impact of flood disasters on them.

2.1.3 Vulnerability to Flood Disaster

A person or group of people can be said to be vulnerable when they are in a situation in which they become susceptible to loss, which can alter their ability to predict, cope with, resist, and recover from an adverse event caused by hazards or a disaster (UNDDR, 2009). Vulnerability is conceptualised in various ways across various literature and fields, so there is no unified definition and explanation of vulnerability (Anees et al., 2020). Nevertheless, being vulnerable is most commonly connected to the following three aspects: risk or hazard, susceptibility, and exposure (Paul and Jayant, 2010). Vulnerability is therefore defined in this study as an

individual's or a community's susceptibility to loss and their ability or inability to recover after exposure to a specific hazard or set of hazards that could potentially lead to a disaster. This study's specific hazard is flooding, and an individual or a community is vulnerable to flood disaster when they are vulnerable to flood hazards combined with their ability or inability to adapt to or recover from the effects of flooding. Vulnerability can also differ from person to person, as a sub-group within a community may be considered more vulnerable to flooding (Liu et al., 2016). Individual vulnerability also differs from community vulnerability. Age, income, race, education, employment, and psychosocial resilience frequently define individual vulnerability. In contrast, community vulnerability is defined by political economy, social norms or regulations, and general gender roles and responsibilities (Dückers, Frerks, and Birkmann, 2015). However, it is relevant to clearly outline what makes a person vulnerable to flood concerning their needs rather than generalising. An individual may be vulnerable not because they are old (older people may have indigenous knowledge, which is valuable in a community) but because they lack access to adequate resources required to predict, cope with, resist, and recover from an adverse event caused by hazards. Community vulnerability is also known as social vulnerability, and it is frequently influenced by social inequalities that vary by location (Dückers, Frerks, and Birkmann, 2015). According to Karagiorgos et al. (2016), flood vulnerability in communities can be viewed through four scenarios and situations. The first scenario is described as a situation in which local communities demonstrate a high coping capacity during flood events but suffer significant damage to their infrastructure and buildings. The second scenario depicts communities where flooding causes considerable damage to the population and infrastructure. The third scenario describes a situation in which communities have a high social understanding and coping capacity and the ability to absorb and recover quickly from a flood event due to the extensive use of local protection measures (they possess a high resilience capacity). The fourth scenario involves a community that has a high level of

resilience-building capacity but is unable to develop a local network system and structure (this implies that they do not have a formal or informal structure or process on how to anticipate, prepare, mitigate, and respond or recovery from a disaster). Flood vulnerability could be a dynamic, socially constructed concept that varies over space and time. It is, therefore, relevant to understand the vulnerability of a community to flood hazards to mitigate the risk confronting the community, thereby improving their resilience to flood disasters.

2.1.4 Resilience

Resilience was first used in ecology but has become popular in different fields, such as social science, psychology, and disaster management (McClymont et al., 2019).

Table 2.1: Examples of the Definition of Resilience from Research Literature

Different Definitions of Resilience	Author	Field of Study
"The ability of a system, community/society exposed to hazards to resist, absorb, accommodate, adapt to, transform and recover from the effects of the hazard in a timely and efficient way, while preserving and restoring its essential basic structures and functions through risk."	(UN, 2015)	Disaster Management
"The intrinsic ability of a system to adjust its functioning prior to or following changes and disturbances, so that it can sustain operations even after a major mishap or in the presence of continuous stress"	(Steen and Aven, 2011, p. 296)	Safety Science
"Resilience is the ordinary human adaptive response to the tragedy, not extraordinary."	(Issacs, 2018, p. 219)	Health Care

<p>“Resilience is the ability to bend but not break, bounce back, and even grow in the face of adverse life experiences. It generally refers to a pattern of functioning indicative of positive adaptation in the context of significant risk or adversity. Thus, resilience is not invulnerability to stress or risk but rather a favourable adjustment”.</p>	<p>(Guimaraes, 2018, p.1146)</p>	<p>Nutrition and health</p>
<p>“The ability to withstand a large disturbance without, in the end, changing, disintegrating, or becoming permanently damaged; to return to normal quickly; and to distort less in the face of such stresses”.</p>	<p>(McClymont et. al., 2019, p. 5)</p>	<p>Engineering</p>
<p>Resilience is the personal qualities and skills that allow for an individual’s healthy/successful functioning or adaptation within the context of significant adversity or a disruptive life event.</p>	<p>(Lee, Sudom, and McCreary, 2011).</p>	<p>Psychology</p>

(Source: Compiled by the researcher)

From the understanding of the various definitions of resilience shown in Table 2.1, this study will define resilience as the ability to resist, absorb, recover, transform, and adapt to adverse events. There are various aspects to resilience ranging from economic, social, and community attributes of a system, which have been described in multiple literatures as regards the human environment and disaster management. However, Twigg (2009) summarised these various areas of resilience in Table (2.2) below.

Table 2.2: Areas of Resilience

Disaster Preparedness and Response	Emergency resources and infrastructure; Emergency response and recovery; Participation, voluntarism; Accountability; Early warning systems
Risk Management and Vulnerability Reduction	Health and well-being; Sustainable livelihoods; Social protection; Financial instruments; Physical protection; Management of the environment and Natural resources
Knowledge and Education	Awareness, knowledge, and skills of the general public; Administration and dissemination of information; Education and training; Cultures, attitudes, and motivation; Learning and research.
Risk Assessment	Information and analysis regarding potential dangers and risks; Information and analysis regarding potential vulnerabilities and capacities; Information and analysis regarding potential innovations in scientific and technical fields
Governance	The political commitment, along with policy, strategy, and priorities Integration with development policies and planning Integration with emergency response and recovery Systems for the law and regulation Integration with development policies and planning Integration with emergency response and recovery; Partnerships; Accountability and Community Participation; Institutional Mechanisms,

	Capabilities, and Structures; Allocation of Responsibilities
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(Twigg, 2009)

Resilience can occur at different levels, including individual, household, community, local government, and national government (The International Federation of Red Cross and Red Crescent Societies (IFRC), 2018). However, the build-up of community resilience is based on individual and household levels of resilience. The level of resilience in a community to which an individual belongs determines the likelihood of them becoming more resilient. This study is, however, focused on resilience at the community level, which will be discussed in section 2.4. According to Berman Quinn and Paavola (2012), there is a broad argument that resilience and adaptive capacity are closely related, as the concept of resilience approach helps with understanding the relationship between coping and adaptive capacity. The measures and actions undertaken in response to a flood disaster could determine whether a social-ecological system can reorganise or collapse in the future (Baker and Berenbaum, 2007). However, Cutter, Ash, and Emrich (2018) further argue that coping and adaptive strategies can help build resilience by reducing the effects of a disaster. Communities can systematically learn from their flood coping strategy, which could sometimes inform their adaptive strategies to flood hazards. Communities can reach a state of resilience to flood hazards by strengthening their coping and adaptive strategies to flood disasters (Abubakari and Twum, 2019). This then leads to the discussion of conceptualising flood coping and adaptive strategies.

2.1.5 Conceptualising Flood Coping and Adaptive Strategies

Coping is the mechanism (which includes thoughts, behaviours, and actions) people employ to manage stressful situations' internal and external demands. It is also considered the immediate response to unusual, abnormal, and adverse conditions within the limits of people's existing

resources and grouped coping into two significant theories. They include Emotion-focused coping and Problem-focused coping. Emotion-focused coping aims to relieve people from the negative emotions afflicted by a stressful situation, while Problem-focused coping entails addressing the problem causing the stressful situation. Problem-focused coping involves people putting up a defence against environmental stressors (this is a particular way of thinking about hazards) that could potentially lead to harm (or problems). After the problem is defined, possible alternative solutions are created, and a decision is made to ascertain the appropriate alternatives in terms of their costs and benefits, making a choice among them and acting (Folkman and Moskowitz, 2014). Problem-focused coping is aimed at changing external stressors through planned actions, and efforts are made to change the problem at hand by generating and executing options to solve the problem (Van Zomeren et al., 2019). In light of this, this study will focus on how people physically and not psychologically cope with flood disasters and adapt to recurrent flooding situations. The study also involves the physical strategies people employ to manage and further adapt to the frequent flood disasters that confront them.

On the other hand, adaptation is defined by UNDRR (2009) as the adjustment made to natural or human systems in response to actual or predicted disaster which could potentially lead to harm. Adaptation also involves a long-term planned or spontaneous systematic approach to learning, experimentation, and changes conducted before or after a disaster (Abubakari and Twum, 2019). According to Thanvisitthpon et al. (2020), flood adaptation involves the awareness and participation of communities residing in flood-prone areas to apply resources and information available to them in a timely and relevant manner to respond to flood hazards. People affected by flooding respond to flood events or disasters by employing various coping and adaptive strategies aimed at assisting them to cope with the losses they might experience or are currently experiencing and adapt to the recurrent flood events. One of the implications

is that these strategies could change constantly as people affected by flooding employ coping and adaptive strategies sequentially to sustain their livelihood before, during, and after a flood disaster with the possibility of transitioning from one to another under certain circumstances. It is also relevant to establish that there are various descriptions of coping and adaptive strategies as socio-cultural factors can influence them. People somehow create means of defence (sometimes based on their past experiences), which they believe will enable them to mitigate against losses or adapt to future events, significantly influencing their coping and adaptive strategies. However, these coping and adaptive strategies can be employed at different levels: individual, community, and institutional (Mavhura et al., 2013). Coping and adaptive strategies can sometimes be created by learning, experimenting, and making deliberate changes through spontaneous reactions, planning, strategic actions, and modification of behaviours (Thanvisitthpon, 2019). Research by Berman, Quinn, and Paavola (2012) compiled definitions of coping and adaptive strategies by different authors, as shown in Table (2.3). These definitions align with this thesis's conceptualisation of coping and adaptive strategies. Therefore, they form the basis for understanding how coping and adaptive strategies are referred to throughout the thesis.

Table 2.3: Definition of Coping and Adaptive Strategies from Literature

Coping Strategies	Adaptive Strategies	Reference
Short-term response to an unexpected flood disaster.	Permanent change in the ways of responding to flood disasters.	Davies (1993)
The respond to flood hazards in order to avoid its potential negative impacts	Ways of transforming a functioning community to survive under the condition of flood hazards threatening its existence	Kelly and Adger (2000)
The immediate responses to hazards such as a specific flood event	Medium and long-term strategies for changes in institutional frameworks	Birkmann et al. (2009)
The strategies and practices used by people or communities living with rapid onset disasters such as flash floods	Change in those practices and underlying institutions that generate the root and proximate causes of risk, frame capacity to cope and further rounds of adaptation to flood hazards.	Pelling (2011)

(Berman, Quinn, and Paavola, 2012)

According to the pieces of literature reviewed, some flood-prone communities have learned to cope and adapt to flood disasters because they are left with little or no option, which is the case of two communities (namely Mansión del Sapo and Maternillo) in Puerto Rico where one of the residents said “We have lived here a hundred years with the flood, and we can live that way a hundred years more” (López-Marrero, 2010, pg. 150). Mansión del Sapo and Maternillo are flood-prone communities that survive and live with floods due to their implementation of various coping and adaptive strategies. However, it is relevant to note that the level of coping and adaptive strategies present in a community can determine how resilient individuals or communities are to disasters, as sometimes the severity of flood events could exceed their coping and adaptive strategies. Coping and adaptive strategies are closely related but distinct, as coping strategies can sometimes lead to adaptive strategies ((Eriksen, Brown, and Kelly, 2005). The following are the distinctions between coping and adaptive strategies;

- Coping strategies are the available skills, resources, and experiences people employ as an immediate response to manage adverse stress or damage caused by a disaster (ISDR, Terminology on Disaster Risk Reduction, 2009). Adaptive strategies are preparing responses in advance aimed at adjusting, changing, and adapting to the effects caused by the stress associated with a disaster (Berman, Quinn, and Paavola, 2012).
- Coping strategies can also be considered short-term as against long-term adaptive capacity. Radhakrishnan et al. (2018) state that coping strategies focus on maintaining functionality during a short-term, hazardous event, including moving belongings to relatives' houses, moving animals to higher lands, and avoiding the entrance of water with mobile barriers (López-marrero, 2010). On the other hand, adaptive strategies prepare a system to adjust in anticipation of long-term changes to the effect of a disaster. For example, they were not building in an area perceived to be flood-prone, placing barriers around a house, avoiding susceptible building materials to prevent cracking during flooding, buying water-resistant furniture, building floating houses and raising the platform of the kitchens and storerooms to keep food, water, fuel, and valuables during flooding (López-Marrero, 2010).
- Coping and adaptive capacity is context-specific and could vary among individuals, communities, and regions.
- Therefore, coping and adaptive strategies are actions that help people reduce the effect of a stressful situation. In this study, the stressful situation considered is flooding.
- Coping strategies can be summarised as a reactive and spontaneous response for immediate measures. In contrast, adaptive strategies are proactive responses to hazardous events that enable residents to live with persistent flood disasters year after year.

The context of how coping and adaptive strategies are employed in the Niger Delta communities will be discussed in chapter 7 of this thesis (session 7.1.2).

2.2 Flood Risk Management (FRM)

Flood-prone communities must adopt a practical flood risk management approach to manage their inherent flood hazards. Flooding cannot be eliminated, but its consequences can be mitigated by appropriate responses and actions (De Wrachien, Mambretti, and Schultz, 2011). Flood Risk Management (FRM) is the process in which information regarding flood risk is collected and analysed to make decisions that would help reduce and control the flood risk. These decisions are also constantly reviewed and evaluated to ensure they are appropriately executed. FRM, therefore, involves continuous analysis, adjustment, and adaptation of policies and actions taken to reduce flood risk (Sayers et al., 2013). Although floodplains are prone to flood hazards, people still reside in them as sometimes they are associated with providing sustainable livelihood to flood-prone communities. For instance, in the Delta regions of Vietnam and Bangladesh, communities benefit from wet season fisheries from their flood-prone ecosystems, which is one reason why some people are willing to live with floods (Juarez-Lucas et al., 2019). A study Askman, Nilsson, and Becker (2018) conducted in Akuressa (a flood-prone community in Southwest Sri Lanka) suggested four reasons why people live in high-risk flood areas was because of the feeling of being emotionally attached to the community, difficulties in relocating, being well-adapted to the situation and the benefits they gain from the floodplains. According to Sayers et al. (2013), the populations in floodplain regions and flood losses are increasing respectively, and this calls for the need to do things differently, which led to the evolution of FRM paradigm shift from controlling floods (See figure 2.1).

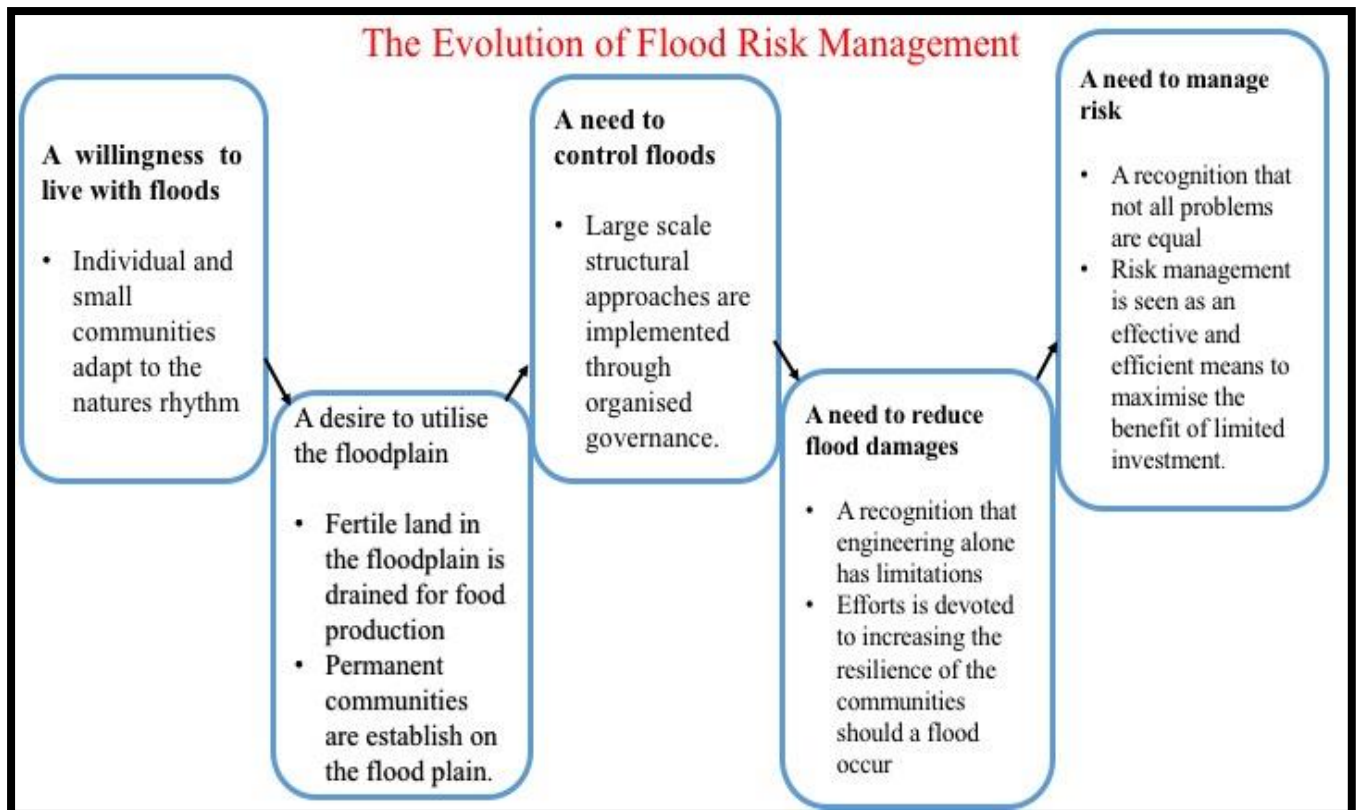


Figure 2.1: Evolution of Flood Risk Management

(Sayers et al., 2015)

It is necessary to understand why people live in flood-prone areas to encourage community involvement in the design and implementation of flood risk management, as community participation (allowing people to express their assessment and experience of their condition) can aid in reducing vulnerability and improving resilience (Akram, 2002). There is sometimes an assumption that communities need more expertise to respond effectively to flood risk, and authorities need to recognise the inherent capacity of communities' residents to organise response and recovery if given the resources and opportunity (Reaves, Termini, and Burkle, 2014). However, flood risk management begins and ends at the local level, with a nesting of scales (e.g., catchment and upstream/ downstream relations). For example, a study López-Marrero (2010) in Guyana highlighted how the local communities regularly cleaned drains and

canals to reduce the trash problem contributing to flooding and develop collective-help systems for building elevated houses that successfully decreased their flood risk exposure and damage.

2.2.1 Community-Based Flood Risk Management (CBFRM)

The concept of community can be broad and complex to define. However, a community can be described as a group within a specific cultural unit (a town or locality) or a population within a more or less visible spatial area (Buckle, 1999). According to Coates (2010), communities are heterogeneous and may vary based on their philosophy and local structures. It is, therefore, essential to understand communities based on their unique nature to effectively co-manage the flood risk they experience. IFRC (2014) acknowledges that a community can exist between people who live in a defined geographical area, people who share a typical social structure, and specific or broad interests across local, national, and international levels. Therefore, in this study, a community is defined as a group of people who share the same beliefs and physical environment. Local communities provide the first line of defence in managing the risk they are exposed to during a flood disaster, as they live with the risk and may be capable of managing it within their community (López-Carresi et al., 2013). However, sometimes, they do not have adequate resources, technology, knowledge, and organisation to manage flood disasters effectively, which is the reason why actively involving the community in every step, process, and phase of disaster management (which is a community-based approach) is relevant in flood management. Community-Based Flood Risk Management is, therefore, flood risk management plans and actions at the community level that include strategies that are locally appropriate and developed from the indigenous knowledge of the communities (Peng et al., 2020; Syafwan, Abdul and Januar, 2021). Australia has included 'prepared communities' in their emergency management agendas and anticipation and assessment of disaster risk management (Reaves, Termini, and Burkle, 2014), which aims to allow communities to define their characteristics

and needs to work together (within communities, between communities, and with specialist decision-makers) to mitigate these risks before disaster strikes.

CBFRM can be achieved by promoting flood risk awareness and preparedness activities into the day-to-day socioeconomic activities of local people, which is crucial in achieving and maintaining a culture of preparedness (Shaw, Ishiwatari and Arnold, 2011) which can be most relevant for communities that experience flooding frequently. It is appropriate that the community-based activities or measures geared towards flood risk management be rooted in the culture of the people so they can reflect their real needs and priorities (Shaw, 2012), which will encourage them to be involved and responsive to the measures designed and implemented. Although CBFRM has become increasingly popular for the past 20-30 years, the concept is not new, as communities in ancient times have often devised means of being resilient and surviving flood disasters. For example, a community-based organisation known as Suibo-dan (meaning flood fighting) has managed flood disasters in Japan for centuries. Suibo-dan has also provided relief support and assistance to countries like Kenya and Nepal (Shaw, Ishiwatari and Arnold, 2011). According to Coates (2010), various studies also support the view that communities must be involved in the FRM process, as the possibility of successful management of hazards, risks, impacts, and consequences depends on community commitment and involvement. A community's understanding of its flood risks could reduce flood disasters' impacts and improve communities' resilience to future flood disasters (Tyler, Sadiq, and Noonan, 2019).

In summary, the main aim of community-based flood risk management is to make communities more resilient and less vulnerable to flooding, and this can be achieved by implementing community-based Flood Risk Management Strategies (Qasim et al., 2016; Peng et al., 2020). A community's flood risk management strategies are sometimes based on their indigenous knowledge, consisting of traditional components of disaster management strategies acquired by local people over a long period and passed on to future generations (Mavhura et al., 2013).

These strategies are usually culture and context-specific, informal, and transmitted orally, closely relating to survival and subsistence, dynamic and based on innovation and adaptation. The strategies may not always be explicit and overt to the people who practice them. Still, they use them to informally construct and reconstruct themselves to prevent, mitigate, prepare, respond, and recover from a flood disaster (Šakić Trogrlić, 2020).

The strategies are fall-back mechanisms commonly formulated from a wide range of primary behavioural and cognitive responses ordinary people use to manage distress or reduce the impact of disaster disruptions (Somerfield and McCrae, 2000; Folkman and Moskowitz, 2004). They could also be formulated from knowledge based on beliefs that promote particular ways of responding to disaster.

2.2.2 Community Flood Risk Management and Indigenous Knowledge

(IK)

Communities have a large and diverse body of knowledge on disaster mitigation based on traditional wisdom. Since they live in remote, isolated, and inaccessible hamlets on the ridges or on the foothills, they have their coping strategies in times of disaster. Cross-fertilisation and blending this indigenous knowledge with modern scientific understanding would strengthen the communities' disaster mitigation and preparedness capacity.

(UNDRR, 2008. pg. 33)

There has been an increasing interest in the link between how Indigenous Knowledge (IK) relates to and informs coping and adaptation to flood disasters and in more comprehensive climate resilience. Flood-prone communities tend to possess invaluable knowledge and creative strategies gained through experience that help them prepare and manage flood events and continue to live in flood-prone areas. These include knowledge of hazards, vulnerabilities, and capacities, which is essential to the community's resilience. It can also form the basis of a

community's coping and adaptive strategies and is an inherent part of its resilience (Mavhura et al., 2013). In the absence of, and before the arrival of, external parties, communities tend to make decisions to mitigate losses as a result of their indigenous knowledge (Domfeh,2007). Indigenous knowledge (IK) has also been described with various terms such as local knowledge, traditional knowledge, indigenous technical knowledge, and peasant knowledge (Mavhura et al., 2013; Sillitoe, 1998). However, they all describe a set of knowledge gained by experience within a community (or local people) that has been amassed from experience, observation, beliefs, behaviour, and experimentation and passed on through generations. The knowledge base varies between communities as it is a diverse combination of locally tailored knowledge (Hooli, 2016). Indigenous knowledge is argued to be essential in the successful implementation of developmental and non-static strategies to solve problems in the local communities as it is particularly prevalent and valuable for flood-prone communities that experience recurrent flooding and have developed culturally embedded knowledge on how to live with floods over many generations (Nyong et al., 2007). Indigenous knowledge also exist across the stages of the Flood Risk Management (FRM) cycle (i.e., before, during, and after the flood: phases commonly used in disaster).

Examples of the use of indigenous knowledge as flood management strategies in the preparatory (living with risk) phase include indigenous plants used to tackle bank and gully erosions by local communities in Nigeria (Iloka, 2016) and also the use of bamboo plants and raffia palms planted at the river banks by the local people to prevent the washing away of the soil which causes bank erosion (Abam, 1993). The materials are strengthened over time as the plants serve as current breakers for the erosive power of water. Also, bamboo plants' fibrous roots and rhizome system (which hold the soil together) make them very valuable for controlling soil erosion and preventing landslides (Ben-Zhi et al., 2005). As an example of land management and intervention towards flood disasters, a study by Tunde and Ajadi (2019)

showed how local farmers used bush-fallowing methods to prevent erosion during flooding, and this decision was made based on their indigenous knowledge. A study by Hooli (2016) in Namibia showed how weather forecasting and prediction through IK were crucial in the community's flood-coping methods, as the locals had limited access to formal weather forecasting. In Swaziland, the observation of the presence of specific bird species on trees can indicate the beginning of the rainy season for the local people; the height at which the birds build their nests from river surfaces is also a triggering event used to predict flood level (Domfeh, 2007). These are examples of the preparation phase of the disaster cycle as the local people based their livelihood on their capacity to reinforce the process with each experience. Their indigenous knowledge included knowledge of the occurrence of extreme local weather (how and when), mitigation guidance to the extremes, and ways to cope with the impacts. According to Iloka (2016), in 2004, when a tsunami hit the coastlines of Asian countries, the onset of the disaster was predicted by the Moken community (living by the coastline) through the abnormal weather patterns. The indigenous communities thereby survived by making sensible decisions because of their knowledge of the environment, while tourists, who did not have such local knowledge, lost their lives. An example of how coping and adaptive strategies are linked to the disaster cycle is shown below (Table 2.4), which was adopted from the study conducted in local communities in Namibia by Hooli (2016) and was modified to suit this study. Table (2.4) shows how indigenous knowledge linked to the disaster cycle informs coping and adaptive strategies.

Table 2.4: Indigenous Knowledge of Namibia concerning Disaster Cycle.

Disaster Cycle Phases	Knowledge source	Knowledge	Coping or Adaptive Strategies
Triggering event	Trees and plants	How different trees in the local living environment produce fruits/flowers in that season.	Coping Strategies

	Behaviour of livestock	Awareness of the behaviour of domestic animals; for example, how cattle leave the kraal (fast/slow) in the morning, what they feed on during the day, and where, when, and how they sleep.	Coping Strategies
	Weather	Observation of direction and type of rain and wind, form and colour of the clouds, the humidity of the air, thunder, lightning, the water flow, and colour of the water flowing in channels	Coping Strategies
	Insects and animals	Observation of how insects and animals (ants, termites, lizards, frogs, birds, and millipedes) behave, when and where these insects and animals occur, how many there are, and how the mammals mitigate	Coping Strategies
Sense making	Astronomy	Interpreting the stars and moon.	Coping Strategies
Decision making	Topography	Where to build/not to build permanent houses or temporally relocate, where to prepare meals and take the domestic animals during the flood event	Adaptive Strategies
Mitigation	Sand	Knowledge about the best type of sand to protect homesteads and assets. Places to collect it and how to use it for protection	Adaptive Strategies
	Building techniques	Learning about how to build, what materials to use to prevent water from accessing the buildings, and how buildings can better withstand floods	Adaptive Strategies

	Village elder	Dreams, rites, and other secret methods to prepare the community for weather extremes.	Coping Strategies
Rescue and Relief	Belief systems	Spiritual sessions, rites, and prayers strengthen the unity of the community and mental preparation.	Coping Strategies
	Food security	What to eat and how and where to store the food. Eating wild berries, for example, eendago and eenyandi. Where to get and how to store safe drinking water.	Coping Strategies
	Fire making	Knowledge about where to make fire, the materials for making it, and where to find those materials. Making a fire on top of a broken piece of clay pot.	Coping Strategies
	Social security	Storing food in common storage and during the disaster distributing it to those in need	Coping Strategies
Recovery & reconstruction	Agriculture techniques	Where, when, and how to cultivate or when to leave the field uncultivated when facing a flood.	Adaptive Strategies

(Hooli, 2016)

Community members can, therefore, reside in communities exposed to frequent flooding due to the indigenous knowledge incorporated into their coping and adaptive strategies. According to Iloka (2016), indigenous knowledge of local communities is an important knowledge system that can assist in FRM and contribute to a community's resilience to flood hazards.

2.3 Community Flood Resilience (CFR)

As established in section 2.1.4, there are various levels in which resilience can occur, and this research will focus on community resilience. A community experiencing frequent flood disasters makes some effort to develop their resilience by engaging in activities that deal with disasters according to their capacities (Chowdhoree and Islam, 2018). The community's capacities enable them to have the potential to function effectively and adapt successfully to the after-effects of disasters (Norris et al., 2008). Also, local actions have proven effective in flood risk reduction and should be a helpful starting point for community resilience (López-Marrero, 2010). Community resilience is, however, the community's capacities, skills, and knowledge combined that enables it to maintain or entirely survive, recover, and function after a flood disaster (Chowdhoree and Islam, 2018; Bulti, Girma and Megento, 2019). Community resilience has evolved and has moved from the concept of communities trying to predict hazards and prevent a disaster to being prepared and building the capacity to respond to a disaster as and when it occurs (IFRC, 2011). This perspective also relates to communities building adequate capacity to be self-determined and seek better ways to reduce their vulnerability, which will, in turn, develop their resilience. According to Schelfautet. al. (2011), because resilient communities are knowledgeable and aware of the flood risk that they experience, they tend to improve their capacity in each phase of the flood risk management cycle. Therefore, they get well-prepared to respond to flood events and have strategies that assist them to recover quickly. CFR, however, could only happen after a period of time; it takes several flood experiences, adaptation, and practical strategies for a flood-prone community to achieve it. Communities' resilience to flooding is a collective behaviour of addressing floods and is a product of a community's consistent empowerment against floods (Isaacs, 2017). It is, however, relevant for researchers and practitioners to consider the 5 W's" of resilience (which entails whose resilience is enhanced, against what threats, when, where, and why) to be able to

plan and create policy and infrastructure solutions to flood disaster to increase community resilience (Doberstein, Fitzgibbons and Mitchell, 2019). It is also essential to understand what makes a community resilient.

2.3.1 Characteristics of Community Resilience to Flooding

A community is considered resilient when it has adequate individual and collective capacity to respond to flooding, recover from the effect and bounce back better (Wang et al., 2018). According to IFRC (2011), a resilient community is equipped with adequate knowledge required to meet its basic needs and be socially connected and cohesive to manage available resources. To determine if a community is resilient to flooding, there are some characteristics that they may possess. Several authors have categorised these characteristics differently (Colussi et al., 2002; Twigg, 2009; IFRC, 2014; Oven et al., 2017).

However, the categorisation by Colussi et al. (2002) suits the narrative for this thesis as they categorised the characteristics of a resilient community into four categories, which include people, resources, community process, and organization, and this will be used as the focus of the characteristics of a resilient community for this study. These categories can be further explained as:

People: As discussed earlier, a community comprises people, and their resilience contributes to the community's resilience. A resilient community is characterised by a group of people who have a sense of belonging to their community and are willing to cooperate and contribute resources to ensure that the community responds and bounces back better after a flood event (Colussi et al., 2002).

Resources: A resilient community possesses adequate resources to respond to a flood event, and in the case that they don't, they have strategies in place to seek assistance when necessary and are willing to imbibe alternative means of securing the resources that they require (Colussi, et al., 2002).

Community Process: A resilient community has guidelines, strategies, and plans for responding to a flood disaster before, during, and after it occurs. It also regularly evaluates these processes to improve its strategy and record better results (Colussi et al., 2002).

Organisation: A resilient community works with internal and external organisations with which it partners and collaborates to respond adequately to flood events (Colussi et al., 2002).

IFRC (2011) summarised the characteristics of a resilient community into six major points: A resilient community should.

- Possess the capacity to manage and monitor its risk and could gain new skills via experiential learning.
- Possess the capacity to evaluate their priorities and respond to problems adequately.
- Possess adequate infrastructures and social amenities and the ability to maintain, repair, and renovate them as and when due.
- Possess adequate resources to proactively respond to uncertainties in a flexible and timely manner.
- They possess the ability to manage their assets by protecting, enhancing, and maintaining them.

2.4 Frameworks for Community Flood Resilience

A framework for operationalising the process of achieving community flood resilience is relevant as it enables the collaboration of the stakeholders of the community by sharing their knowledge, structuring complex decision-making, and understanding their various roles and responsibilities in ensuring that they respond to the flood events effectively and productively (Herath and Wijesekera, 2021). Frameworks are broad concepts that can be adopted and employed in diverse ways and methods. However, it is relevant to establish a framework and its purpose to understand the different frameworks for community flood resilience. Understanding the purpose of frameworks forms the basis and understanding of how the flood

risk management framework for the Niger Delta communities will be developed in this study to achieve the aim of critically designing a Community Based Flood Risk Management Framework.

2.4.1 Categorization of Frameworks and how they are structured

Frameworks are developed for various reasons, as the term "framework" refers to a conceptual structure that can serve multiple purposes (Merriam and Simpson, 2000). Frameworks can be broken down into a wide variety of categories and sub-categories, some of which include (but are not limited to) the following: theoretical frameworks, conceptual frameworks, operational frameworks, decision-making frameworks, policy-making frameworks, and so on. Yet, this research will explore the distinctions between theoretical, conceptual, and operational frameworks. These are the three primary types of frameworks; all the others are sub-categories of these three mentioned.

A theoretical framework is the use of existing theories by a researcher as a foundation for their inquiry. The researcher develops the framework from existing theories to have a foundation and guidelines for their argument (Adom et al., 2018). It is also used to logically connect and develop the concepts of one or more theories as a foundation for a study. Theoretical framework can be summarised as a researcher's use of theory to understand the study (Varpio et al., 2020).

A conceptual framework uses various related concepts to justify why a given study should be conducted. It is aimed at linking the relevant concepts of a study and the relationship between them, as well as categorising and describing the purpose of the ideas in developing the study (Rocco and Plakhotnik, 2009). According to Varpio et al. (2020), a conceptual framework involves,

- They are utilising a literature review to describe the existing knowledge regarding a study.

- Identify and comprehend the informational gaps within the research domain or research topic.
- Investigate the value and relevance of the contribution obtained from the findings to develop and justify the methodological foundations on which the study is based.

The theoretical and conceptual framework can be more abstract and tied to directing research and strategic thinking. In contrast, the operational framework is more related to the practical implementation of the strategy. Therefore, the operational framework could be a recommendation for conveying and applying information, which is why the researcher chooses to use an operational framework in this study. An operational framework can also be used to recommend or suggest practical approaches to a problem or propose how an idea or idea can be executed to achieve a particular aim (Watmough, Palm, and Sullivan, 2017). Also, an operational framework can act as a handbook for addressing issues where specific roles and responsibilities of various stakeholders are being explained and recommended (Intrieri et al., 2020). The World Health Organisation (2015) developed an operational framework in the form of a handbook designed for building climate-resilient health systems. It guided health systems to professionals and decision-makers in the health-determining sectors of its member states and partners. The operational framework also helps identify the roles and responsibilities of stakeholders within and outside the health sector that are required to build a climate-resilient health system. An operational framework can also provide a potential basis for understanding a problem or the issue of inquiry being studied (Markham, 2015), which is evident in research by Ebhuoma & Leonard (2020), where an operational framework was developed to provide an understanding of flood risk communication warnings to indigenous farmers in Southern Nigeria. A picture (as seen in Figure 2.2) in the form of a visual representation was used to show the proposed framework and adequate flood warning. The researcher also explained the

diagram. The researcher may have used this approach due to cultural preference or easy comprehension.

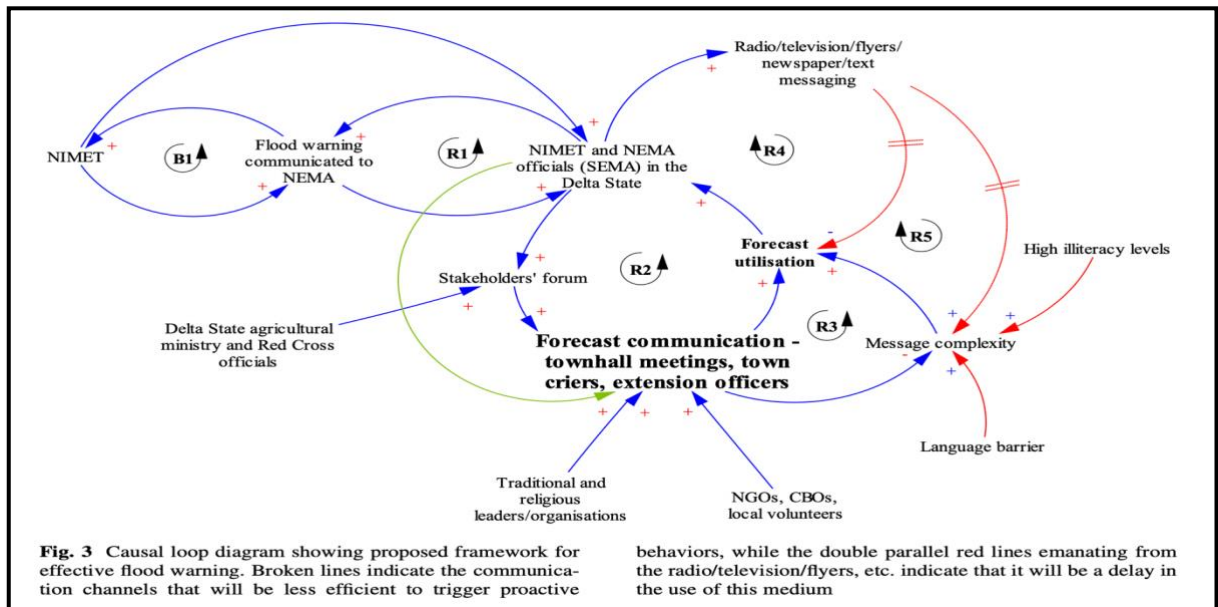


Figure 2.2: Sample of Operational Framework Visual Representation

(Ebhuoma and Leonard, 2020)

An operational framework can sometimes be used interchangeably with a decision support framework or a policy framework, depending on the framework's purpose, as all three frameworks are usually aimed at providing recommendations for an action or actions to be taken or executed. Research by Sundnes (2014) presented an operational framework in the form of a structure (which included a description of various concepts) that is relevant for evaluating specific disaster relief and recovery interventions. The operational framework structure formed the basis for deciding to respond to relief and recovery from a disastrous event. The framework was written out in sections, and diagrams and graphs did not represent ideas. The researcher might have chosen to create the operational framework through this format, possibly because of the nature of the study as an explanation of the key concepts that are relevant to understanding the operational framework. The different characteristics of an operational

framework explained sums up why this is the chosen framework for this study, as the operational framework is looking to recommend and suggest practical approaches that can influence the response and the decisions of the stakeholders in the Niger Delta communities regarding flooding. The researcher also believes that an operational framework is more suitable for the cultural experiences of the Niger Delta communities as the communities are more hands-on when dealing with flooding. The operational framework will also be appropriate and beneficial to not just the Niger Delta communities but will add to the literature regarding community flood resilience.

2.5 Chapter Summary

The literature review has demonstrated that communities can achieve resilience by employing coping and adaptive strategies. This study will, therefore, define the following key terms as follows:

Flood Hazards: This can be described as any phenomenon or process leading to excess water disrupting human activities and the loss of life or damage of properties.

Flood Disaster: This is exposure to flood hazards without adequate resources or external interventions to respond to and deal with the flood situation, which leads to significant loss, damage, and destruction.

Flood Vulnerability: The presence of flood hazards combined with the ability or inability to adapt to or recover from the effects of flooding.

Flood Resilience: This can be said to be the ability of an individual or a community to resist, absorb, recover, transform, and adapt to adverse flood events.

Flood Coping Strategies are people's immediate responses to a flood event, aimed at primarily protecting their basic welfare and providing basic human security after the flood event has occurred (IPCC 2012).

Flood Adaptive Strategies are strategic and focused responses to anticipated flood events aimed at proactively addressing them. The strategies are practiced before or after a flood event in anticipation of a future flood event (IPCC 2012).

Flood Risk Management is the process in which information regarding flood risk is collected and analysed to make decisions that help reduce and control the flood risk.

Community: A community is a group of people who share the same beliefs and physical environment.

Community-Based Flood Risk Management: This can be said to be community-based activities or measures geared towards flood risk management that are rooted in the culture of the community members and reflect their real needs and priorities.

Indigenous Knowledge: This can be described as a set of knowledge gained by experience within a community (or local people) that has been amassed from experience, observation, beliefs, behaviour, and experimentation and passed on to generations.

Community Resilience is the combination of the community's capacities, skills, and knowledge that enables it to maintain or fully survive, recover, and function after a flood disaster.

Resilient Community: A resilient community is one that possesses adequate individual and collective capacity to respond to flooding, recover from its effects, and bounce back better.

Coping and adaptive strategies are critical concepts in this study; therefore, it is relevant to understand and consider the coping and adaptive strategies that the community employs in the event of a flood disaster as they are relevant for the community's flood risk management. The literature review provides an understanding for this study to address the knowledge gap of the problem of scarce studies on flood coping and adaptive strategies in the Niger Delta communities by exploring similar deltaic communities. This study also addresses the knowledge gap of limited studies understanding the flood coping and adaptive strategies and

how they can be instrumental in developing community-based flood risk management to improve the flood resilience of the Niger Delta communities by discussing the relevance of coping and adaptive strategies in flood risk management. The chapter also establishes that Indigenous knowledge influences a community's flood risk management by understanding what communities can do in response to flood disasters. Therefore, there is a need to consider the indigenous knowledge of communities when developing community-based flood risk management to improve the community's flood resilience. The literature reviews also established that understanding the characteristics of a resilient community is relevant to ascertain if a community is resilient. The characteristics of a resilient community can be categorised into people, resources, organisation, and community process. However, a resilient community should be equipped to manage the available resources they possess before, during, and after a flood disaster. Also, a community-based flood risk management framework can improve a community's resilience to flood. The community-based flood risk management framework aimed toward community resilience to flood can be employed to organise and structure what is needed for a community to be resilient. Although the Niger Delta communities are experiencing yearly flood events, there is no academic research on a community-based flood risk management framework designed for the communities. The literature review further lays a foundation for understanding what a framework is and the various types of frameworks. The chapter considers three types of frameworks: theoretical framework, conceptual framework, and operational framework. The review of the various types of frameworks enabled the researcher to understand what type of framework would be relevant to achieve the aim of the study. Therefore, an operational framework was evaluated as the most appropriate to be developed and employed in this study, and it will be explained in more depth in Chapter 6.

Chapter 3 Study Setting

3.0 Introduction

This chapter provides an overview of the history of flooding in Nigeria, with a particular focus on the Niger Delta Region of the country. The chapter also discusses the status of climate

change in the Niger Delta. It provides knowledge of the present techniques that the region employs in its flood risk management. The chapter further discusses the various stakeholders responsible for managing flood risk in the region. It draws on evidence from literature to discuss the flood risk management in Nigeria and the Niger Delta.

3.1 Background of Nigeria and flooding

Flooding and other natural disasters, such as landslides, gully erosion, and windstorms, are common in Nigeria, just as in most African countries (Echendu,2022). Nigeria is made up of 36 states, and Abuja serves as the country's capital city. The government is also split into six distinct geopolitical zones: The North Central Zone, the North East Zone, the North West Zone, the South East Zone, and the South West Zone (also known as the Niger Delta Region). Each of Nigeria's 36 states is at risk of experiencing a devastating flood. Nevertheless, most of the states in Nigeria are flood-prone as they are characterised by having a large number of settlements and populations located in low-lying riverine and coastal plains (Soneye, 2014). A study by Amadi and Mac Ogonor (2015) reported that approximately 20 million people, corresponding to approximately 20% of the Nigerian population (when their study was conducted), lived in coastal areas.

According to Onwuemele (2012), most of the damage caused by natural disasters in the country may be traced back to floods, directly or indirectly. Severe droughts are prevalent throughout the northern states, including those in the North Central, North East, and North West regions (Adedeji et al., 2020). However, the states located in the South West, South East, and South regions experience severe flooding, landslides, and extensive gully erosion (Onwuemele, 2012). Nigeria is characterised by two major rivers: The Niger and the Benue (Olayinka-Dosunmu et al., 2022). The populations that live along the banks of these rivers are susceptible to flooding, and they suffer significantly from frequent flooding because of inadequate

infrastructure and the disregard of existing environmental and town planning regulations, further increasing their vulnerability (Chukwuma and Uchenna, 2018).

Figure 3.1 shows the 36 states that makeup Nigeria, the states that are most susceptible to flooding, and the different kinds of flooding to which the states are susceptible (National Emergency Management Agency (NEMA), 2019).

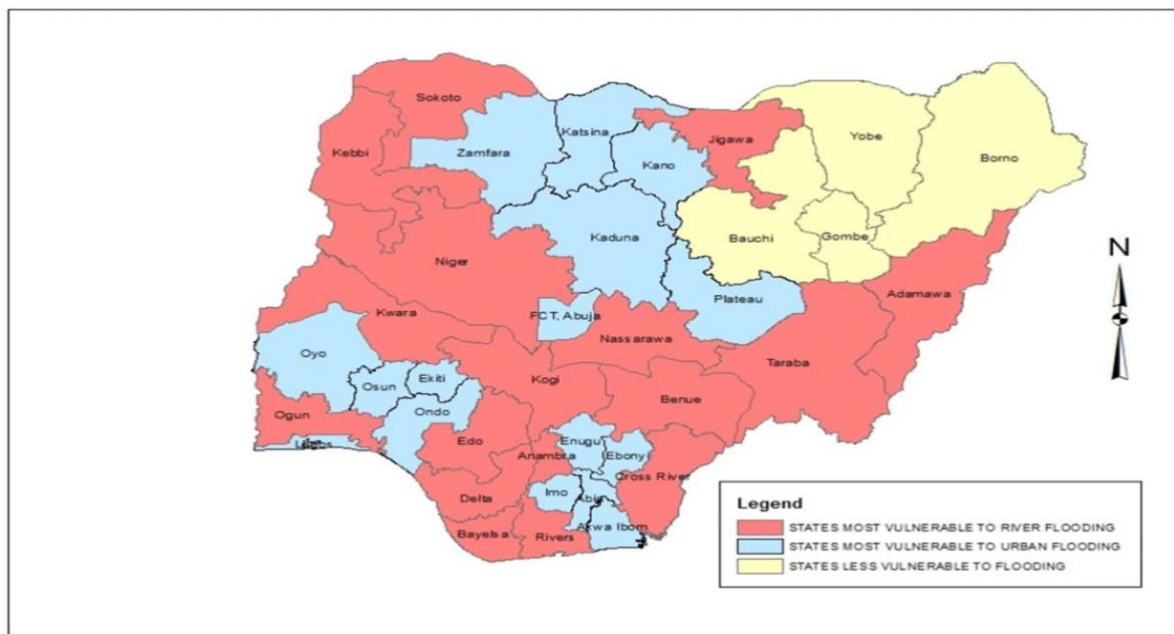


Figure 3.1: Map of Nigeria, showing the states most vulnerable to flooding.

(NEMA, 2019).

3.1.1 Overview of Nigeria Emergency Management

Flooding has been a problem in Nigeria for several decades and is being addressed by the National Emergency Management Agency (NEMA) (Schelfaut et al., 2011; Soneye, 2014; NEMA, 2019). The following are the primary goals that NEMA (2011) has set for itself:

- To plan and coordinate actions and programmes targeting and ensuring an efficient and effective response to disaster by formulating policies at the national level.
- Participate in and organise research initiatives regarding managing natural disasters at the national level.

- Monitoring and monitoring the preparedness of organisations and agencies working on disaster management at the state level in Nigeria.
- They are improving catastrophe management planning and response by compiling data from all relevant organisations.
- Raise awareness among the general population and educate them on how to avoid and cope with natural disasters.
- We coordinate and provide the necessary resources for search and rescue and other disaster curtailment efforts and distress calls.

Also, NEMA maintains regional offices situated in each of the country's six geopolitical zones, which are as follows: North Central (Jos), North West (Kaduna), North East (Maiduguri), South West (Lagos), South-South (Port Harcourt), and South East (Enugu). These zonal offices were set up so that response to disaster management in the country could be decentralised, promoting active engagement at the local government and community level. Compared to waiting for a response from the national office, this indicates that the response time for disaster management will be significantly reduced. The plan is for the zonal offices to work independently but remain financially dependent on the head office for resources. In addition, NEMA operates call centres nationwide to respond rapidly to emergency notifications. Ideally, the local government and community should have direct contact with the agency through the zonal offices. Since the establishment of the zonal offices, there has been an improvement in the speed of intervention, which has decreased to around two days for assessing and delivering relief aid for critical situations (NEMA, 2013).

Despite the help of international organisations like the Nigerian Red Cross Society (NRCS) and other organisations that serve as equivalents, the NEMA needs to make more progress towards accomplishing its goals (Soneye, 2014). However, flood risk management in Nigeria is inadequate, as a recent study by Oni and Ayegba (2022) concluded that NEMA has not been

successful in providing appropriate assistance in mitigating, preparing, responding and recovering flooding in Nigeria. It was also concluded that there needs to be more coordination between the central federal, state, and local government stakeholders responsible for flooding, which implied that NEMA needs to manage flood risks credibly. Also, studies on the needs and satisfaction of flood victims and evaluations of the aid, the providers, and supply chains for sustainable policy decisions are not conducted efficiently. There is a lack of investigation into humanitarian assistance provided to victims and a way forward to improve community resilience to flooding (Soneye, 2014). Responses to flood events from the government are mainly reactive, including providing relief, medical care, food, and water, as well as search and rescue, whereby preventative and proactive responses receive less attention. Although NEMA states it is still working to enhance its contingency planning and has various documents related to this activity, it still needs to improve its efficacy in executing the plans it has laid out (Anthony, Agetue, and Obuseh, 2019). In recent years, there has been an increase in the frequency of flood disasters in Nigeria, which can be ascribed to the problems caused by global climate change that are currently being faced by the world (Akanwa and Joe-Ikechebelu, 2019).

3.1.2 Flood Histories in Nigeria

In 2010, Nigeria was struck by a devastating flood that impacted the lives of more than 270,000 people across the country (Agada and Nirupama, 2015). In addition, a catastrophic flood disaster occurred in 2012, lasting five weeks. The tragedy was caused by high local rainfall, the failure of the Lagdo Dam (located in Cameroon), and inadequate dam management. This produced runoff on the Benue River (in Nigeria), contributing to the disaster (Daniel et al., 2023). It is believed that the flooding catastrophe that occurred in 2012 was the worst flood disaster in Nigeria's history (Chukwuma and Uchenna, 2018). It significantly impacted the lives of individuals, communities, and the nation as a whole. There are also claims that it is the worst natural disaster related to flooding in the past 30 years (Loveline, 2015). At least 25 out of the

36 states were impacted, and an estimated 3,871,063 individuals were forced to relocate. It is estimated that 5,871 people were hurt, 363 people lost their lives, and over 597,400 dwellings were destroyed (Agada and Nirupama, 2015). In addition, it resulted in damages and losses totalling over N2.6 trillion (about \$19.0 billion). Bayelsa (N596 billion), Rivers (N507 billion), and Anambra (N484 billion), which are located in the Niger Delta region, suffered the most damage and loss among the 12 states that were most affected by the disaster (NEMA, 2013). The Niger Delta region was the most affected because the three most affected states, Bayelsa, Rivers and Anambra states are geographically located in the area. The 2012 flood disaster was so severe and extensive that it attracted the attention and assistance of people and organisations from other countries to cushion the flood disaster's effect on people. International institutions such as the United Nations, the World Bank, and the European Union also provided financial assistance to Nigeria (Chukwuma and Uchenna, 2018). The devastating flood that took place in 2012, which had a significant impact on the Niger Delta region, led to an unforgettable experience for the Niger Delta communities. The overflowing of the Niger River and the Atlantic Ocean, which the Niger Republic is bordered, contributed to the severity of the coastal flooding in the region (Loveline, 2015). The flood waters caused the land used for farming to become inundated, houses submerged, and people rendered homeless (Mmom and Aifesehi, 2013).

3.2 Background of the Niger Delta Region (NDR)

The coastal region of Nigeria, known as the Niger Delta, got its name from the natural delta formed by the river Niger system because it is located on the shore (Dan-Jumbo, 2018). It is located in the southern parts of Nigeria. The Niger Delta region is estimated to cover an area of approximately 20,000 km² (Ologunorisa and Adeyemo, 2005). It is believed to be the largest wetland in Africa (Loveline, 2015), constituting around 12 per cent of Nigeria's entire surface area (112,110 km²). It is responsible for approximately 55 per cent of the total freshwater

wetlands in Nigeria (Ibeziako, 2019). It is estimated to be one of the largest wetland areas in the world (Moffat and Linden, 1995). The Niger Delta region of Nigeria is bounded by the Atlantic Ocean to its south, Cameroon to the east, Lagos State to the west, and Onitsha to the north. It is situated on the Gulf of Guinea between 5 degrees East longitude and 8 degrees East longitude and between 4 degrees North and 6 degrees North latitude (Dan-Jumbo, 2018; Ibeziako, 2019). It is possible that the Niger Delta took the shape of a prism during its formation because of the accumulation of sedimentary deposits that were carried there by the rivers Niger and Benue. Furthermore, the Niger Delta Region (NDR) has been built up with sediment from both rivers and the ocean for more than 50 million years (Mmom and Aifesehi, 2013). Within the flood plains, the river branches into six major tidal channels and an infinite number of smaller outflows (Mmom and Aifesehi, 2013). Around 70,000 square kilometres of the NDR are covered by floodplain (Ohimain, 2004), while approximately 270 kilometres of the region are comprised of coastline (Abam, 2001). The Niger Delta Region is comprised of eight states (as shown in figure 3.2): Abia State, Akwa-Ibom State, Bayelsa State, Rivers State, Cross River State, Delta State, Edo State, Ondo State, and Imo State. It also has over forty distinct ethnic groups, including the Ogonis, Urhobos, Ijaws, and Itsekiri, making it one of the most socio-ecologically diverse regions in the world (Ibeziako, 2019). According to Ologunorisa and Adeyemo (2005), the NDR comprises four ecological zones: the coastal barrier, the mangroves, the freshwater swamp forest, and the lowland rainforest. However, the mangrove is the most extensive of the four (Mmom and Aifesehi, 2013). In addition to this, NDR has three distinct vegetative zones that are as follows (Amadi and Mac Ogonor, 2015):

- The beach ridge zone is characterised by its tidal flats, swamp trees, palms, and shrubs.
- The saltwater zone, which is characterised by its red mangroves.
- The zone of freshwater, which is composed of several types of forest trees.



Figure 3. 2: Map of the Niger Delta Region showing its states

Source: (Udotong et al., 2017, p.28)

NDR is the wealthiest region in Nigeria in terms of natural resources, with a large deposit of oil and gas, extensive forests, arable agricultural land, and substantial fish resources. In addition, it is the most geographically extensive territory in Nigeria (Ologunorisa and Adeyemo, 2005).

Despite abundant natural and human resources, the NDR still needs to overcome a significant obstacle to development. This obstacle is primarily attributable to the dangers of environmental degradation that result from oil exploration and exploitation, as well as flooding, coastal erosion, ozone layer depletion, pollution, deforestation, acid rain, gas flaring as well as sea level rise (Amadi and Mac Ogonor, 2015, Ologunorisa and Adeyemo, 2005). Despite these frequent occurrences of intense environmental stress, there is still inadequate response from the national, state and local governments to the numerous challenges that generate ecological insecurity in the region (Amadi and Mac Ogonor, 2015; Moffat and Linden, 1995). The Niger Delta region comprises mainly rural settlements that are home to approximately 70 per cent of

the region's total population, and the primary sources of income for the residents come from fishing, farming, and the timber industry, in addition to several positions held by oil and gas industry workers (Ologunorisa and Adeyemo, 2005). Ibeziako (2019) states that although the communities in the NDR have significant differences, they have similarities in terms of their predominant traditional economy, which consists of subsistent fishing and farming. Nevertheless, these ways of making a living are in danger because of the projected increase in the flooding events they experience due to climate change.

3.3 Climate Change and Flooding in the Niger Delta

As mentioned earlier, the Niger Delta Region is characterised by a large wetland with a sizable floodplain. Oil palms, lianas, rainforest trees, raffia palms, reeds, and floating grasses are the most common types of vegetation found in the flood plains of the NDR rivers (Moffat and Linden, 1995). The average annual rainfall in the NDR is very high, ranging between 10 and 15 metres, with an increase of roughly twice that amount during its peak months of July and September (Mmom and Aifesehi, 2013). According to Barry (2018), even though the amount of rainfall in Nigeria as a whole over the past few decades has decreased, the coastal region of the Niger Delta has seen a slight increase in the amount of rain that falls there annually in the most recent years. The increase in annual rainfall in Nigeria has resulted in approximately 80% of the NDR experiencing seasonal, yearly flood events because of the high rainfall during the rainy season (from April to October) (Barry, 2018) combined with poorly drained soils in low and flat terrains. The effect of the increase in flood events has further led to the rise in the number of people in NDR who have lost their homes and belongings (Moffat and Linden, 1995; Barry, 2018). Climate change has, therefore, led to increased flooding, higher storm surges, and increased inundation of coastal areas with subsequent increases in erosion. The region is experiencing a rise in temperature as the climate continues to warm, which impacts the local environment, the weather pattern, and the increase in sea level (Ikporukpo and Dengiyefa,

2019). The NDR ecosystem is characterised by ongoing erosion and sediment deposition because of the frequent flooding (which includes severe and moderate flood events). The majority of the settlements in the NDR were established on low-lying land that was prone to flooding and contained mangrove forests. As a result of the region's year-round high average annual rainfall and the fact that the majority of its communities are subjected to high levels of flooding as a result of the numerous tributaries and creeks that the Niger River flows through on its way to the ocean, the region is also prone to erosion (Odemerho, 2015). According to the findings of a study conducted by Mmom and Aifesehi (2013), the primary factors that contribute to flooding in the NDR are excessive rainfall, the physical terrain, inadequate land use planning, inadequate drainage, and changes in land cover. The majority of people choose to live in the NDR (which is prone to flooding) because they want to maintain family ties, they were born in the community, it is close to their place of work or business, it gives them an opportunity for livelihood, and the cost of land and housing is low. The findings of the research carried out by Mmom and Aifesehi (2013) also stated that the aftermath of previous floods in the region resulted in direct and tangible impacts such as the destruction of infrastructure, loss of lives, homes, crops, and domestic animals as well as indirect and intangible effects such as traumatic emotional stress; and an increased risk to health.

3.4 Flood Risk Management Stakeholders in the Niger Delta Region

The following section establishes the roles and responsibilities of the flood risk management stakeholders in the Niger Delta region. The stakeholders are divided into three categories following their hierarchical level: national, regional, and local.

3.4.1 National level

The National Emergency Management Agency (NEMA) is in charge of developing flood warnings and the policy documents and guidelines that go along with them to protect against the risk of flooding. The Nigeria Meteorological Agency and the National Emergency

Management Agency (NEMA) work closely together to provide early warnings to the NDR for the annual seasonal rainfall that leads to the yearly flood events. The dissemination of these warnings, among other forms of public awareness-raising activities, is planned through engagement with the local community, targeted television programming, advertisements, information, education, and communication materials (NEMA, 2013). Also, NEMA is in charge of the strategic management, operational management, and maintenance of the dams in Nigeria, which are considered to be one of the risks associated with flooding in the country and the Niger Delta region (NEMA, 2013).

3.4.2 Regional level

The Niger Delta communities' flood risk management is the responsibility of the South-South zonal office of the National Emergency Management Agency (NEMA). The function of the zonal office is analogous to that of a subsidiary of the National office, and it serves as the connecting point between the communities and the National office. The zonal offices can only make decisions independently after first receiving approval from the National office. The zonal office is also responsible for ensuring that the policies and strategies developed by the National Office are implemented locally. This responsibility falls under the remit of the National Office (NEMA, 2019).

3.4.3 Local level

The residents of the Niger Delta communities are the most important stakeholders at the local level, and this includes the leaders of the local government areas, the leaders of the communities, and the leaders of the compounds. The various stakeholders operating at the local level are typically the first people on the scene during flood events. The community leaders sometimes organise the community residents to work together so they can deal with the seasonal flood events. In most cases, this is decided by the degree to which community members are willing to work together and the calibre of the leadership. The leaders of the

communities also organise forums to discuss how to arrive at flood decisions that are pertinent to the entire community and will benefit all of the community residents. Nevertheless, this is only the case for some of the communities in the region, as some community leaders do not show concern for the community residents during a flood event, which leaves the residents to fend for themselves. Sometimes, during flood events' response and recovery phases, local stakeholders receive considerable support from local and international charities (NEMA, 2013).

3.5 Chapter Summary

The majority of states in Nigeria are affected by flooding on an annual basis, and the states that are located in the Niger Delta Region are the most susceptible to flooding. This region has nine states, with four being the most vulnerable to flooding in the country. The region, which is characterised by high annual rainfall, is a coastal region with a large floodplain, and because of this, it is at risk of flooding and flood disasters. Climate change, which is a global concern, is leading to an increase in rainfall, and this is having an effect that is detrimental to the current state of flooding in the region. The flood risk management stakeholders of the region are categorised into three levels: the national level stakeholders, represented by NEMA (an agency of the federal government). The regional level stakeholders, organised by the state governments of the region, and the local level stakeholders, comprised the local governments, traditional rulers, compound leaders, household leaders, and the individuals who live in the community. NEMA is the only agency at the national level that is responsible for flood risk management. To achieve successful flood risk management in the Niger Delta Region, all of these different levels of stakeholders are necessary. The data collection for this study was carried out in seven other communities throughout the region. These communities share several similarities, including their culture, terrain, expected rainfall, and vegetation; however, some are well-

known for something exclusive to them. The next chapter will discuss these communities in detail (session 4.8).

Chapter 4 Research Methodology and Design

4.0 Introduction

Methodology is the lens through which a researcher sees the world. Therefore, a researcher's choice of method in addressing a research problem is frequently influenced by their perspective

of the world (Watkins and Giola, 2015). A researcher can give their best account, interpretation, argument and reasoning of a study based on the method of inquiry employed by (Willis, Jost, and Nilakanta, 2007). Research methodology is, therefore, the principle, process, and procedure that governs a researcher's approach to finding possible and best answers to research questions, objectives, and problem (Taylor and Peace, 2015). In this chapter, the research methodology choice and design for this research (which includes the most appropriate research philosophy, approach, methodological choice, strategy, timeframe, sampling, pilot study and procedure for data collection) will be discussed and linked to the aim and sub aims of the study concerning why they were employed. The diagram below (figure 4.1) summarises the methodology and design. The data collection technique and process will also be discussed. The chapter ends with the researcher explaining how the data collected was analysed.



Figure 4. 1: Summary of Research Methodology and Design

4.1 Research Philosophy

When conducting research, it is essential to construct a philosophical position to link the research to philosophical traditions that provide a better understanding of the researcher and their perspectives on the study. Research philosophy is the hub of any study as it underpins the knowledge of the appropriate research design to be employed by the researcher (Sloan and

Bowe, 2014). When beginning a research project, researchers frequently make several fundamental assumptions about the nature of reality and science. The validity of the assumption is based on the comprehension of reality from a particular rational perspective in terms of method, objectivity, subjectivity, and the understanding of the meanings of description, analysis, and interpretation (Holden and Lynch, 2004). Included in a research philosophy are its Ontology, Epistemology, and Axiology.

4.1.1 Ontology

Objectivism and subjectivism are two major traditional assumptions that serve as the foundation for ontology. Objectivism implies that reality exists in isolation from social actors, and subjectivism suggests that even though reality does exist, it depends on social phenomena through social actors' perceptions and consequent actions (Saunders, Lewis, & Thornhill, 2012). Objective researchers are realists because they believe that the world antedates human existence and consciousness, irrespective of whether humans assign labels and perceive the existence of an external reality. This does not change the world from existing as a factual entity consisting of physical and relatively unchanging structures independent of the individual's cognitive effort (Holden and Lynch, 2004; Sloan and Bowe, 2014)

Subjectivism is the philosophical position that individuals are the sole arbiters of what constitutes reality based on their experiences and interactions with the social world. It also presupposes that humans make sense of reality based on their imaginations, even though individuals' imaginations are socially constructed, dynamic, and intricate (Holden and Lynch, 2004; Sloan and Bowe, 2014). Amaratunga, Haigh, and Ingirige (2015) argue that society tends to have an objective potential built up by a subjective meaning, which is achieved by studying society and the relationships of individuals within it to understand human behaviours and their impact on the outside world.

This study is mainly aimed at having an in-depth understanding of flood coping and adaptive strategies and how they influence community resilience to flood risk. Therefore, it studies the society (the communities in the Niger Delta Region) and how individuals in these communities respond to the frequent flood situation and how they have coped and adapted over the years.

This study is subjective because the researcher makes sense of the people's flood coping and adaptive strategy through their narrative experiences of how they interact with society and survive during the flood season. Making sense of the experiences, activities, and traditions of the communities that fit the researcher's definition of coping and adaptive strategies or means of coping or adaptation allowed the researcher to accomplish the goal of the research (which is to critically design a Community-Based Flood Risk Management Framework that can improve the community resilience of the Niger Delta communities and evaluate how their flood coping and adaptive strategies can contribute effectively to this process). This study also investigates society and the relationships of individuals within it, making it a social science field of study. One key element of social science is that it is built up with a subjective meaning of human behaviours and their impact on society (Amaratunga et al., 2015).

4.1.2 Epistemology

Epistemology is concerned with the nature of knowledge of the world based on the procedure, validity, and limits of the gained knowledge (Holden and Lynch, 2004). It aims to provide sufficient explanatory power regarding new phenomena of interest. (Niehaves and Stahl, 2006)

There are two basic traditional epistemological approaches to research perspectives: positivist and interpretivist. The positivist approach proposes that scientific methods can discover and justify the valid reason or cause of an event or social pattern. At the same time, the interpretivist seeks truth by investigating patterns through subjective understanding (Roth and Mehta, 2002).

Some attempts by scholars to integrate the views of positivist and interpretivist approaches led to the emergence of post-positivism/ pragmatism. Both the positivist and interpretivist

approaches underpin pragmatism. It is in the middle of the two major traditional approaches, which are majorly associated with action, intervention and constructive knowledge (Goldkuhl, 2012). Positivism is also considered objective and realist, while interpretivism is subjective and critical. The interpretive theory contends that people have unique perspectives on the social world, each of which can lead to a unique interpretation of the same set of circumstances. They possess some consciousness that allows them to think and feel, providing them with a sense of awareness that prevents their response from being purely mechanical (Saunders, Lewis and Thornhill, 2012). According to Erickson (2012), new relationship meanings are negotiated through human interactions with their environment.

As a consequence of this, the definition of the world is constantly being created, changed, modified, and developed. This viewpoint is of an interpretivist, who believes that research is a socially constructed activity. The reality it informs us about is also socially constructed because it is founded on human interaction, which varies from person to person, person to society, and society to society. Individuals are known to build their understanding of the world through their personal experience and maturation, creating a unique reality for themselves. Also, humans in a specific group construct meanings and reality through their social process using traditions and lifestyle activities (Erickson, 2012). The interpretive researcher studies and makes meaning out of these social processes concerning their study aim. This study believes that the people in the NDR survive the frequent flooding they have experienced over a long time due to the traditions, lifestyle activities, and practices they employ to cope with and adapt (over time) to the flood events. The aim of the research (which is to critically design a Community-Based Flood Risk Management Framework that can improve the community resilience of the Niger Delta communities and evaluate how their flood coping and adaptive strategies can contribute effectively to this process) was achieved by the researcher making sense of the experiences, activities and tradition of the communities that fit the researcher's

definition of coping and adaptive strategies or means of coping or adaptation. Interpretivists also believe that understanding a particular situation within a context depends on interpreting the data collected. This questions the generalisation of knowledge within interpretive research because the understanding obtained is often distinct from the context in which the research was conducted. However, interpretive research aims to have an in-depth knowledge of a particular situation, context, or concept rather than the discovery of universal law or rules (Goldkuhl, 2012).

This study seeks to understand the concepts of coping strategies, adaptive strategies, indigenous knowledge/experiential learning, community-based flood risk reduction and community resilience within a particular location/context (the NDR). The researcher employed more than one method of data collection, which helped eliminate bias in data interpretation. An interpretive researcher recognises that they are not wholly distinct from the research and considers their positionality in the subjective nature of the study. Therefore, the result obtained is based on the interpretation the researcher gives to the expressed experiences of the participants. In this process, the value of the researcher is explored for interpretation. For the sake of this research, the knowledge the researcher has about the study area combined with the researcher's research skills adds to the credibility of the research findings. This study further employs one of the traditional philosophies of interpretivism called phenomenology (Saunders, Lewis and Thornhill, 2012). Phenomenology understands the world through the perception of the people being studied. It does not look out for generalised truth but the participant's perception of reality concerning their experiences. One of the challenges of phenomenology could be the difficulty of a researcher understanding the participant's perception. However, it is best for exploring the phenomena of human experience and how they are expressed because it gives voice to the participants' perceptions and experiences. This research likewise employs this approach by identifying the coping and adaptive strategies of the NDR communities to

flood disasters, interpreting the phenomena of their coping and adaptive strategies through their flood experiences and perception of communities' resilience. Community resilience is ascertained through this interpretation, which led to having a richer picture of the effectiveness of community-based flood risk reduction within the NDR communities through the development of a viable Flood Risk Management framework.

4.1.3 Research Axiology

Axiology is about the role and influence the researcher has on the process of social inquiry, which is based on the value they possess that could affect the credibility of the research results (Saunders et al., 2012). The researcher's philosophical approach and data collection techniques reflect the researcher's values. For instance, if a researcher chooses to conduct interviews rather than statistical questionnaires, this may suggest that the researcher values personal interaction as the ideal means of getting the respondents to express their views rather than anonymously (Saunders et al., 2012). For this research, during the data collection phase, the axiology is pronounced, as the researcher has formal training in conducting research and is an indigene of the NDR who knows the study area extensively, has an insight on the most appropriate way to approach the people to get as much positive response as possible and not bridge the ethical consideration of the study while remaining as subjective as possible. The researcher's understanding of the uniqueness of the study area also influenced the research design, such that the researcher did not conduct any formal training or education before the data collection as the researcher was looking to capture the real experiences of the participants with little or no influence.

4.2 Research Approach

Research often requires the use of theory or concepts, which may or may not be made clear in the design but must be made clear in the result presentation and conclusions. The clarity regarding theory at the beginning of research influences the research design. There are two

approaches regarding theory: inductive and deductive. These approaches are often attached to different research philosophies. However, they may need to be more accurate for some research that needs a clear-cut of being entirely inductive or deductive (Saunders, Lewis and Thornhill, 2012; Thomas, 2006). The deductive approach is when a theory and hypothesis are developed, and the research strategy is designed to test the hypothesis. The inductive approach is when data is collected based on certain assumptions, and a theory or concept is developed due to the data analysis (Saunders, Lewis and Thornhill, 2012; Thomas, 2006). The deductive approach is more associated with positivism, while the inductive approach is more associated with interpretivism (Saunders, Lewis and Thornhill, 2012). This study employs the inductive approach because the assumptions regarding the fundamental concepts of the research (which include coping strategies, adaptive strategies, indigenous knowledge, community-based flood risk management, and community resilience) were obtained mainly from literature and not based on any specific predictive or deductive theory. The primary collection of raw data further explored these assumptions to validate the concepts and develop themes and interpretations by the researcher. The main reason why this study employed an inductive approach is to allow the research findings to emerge from the recurrent, dominant, or significant themes inherent in raw data without the control imposed by structured methodologies, which are commonly used in social science research (Thomas, 2006).

4.3 Methodological Choice

The methodological choice includes the methods, tools and techniques used to gather information needed to understand (either confirm or contradict) research and confirm the methodological underpinning of the research (Watkins and Gioia, 2015). There are three types of research methods: qualitative research method, quantitative research method and mixed-method research. Quantitative research involves exploring a phenomenon by collecting numerical data and analysing them with statistical methods (Muijs, 2011). The qualitative

research method is concerned with non-numerical data, and mixed method research explores qualitative and quantitative research in exploring a phenomenon. The quantitative view is primarily objective, while the qualitative view is subjective, and the mixed methods is a combination of at least one qualitative and at least one quantitative perspective within a single research project (Bergman, 2008; Cassell, Cunliffe and Grandy, 2017) which cancels out their weaknesses (Guthrie, 2010), although one perspective could be dominant (Muijs, 2011). This research adopted the mixed method, with the qualitative approach being dominant.

4.3.1 Mixed Method Research

A mixed method research is the mixing of the different methodological approaches (qualitative and quantitative), which could include the paradigms, language and discourse associated with these different viewpoints (Clark and Ivankova, 2016) for in-depth understanding and corroboration (Schoonenboom and Johnson, 2017). Mixed-method research aims to better understand a social phenomenon, thereby taking the best out of qualitative and quantitative methods (Bergman, 2008). The mixing can occur at the data collection stage only, at both the data collection and analysis stages or all across the different stages of the research. In this study, the methods were mixed at the data collection and analysis stage.

The types of mixed methods design have been categorised in different ways by various authors (Maruyama and Ryan, 2014; Bergman, 2008; Leavy, 2017; Guest, Macqueen and Namey, 2012), but for this study the categorisation by Clark and Ivankova (2016) is being adapted because of its simplicity and clarity. Therefore, the types of mixed-methods designs are categorised as follows:

- **Sequential Quantitative → Qualitative design:** This is when the quantitative and qualitative techniques are implemented sequentially. The qualitative technique is implemented as a follow-up to elaborate, explain, or confirm initial quantitative results.

- **Sequential Qualitative → Quantitative design:** This is when the qualitative and quantitative techniques are implemented sequentially. The quantitative technique is implemented as a follow-up to generalise, test, or confirm the initial qualitative result.
- **Concurrent Quantitative + Qualitative design:** This design aims to compare or merge quantitative and qualitative results to achieve a complete and more validated conclusion, so the quantitative and qualitative techniques are implemented concurrently or independently. The diagram below (figure 4.2) shows the process of implementing the concurrent Quantitative + Qualitative design in this study.

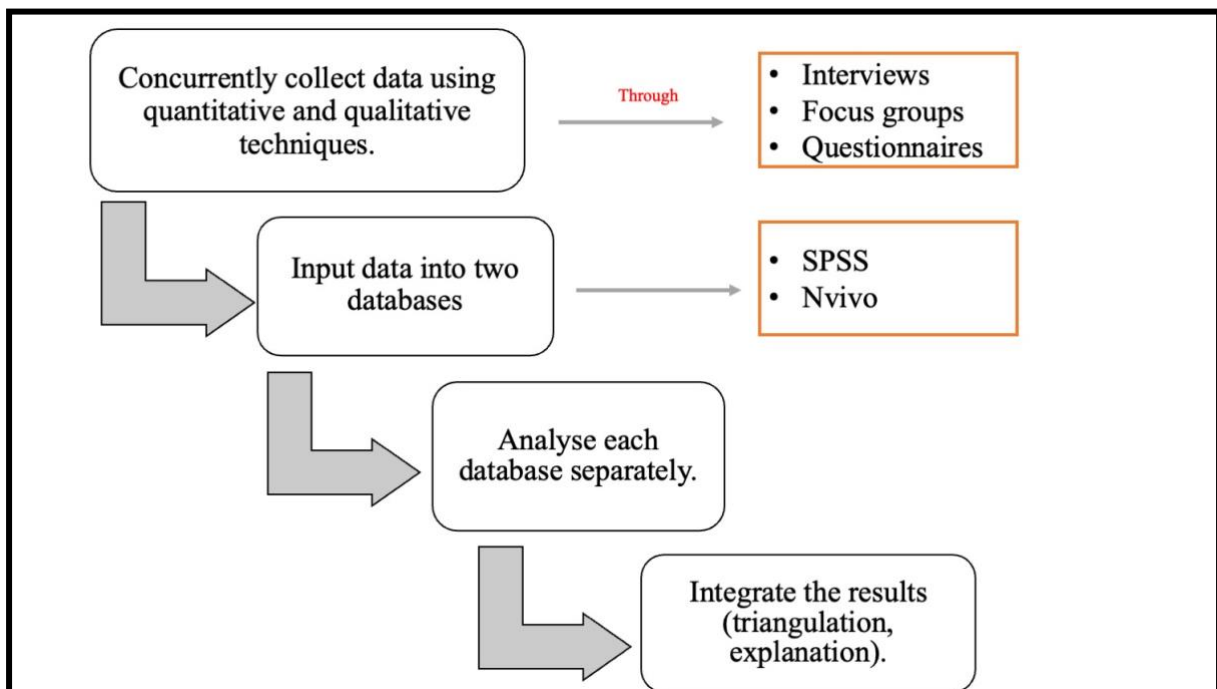


Figure 4.2: Process of Concurrent Quantitative + Qualitative Design in this study.

(Source: Created by Researcher)

This study adopted a concurrent Quantitative + Qualitative design. The questionnaire, interviews and focus groups were conducted independently but analysed together. However, the results obtained from the questionnaire and interviews were merged to understand the NDR communities' flood coping and adaptive strategies. The research problems or objectives that

could benefit from a mixed-method research design can be summarised as follows (Maruyama and Ryan, 2014; Guest, Macqueen and Namey, 2012). Research seeking to:

- Supplement insufficient data from one source.
- Explain preliminary results.
- Generalise the exploratory findings.
- Strengthen a study with a second method.
- Collect both quantitative and qualitative data to justify a particular theoretical stance.
- Understand its objective through multiple research phases or techniques.

This study employed the mixed method approach to generalise some of its exploratory findings and also understand the sub aim 2 (which is to identify the existing coping and adaptive strategies of the Niger Delta communities and the development of an in-depth and critical understanding of these strategies.) through multiple research techniques. The study sub-aim 2 is why a questionnaire was created for this research (the questionnaire design will be discussed in detail in section 4.6.5). However, some interview and focus group questions led to discussions that included sub-aim 2. Maruyama and Ryan (2014) stated that a mixed method approach allows a researcher to collect quantitative and qualitative data to have precise measurable information about how participants respond to specific issues and more general information about how participants think about the problem. In the case of this study, the questionnaire gave the researcher measurable information about the participant's flood coping and adaptive strategies, while the interviews provided some more general information on the participant's flood coping and adaptive capacity and shed more light on it. Mixed-method research is valuable for integrating components by giving the researcher more confidence in the results and the conclusions they draw from the study (McKim, 2017). It can be conducted

to understand a phenomenon better and provide an enhanced description of a phenomenon or triangulation. It can also be performed for all three reasons (Clark and Ivankova, 2016). An article by Schoonenboom and Johnson (2017) highlighted five purposes for mixed methods research gathered from their research, and they include:

- Complementarity seeks to elaborate, enhance, illustrate, and clarify the findings from one method with those from the other.
- Initiation seeks to discover paradox and contradiction, as well as new perspectives on frameworks that recast questions or findings from one method with those from the other method.
- Expansion aims to elaborate the depth of inquiry using different methods for different inquiry components.
- Development seeks to use the findings from one method to help develop or inform the other method.
- Triangulation aims to converge, corroborate, and correspond to the findings from the different methods.

The mixed-method research approach was also employed in this study for expansion and triangulation. The quantitative research approach was used to understand a component of the research and, together with the qualitative approach employed, provided convergence, corroboration and correspondence of the findings obtained from both methods. In summary, the mixed method research approach was used in this study to enhance the understanding of the phenomenon (community coping and adaptive strategies) and triangulation (increasing the validity and reliability of the research).

4.3.2 Purpose of Research

The purpose of the research is closely related to the research design employed. Research has three purposes: descriptive, explanatory and exploratory (Leavy, 2017). Descriptive research attempts to describe a phenomenon comprehensively with the use of numbers. It is usually concerned with how many people, places, and things are involved in a process or phenomenon, their characteristics, what processes occur and how often they occur (Watkins and Gioia, 2015). An equal amount of quantitative and qualitative methods can be used in descriptive research.

Explanatory research focuses on why things happen, intending to provide causations and predictions. Descriptive research usually explains the relationship between variables, which can also be used to test theories within social work (Grinnell and Unrau, 2014). A quantitative method is best used in conducting explanatory research. Exploratory research is usually aimed at studying a particular phenomenon to find relevant concepts about the phenomenon (Watkins and Gioia, 2015). Researchers conduct exploratory research when they need more scientific knowledge about the group, process, activity, or situation they want to study. Still, however, they are convinced there is something worth discovering. Qualitative and quantitative data are gathered during exploratory research, but in most studies, qualitative data dominates. The diagram below (Figure 4.3) shows the relationship between the purpose of the research and the method employed.

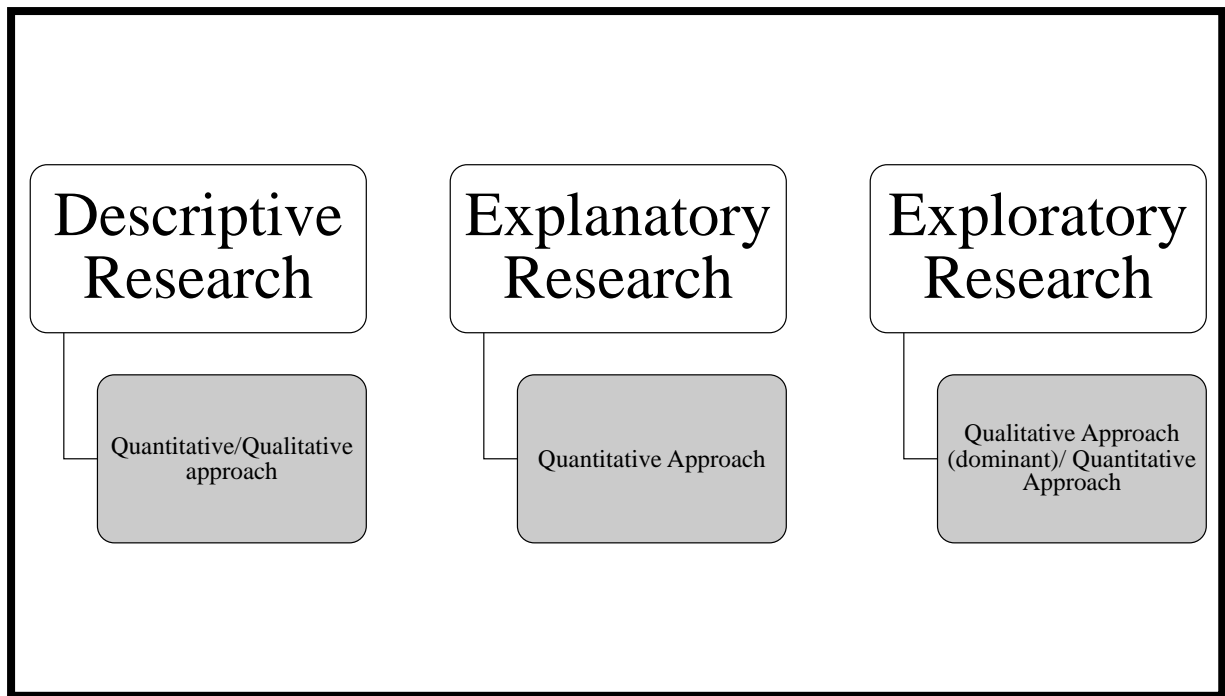


Figure 4.3: Relationship between the research purpose and the method employed.

(Source: Created by Researcher)

This study is exploratory as the researcher is keen on studying the NDR communities, which have been understudied amidst their experience of frequent yearly floods. Although the concept of coping and adaptive strategies is familiar, this study provides knowledge about coping and adaptive strategies peculiar to the NDR communities and how these strategies can contribute to effective community-based flood risk management, which needs to be improved in the communities. The communities have been surviving flooding for decades, and it occurs yearly. The researcher, who has primary knowledge of the region and has explored the existing flood coping and adaptive strategies of the NDR communities, is convinced that there is knowledge worth discovering in this region. The knowledge learned during the process of the study contributed to the development of the operational framework for flood risk management for the Niger Delta communities (in Chapter 6) and achieved sub-aim four. The flood risk management framework is, however, aimed at positively influencing the flood resilience of the Niger Delta communities.

4.4 Research Strategy

A research strategy is chosen based on how the research will be conducted in practice. Research strategy is fundamentally related to the nature of the research question(s) asked or research aims, the amount of time available for the research, the philosophical underpinning, and the resources available. It is, therefore, the methodological link between the research philosophy, data collection methods and data analysis technique (Saunders et al., 2016). This study is interested in the narratives of the NDR communities' flood coping and adaptive strategies and how the community's resilience can be improved. The study is interested in a community-based approach; therefore, the nature of a research inquiry largely determines how the research is conducted. There are various research strategies: experiment, narrative inquiry, survey, case study, action, grounded theory, ethnography and archival research (Saunders et al., 2012). This research, however, employed a case study strategy using narrative inquiry.

4.4.1 Case Study Research

Case study research is an in-depth, detailed inquiry of a single instance or one setting, even though more than one case at a time may be conducted. (Tharenou, Donohue and Cooper 2007). This study employed a case study research strategy. Case study research also uses multiple sources of evidence to empirically investigate a particular phenomenon within a real-life context in an explanatory or exploratory means (Yin, 2014). According to Tharenou, Donohue and Cooper (2007), case study research explains everyday practices affected by embedded culture. It could also be beneficial for exploring new processes and behaviours. The use of a case study research can be summarised as follows: the study of

- A phenomenon involving large-scale change, such as implementing new methods and techniques.
- A phenomenon that involves change and time, where processes unfold.

- Frequent or everyday practices are affected by the culture in which they are embedded.

This study uses a case study research strategy because it studies the frequent flood coping and adaptive practices of the ND communities, and the culture of the people is embedded in these practices. The study also explored the different perspectives and in-depth understanding required to examine and explain coping, adaptation, and resilience at the community level. A case study can be a person, a group of people, an organisation or non-human objects, and case study research can be categorised into single case or multiple cases and then embedded or holistic. A single case study seeks to explore a phenomenon in a particular case. In contrast, a multiple case study aims to find out if the results from a single case apply to other cases by replicating the study. An embedded study involves a case with several units of analysis, while a holistic study deals with one phenomenon (Yin, 2014). This study, however, employed a single case, holistic design. The experiences of the people in the flood-affected communities are the case. At the same time, the phenomenon is their ways of coping and adapting to flood disasters to improve Community Based Flood Risk Management (CBFRM) and resilience. The research is, therefore, a single case study because there is no replication of the study in the various communities or other regions of the country for similarity or comparison's sake. Case study research may use interviews, observations by the researcher, document analysis, meeting attendance and questionnaires for data collection, and can adopt both qualitative and quantitative research designs (Saunders et al., 2012; Tharenou, Donohue and Cooper, 2007).

4.4.2 Narrative Inquiry

A narrative inquiry allows participants to narrate their experiences as a story, showing their collective experiences while acknowledging their differences as individuals (Renton, 2020). A narrative inquiry also supports an interpretive researcher, as participants telling stories around

their experiences allows the researcher to make sense of the cultural context that is influencing their narratives (Pettifer, 2021).

According to Musson (2004), narrative inquiry can be combined with another strategy to complement it. This study, however, used the case study as the primary strategy and the narrative inquiry as a complementary strategy. Although a narrative inquiry has limited interview questions, as this is a complementary strategy in this study, a semi-structured interview was employed. Still, participants were asked about their flood experiences, which were narrated in storytelling formats.

As discussed in Chapter 3, the NDR faces the unique challenge of being blessed with abundant natural and human resources but still faces the obstacles of underdevelopment concerning their flood risk management, and this is because there is insufficient coordination between the government and the local community to manage flood risks credibly. This study, therefore, considers this challenge, and that is why a narrative approach is employed, as it allows the researcher an organic way of understanding and inquiring into the flood experiences of the participants, which reflects their rich human resources and knowledge.

4.5 Time Horizon

Time horizon entails the time taken to conduct research, which depends wholly on the research aim, sub-aims, questions or objectives. There are two classifications of time horizon: longitudinal, which is studying a change and development over a defined period. The second is cross-sectional, which studies a particular phenomenon at a specific time. Cross-sectional studies may seek to describe the incidence of a phenomenon and are best approached when using a mixed-method research design within a case study over a short period (Saunders, Lewis and Thornhill., 2012). This study is a cross-sectional study; it studied the existing coping and adaptive strategies of the NDR communities to flood disasters and developed an improved

framework for flood risk management (a phenomenon) using a mixed-method research design. This research was, however, conducted within a case study, and the data was sourced through interviews, focus groups and questionnaires.

4.6 Data Collection Technique

The primary purpose of this research is to seek insights into the flood experiences of people in the NDR communities, and the data collected is essential in meeting the aim and the sub-aims of this research. Below is a table (table 4.1) showing the research sub-aims and method of inquiry.

Table 4.1 Research Sub-Aims and Methods for Developing the Community-Based Flood Risk Management Framework

Research Sub-Aim	Data sources
Sub-Aim 1: To critically evaluate the relevance of community-based disaster risk management in mitigating flood disasters and building resilience.	Literature Review.
Sub-Aim 2: To identify the existing coping and adaptive strategies of the Niger Delta communities and the development of an in-depth and critical understanding of these strategies.	Interviews, Focus Groups and Questionnaires.
Sub-Aim 3: To create a household and community flood response action guide for the Niger Delta communities.	Literature Review, Interviews, Focus Groups and Questionnaires.
Sub-Aim 4: To develop a practical framework for effective Community-Based Flood Risk Management (CBFRM) in the Niger Delta region by critically contextualising coping and adaptive strategies practised in the communities.	Literature Review, Interviews, Focus Groups and Questionnaires.

<p>Sub-Aim 5: To validate the Flood Risk Management (FRM) framework developed.</p>	<p>Interviews.</p>
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4.6.1 Ethical Considerations

The researcher got ethical approval from the University of Huddersfield, which is shown in Appendix 4 (as the researcher started the study at the University of Huddersfield before transferring to UWE) and The University of the West of England (UWE) before proceeding to the field to collect data. On getting to the field, the consent of participants was secured before the interview was conducted. Participants were offered the research information sheet (which is shown in Appendix 3), and they printed their names and signed the consent form to approve. They were also informed that the interviews and focus groups were being recorded. Participants' names and forms of identity were not asked for as they were irrelevant to the study. However, they were given numbers used as interview identification just in case a participant wished to withdraw their interview from the study.

4.6.2 Sampling Technique

A sampling technique is how a researcher selects data collection sources (in this study, participants). Sampling is selecting enough participants from the population to study the research. The sample being studied then provides an understanding of the sample audience's properties or characteristics to enable the researcher to generalise the properties or characteristics to the population (Forza, 2002). The research sample audience is the target audience that influences the research outcomes as they comprise the study participants. (Bryman, 2012). For this research, the community members and the local authorities of the Niger Delta Region in Nigeria are the research audience. The researcher studied their experience of flooding, and the knowledge gained was used to frame the FRM framework for

community resilience in the region and add to the literature about the region and the country of Nigeria in general.

A researcher's choice of sampling technique depends on the research aim and sub-aim(s). According to Ezeji (2013), sampling enables a researcher to overcome the difficulties of collecting data from an entire population, which can be impossible or hard because of time, costs, and other human resources, which is the reason why seven (7) communities were chosen for this research. There are two types of sampling techniques: probability and non-probability. For probability samples, the chances of each selected case are known, and the same is true for all cases, which makes it possible for the sample to answer the research aim/sub-aims that entail statistical characteristics of the target population. Probability sampling is often associated with experiment and survey research projects (Saunders, Lewis, and Thornhill, 2012; Tracy, 2012). For non-probability samples, the chances of each case being selected from the target population cannot be determined, making it impossible for the sample to answer aim/sub-aims that entail statistical inferences about the target population's characteristics. However, it is still possible to generalise from non-probability samples about the target population, but not statistically (Saunders, Lewis, and Thornhill, 2012). This study employed a non-probability sampling technique, as there is no need for a statistical inference from the target population to address the research sub-aims (the research is subjective). Various types of non-probability sampling techniques (they include purposive, maximum variation samples, snowball samples, and theoretical-construct samples). The research questions, objectives, and aims broadly determine what type of sampling is best for collecting the data required. Purposive sampling is more appropriate when conducting mixed-method research with a dominant qualitative research approach as it allows the researcher to purposefully choose participants that will fit the purpose of the inquiry (Tracy, 2012). The sampling technique employed for this study was non-probability purposive sampling. According to Tansey (2007), purposive sampling is used

where the researcher's knowledge of the population guides sample selection. For this study, the researcher is familiar with the case study and was formerly a member of the NDR community. The researcher conducted a pilot study via telephone interview before going to the field using existing community contacts (this will be elaborated on in session 4.7.1). A snowball method was employed whereby respondents introduced the researcher to potential participants who met the target criteria (which consisted of community leaders and community members who had lived for at least ten years in the area). Participants were asked if they were willing to partake, and data was collected from those who responded positively. The researcher used interviews (individual and focus groups) and questionnaires to identify the community's existing flood coping and adaptive strategies.

4.6.3 Interview

The word "interview" describes conversations such as professional, counselling, therapeutic, job, journalistic, and research interviews. (Kvale and Brinkmann, 2009). The common aim of an interview is to have an engaging conversation by asking and answering questions. Whatever the structure or format of an interview or the medium used for an interview (such as telephone, face-to-face, or computer-mediated), the basic unit of interaction is the question-answer sequence. For the sake of this study, an interview is a guided question-and-answer conversation where a researcher learns about its participants and their lived experiences concerning the researcher's topic of inquiry. It entails systematically hearing and understanding what participants tell the interviewer (Kvale and Brinkmann, 2009; Qu and Dumay, 2011). Given that researchers pose questions to participants to elicit answers, it is helpful to examine in more detail how 'closed' and 'open' questions work and how they can generate different kinds of responses to suit a researcher's data collection approach/aim (Kvale and Brinkmann, 2009). Closed questions require a yes/agree or no/disagree answer with an option to explain further.

Open questions allow for more descriptive responses within which participants can formulate answers in their own words regarding the topic of inquiry from the interviewer. The interviewer can further probe the participant's response by asking follow-up open-ended questions as well (Roulston, 2010). The type of questions, however, determines the structure of the interview. The following degree of structure is a common way to classify a research interview.

- **Unstructured Interview**

Interviews cannot be considered unstructured; however, some are relatively unstructured because they are less guided conversations. They are informal conversations, and there is an assumption that the interviewer plans only some of the questions. This type of interview is common with open-ended ethnographic interviews (DiCicco-Bloom and Crabtree, 2006).

- **Structured Interview**

A structured interview is when participants are asked a series of pre-planned questions, allowing only a limited amount of response categories. Structured interviews are inflexible, and the interviewer reads from a script and does not tend to deviate from it. Every participant is asked the same questions and is expected to answer from a list, which makes organising and quantifying the findings to be simple (Qu and Dumay, 2011).

- **Semi-Structured Interview**

The semi-structured interview has been proven flexible, accessible, and versatile for individual and focus group interviews, which is one reason why it is a popular data collection method (Kallio et al., 2016). The nature of its structure can be modified so that the interviewer can get a response from the participants that suits the study, which is possible as the interviewer can ask improvised and follow-up questions based on a participant's response. It is often the most convenient and effective way to gather information, and it allows the researcher to understand

how the participants perceive the society being studied (Kallio et al., 2016; Kvale and Brinkmann, 2009). The interview questions are usually guided by identified themes or informed by literature with room to improvise and elaborate for further responses from the participants. Focusing on a series of broad themes or topics and guided conversations aimed at getting participants to respond towards the issues the researcher is making enquiries about (Qu and Dumay, 2011). For this study, a set of initial open questions was formed, and they were mainly informed by literature. However, the researcher did not limit the interview to the initial questions and allowed the participants to lead the discussion into new questions to express their attitudes as freely as possible and capture their narrative. The interview questions (shown in Appendix 2) were aimed at explaining attitudes and perspectives in-depth without constraining their narrative experience. As a result, during the interviews, some participants elaborated on their flood coping and adaptive strategies and how they could be improved to make them more resilient. The researcher used a qualitative interview approach because the research was aimed at subjectively interpreting the lived experiences and viewpoints of participants through guided interactive/conversation (Tracy, 2012). Qualitative interviews can be conducted in groups or individually. They can also be done face-to-face, via telephone or online (synchronous or asynchronous computer-mediated interaction). The interviews for this study were conducted qualitatively, as the researcher had a face-to-face conversation with the participants to gather their narratives through spoken words rather than written data (Roulston, 2010). However, the empirical data yielding information for this research was collected through individual interviews and focus groups using insights from the literature on how to structure the interview questions. Semi-structured one-on-one interviews and focus groups were employed in data collection to allow flexibility in accommodating the variety of respondents with different flood coping and adaptive strategies and understanding of how these strategies can increase communities' resilience to flood risk (and also for data triangulation). According to Saunders

et al., (2012), the use of semi-structured interviews is necessary for understanding the reasons for the decisions a research participant has taken or the reasons for their attitudes.

- **Challenges of Interview**

Understanding the participants' reality through interviews could be elusive as the researcher and participants may have meaning in their words even though they speak the same language. However, a properly planned interview can provide a rich set of data which can help overcome this challenge (Qu and Dumay, 2011). In this study, the researcher conducted a pilot (also known as a pre-test interview), which gave the researcher a glimpse of the attitude of the participants and their responses. The researcher was also able to make some adjustments to the interview questions and style before proceeding to the field.

4.6.4 Focus Group

A focus group is a group of persons interviewed by a researcher(s) simultaneously, sharing their personal experience with the questions being asked. It is also a group discussion that includes the conversation and interaction of people based on the questions and topic introduced by the researcher (Lawrence and President, 2014). It is argued to be an excellent method for data collection as it provides a more secure and supportive environment than individual interviews, and it has the potential to generate more ideas by shifting the power and focus more to the participants (Lawrence and President, 2014; Osborne and Collins, 2001; Porter, 2013). It is also a method that allows for the collection of extensive data without consuming much time, which offers a means of exploring the main issues dynamically through group interaction (Osborne and Collins, 2001). Focus groups help collect information on collective views and more profound discussions of different points of view on the issue being explored. They are also instrumental in facilitating discussions of participants' experiences and values. Focus group discussions are generally vibrant and can double as an independent method for data collection or as a multi-method design (Gill et al., 2008; Lawrence and President, 2014). This

study employed a focus group methodology to allow for an in-depth discussion of the research topic, interests, and concerns. The focus group is an appropriate method for less structured questions, and this was the case in this study, as semi-structured questions were formulated before the data collection. The less structured approach allowed for an in-depth discussion of the research topic and, therefore, contributed to generating rich data as participants discussed their various experiences or ideas towards their flood coping and adaptive strategies (Cowton and Downs, 2015). During the discussions, the researcher observed how the participants reacted to each other's narrative on how they coped during the flood and their perspectives on how their coping strategies and adaptation to the frequent flooding over time have improved their resilience as individuals and as a community.

- **Challenges of Focus Group**

According to Morgan, Krueger, and Scannell (1998), focus group requires planning and more organisation than other research methods. Thus, thinking through the entire project when planning for a focus group is essential. It often involves selecting the participants by contacting them, arranging convenient dates, times, and locations for all participants, and planning questions that will result in in-depth discussion. For this study, the participants were chosen through a snowballing methodology. The researcher contacted one participant (a week before the scheduled date), who then arranged a group of persons available to be involved at the time of the interview. Another challenge is the recommended number of participants per focus group (4-15) and the time each session should last (1-2hours). Getting the appropriate number of people might be challenging, and most people will not be willing to spend up to 2 hours (Freeman, 2006; Powell, Single, and Lloyd, 1996). However, this challenge was not encountered during this research as the researcher could get up to 4-5 participants in a group.

The researcher also made the discussion engaging for the participants, and they were willing to give their time to the debate for more than an hour.

4.6.5 Questionnaire

A questionnaire is a written tool for collecting data (either online or physically) from individuals or a group/group of people (Wilson, 2013). According to Brace (2018), a questionnaire is a set of questions articulated by a researcher to which they want to find answers. It can be analysed using qualitative and quantitative research techniques (Wilson, 2013). It is also a medium of conversation or communication (which could be remotely or indirectly) between a researcher(s) and the selected participants of the research. Wilson (2013) argued that although a questionnaire is often seen as a quick way to gather data from respondents, it is more complex and is based on some basic assumptions.

- The concepts of the research interest are being collected through the questionnaire.
- The time the respondents are willing to give to answer the questionnaire contributes to its relevance.
- All the respondents understood the questions in the same way.
- Respondents tend to give honest data by following the rules provided to the best of their knowledge.

These assumptions closely relate to the reasons why a questionnaire is used as a data collection tool in this study. According to Greener (2011), the design and use of a questionnaire as a data collection tool are closely affected by the purpose of the questionnaire in the research design.

The following are some possible reasons a researcher can use a questionnaire.

- To scope or explore the boundaries of an area, they need to learn more.
- To test a hypothesis generated from existing research or their ideas.
- To test a series of propositions they have about a particular social area or phenomenon.

- To test a new instrument or concept they want to use to measure a particular social phenomenon.
- To estimate the attributes of a population from the sample they are investigating.

All this can be summarised by gathering information about the respondents' behaviour, which explains why a questionnaire was used for this research. The researcher used the questionnaire (which is shown in Appendix 1) to gather data about the existing coping and adaptive strategies of the people who reside in the Niger Delta Region. The purpose of this was to investigate the research sub-aim 2 (which is to identify the existing coping and adaptive strategies of the Niger Delta communities and the development of an in-depth and critical understanding of these strategies) and estimate the flood coping and adaptive attributes of the communities from the sample that was investigated. A questionnaire can also complement other data collection methods to add breadth to the data. In this study, interviews were conducted, and the respondents highlighted some of their flood-coping and adaptive strategies during the interviews. However, the questionnaire provided breadth and depth to their coping and adaptive strategies because the respondents indicated how often they implemented a specific flood coping or adaptive strategy if ever they did. The questionnaires were administered simultaneously with the interviews and focus groups but to different participants. The researcher administered the questionnaire to participants who needed more time to commit to an interview or the focus group, which allowed the researcher to reach more participants in the study. Just like an interview, the questions asked in a questionnaire could be open-ended or closed-ended. An open-ended question does not suggest an answer to the respondents; they are expected to answer in their own words.

On the other hand, a close-ended question tends to have predictable answers (usually yes or no) or provide the respondents with a set of possible answers to choose from (Brace, 2018). Close-ended questions are often used for questionnaires measuring behaviour, experiences or

perceptions. This research questionnaire implemented the use of close questions as the aim was to explore the flood coping and adaptive experiences of the people in the ND communities. This research also used close-ended questions because data coding and entry for closed-ended questionnaires are easier than open-ended questionnaires (Bourque and Fielder, 2003). In designing the questionnaire for this research, the following guide was used (Tharenou, Donohue and Cooper, 2007)

- The topic was clearly defined.
- The questions were relevant to the respondents.
- Reducing the length of the questionnaire as it affects the response rate.
- The questions were short and direct.
- Simple and everyday language was used.
- The use of the Likert scale was relevant to the questions.

According to (Yaddanapudi and Yaddanapudi, 2019), before the questions are formulated for the questionnaire, it is essential to review relevant literature to the research being conducted, which should be discussed with an expert(s). In this study, literature on coping and adaptive strategies was reviewed. A list of coping strategies (coloured in red) and adaptive strategies (coloured in green) were gathered from the literature. They formed the basis for the questionnaire questions, as seen in Table 4.2 below.

Table 4. 2 List of Coping and Adaptive Strategies from Literature

Coping and Adaptive Strategies	Reference
Hold regular community meetings regarding flood disasters.	UN (2008)

Community members collectively dig a comprehensive drainage system or trench around their houses, gardens, and land to direct the flood water away.	UN (2008); Sakijege, Lupala and Sheuya, (2012)
Designated area for safety during flood disaster	UN (2008)
Mixed cropping. Planting of bananas because it survives the flood, catkin reeds on sandy lands to control flood waters and retain deposits of alluvial soil and yam in a mountainous region where people migrate during flood disaster.	UN. (2008); Mavhura et. al., (2013); Bola et. al., (2014); Paul and Routray (2010); Few (2003).
Taking shelter on higher ground	
The special plant is used in collecting drinking water during the rainy season to avoid drinking flood water and getting sick.	UN (2008)
Food is preserved in traditional clay pots a few months before flooding for times when people cannot leave their houses.	UN. (2008); Paul and Routray (2010); Few (2003).
Placing barriers around houses with sandbags, water hyacinth, construction of footbridges, etc.	Mavhura, et. al., (2013); Paul and Routray (2010); Sakijege, Lupala and Sheuya, (2012)
Construction of floating houses and raising the platform of the kitchens and storerooms so that they keep food, water, fuel, and valuables during flooding	Mavhura, et. al., (2013); Paul and Routray (2010); Sakijege, Lupala and Sheuya, (2012)
Reducing the number of meals and relying on inexpensive food	Mavhura, et. al., (2013); Paul and Routray (2010); Sakijege, Lupala and Sheuya, (2012)

Alternative sources of income and selling assets, including livestock	Mavhura, et. al., (2013); Paul and Routray (2010); Bola, et. al., (2014),
Temporary migration	Bola, et. al., (2014); Paul and Routray (2010); Sakijege, Lupala and Sheuya, (2012)
Raise homestead before a flood.	Paul and Routray (2010)
Elevate beds using bricks or tie them to a wooden pillar	Paul and Routray (2010)
Move assets (e.g., furniture and household belongings) by boat to a safe place.	Paul and Routray (2010)
Keep poultry and livestock on the higher part of the homestead or move them to safer places.	Paul and Routray (2010)
Use of bamboo and fishing nets to protect fisheries during the flood or use water hyacinth to raise pond embankments	Paul and Routray (2010)
Use of potassium alum and water-purifying tablets for water purification or boil water for drinking.	Paul and Routray (2010) ; Sakijege, Lupala and Sheuya, (2012)
Use of traditional herbs and self-medication from local pharmacy to treat cold, fever, diarrhoea, and dysentery	Paul and Routray (2010)
Use of bamboo to make rafts for movement and shelter during floods.	Few (2003).
Creating spaces with blocks, stones, and furniture to block water inlets	Sakijege, Lupala and Sheuya, (2012)
Building of water outlet pipes above lintel level to drain water off	Sakijege, Lupala and Sheuya, (2012)

Building protective walls	Sakijege, Lupala and Sheuya, (2012)
Use of materials that are separable for building.	Paul and Routray (2010)
Follow the traditional crop calendar	Paul and Routray (2010)
Sow couch grass to guard against erosion	Mavhura, et. al., (2013)
Creation of traditional community grain stores	UN. (2008); Paul and Routray (2010); Few, R. (2003).

(Source: Compiled by Researcher)

Also, some flood coping and adaptive strategies were gathered from the pilot study and added to the questionnaire design. Likewise, a brief introduction that clearly stated the questionnaire's aim was included to provide the participants with information about the research. A range of scales and response styles can be used when designing a questionnaire, which also influences the analysis options (Rattray and Jones, 2007). An attitudinal scale was used to design the questionnaire for this study. An attitudinal scale is commonly used in social research to explore people's attitudes towards various phenomena, situations, problems, concerns and interests regarding their lives (Kumar, 2019). In this study, the attitude scale was used to explore the coping and adaptive attitudes of the Niger Delta communities towards the frequent yearly flood disasters that they experience. There are three types of attitudinal scales.

- The equal-appearing scale (Thurstone scale)
- The cumulative scale (Guttman scale)
- Summated rating scale (Likert scale)

This study used the Likert scale to design the questionnaire. One of the reasons is that the Likert scale is easy to construct and understood by respondents. In developing the Likert scale, the study further considered using a categorical scale because it is more appropriate to capture the

expression of the participants towards the strategies they employ before, during and after a flood disaster. Also, a five-point categorical scale with varying degrees (from 1 representing never to 5 representing always) was included in the questionnaire design. However, the questionnaire for this study had just one question with thirty-two responses on a five-point category scale (see Appendix 1 for a sample of the questionnaire). As with most data collection tools, a questionnaire has strengths and weaknesses. Wilson (2013) highlighted some of its strengths and weaknesses, respectively.

- They can be administered to many people simultaneously using various methods (such as face-to-face or phone interviews, emails, online survey tools, etc.).
- They are more anonymous.
- The results can be used to compare responses.
- The result obtained can be used to inform other methods.
- They are easy and fast to analyse.

One of the weaknesses of a questionnaire is that it needs to have the opportunity to clarify the question if the respondents need help understanding what is being asked (Greener, 2011). This weakness was overcome in this study as the researcher is a member of the Niger Delta community and was able to clarify any questions and read out the questions to respondents who needed help with interpretation in their local language, which the researcher understands and can speak fluently.

4.7 Data Collection Process and Activities

A summary of the data collection process for this research is shown in (Figure 4.4). The pilot study and data collection activities are also discussed in detail.

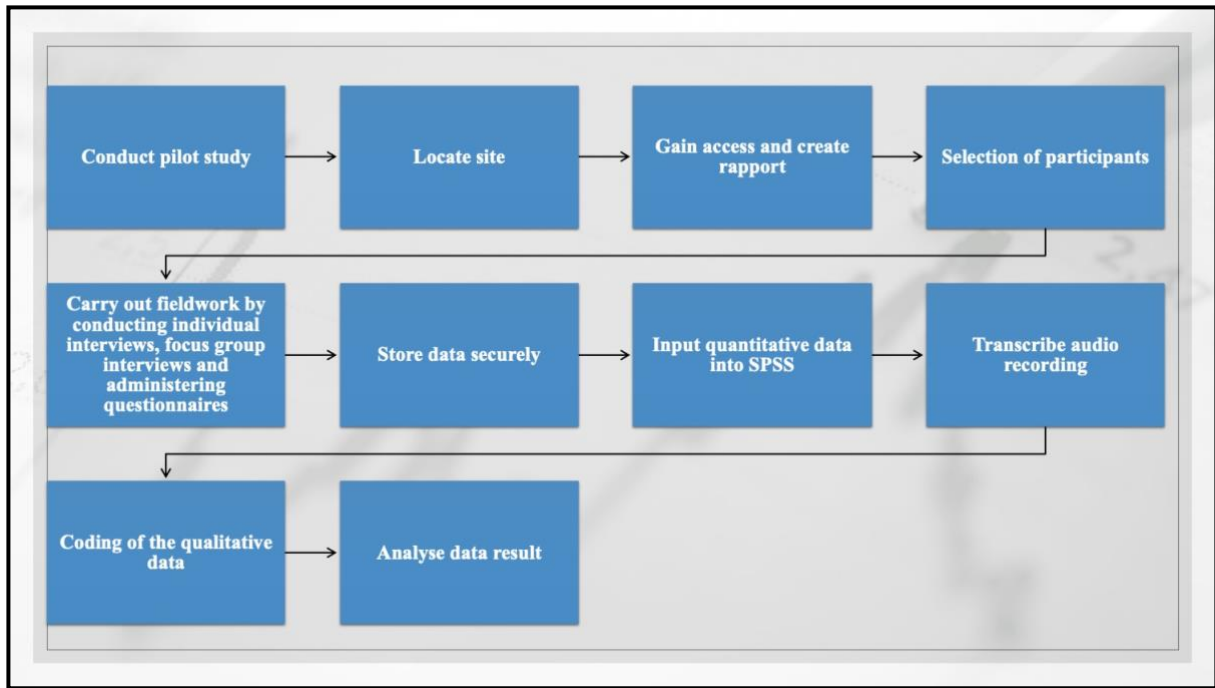


Figure 4.4 Data Collection Process

4.7.1 Pilot Study

A pilot study may be necessary in case study research where semi-structured qualitative interviews are used. Therefore, conducting a pilot study will better inform and prepare the researcher (especially a novice researcher) for the challenges they will likely face in the substantive study. They can gain more confidence in their data collection tool (Malmqvist et al., 2019). In the case of this study, the researcher was studying in England, and the research case study (NDR) is over 6,700km apart. The pilot study was essential in preparing the researcher to collect the data before travelling to the field. According to Malmqvist et al. (2019), a pilot study enables the researcher to identify weaknesses that may be addressed through the analysis of the procedures and, therefore, has the potential to improve the quality of the research as the results from the pilot study can feed into the research process. The pilot study was conducted via telephone interviews and included five participants residing in the NDR of Nigeria. The study contributed to the questionnaire design, and some issues were critical to the effectiveness of the semi-structured interviews. They are:

- **Timing of the interview session:** The interview was aimed to last an hour for each participant, but it was reduced to 30-45mins as during the pilot study, the interviews were achieved within 30-45mins.
- **Field challenges:** The pilot study informed the researcher on the interpretation, as not all of the community members could speak or understand the English language fluently. The researcher could speak and understand Ijaw (the mother tongue of the communities) and Pidgin English, which made the job easier.
- **Adequacy and clarity of the interview design:** The pilot study revealed that some of the interview questions (which involved gender) were not significant. It also informed some of the flood coping and adaptive strategies listed in the questionnaire, as the participants mentioned some coping and adaptive strategies that were peculiar to the Niger Delta communities. It also enabled the researcher to ascertain whether the questions were clearly stated and understandable to the participants.

4.7.2 Data Collection Activities

- **Study Site:** Seven communities in the Niger Delta Region of Nigeria (details of the communities are discussed in session 4.8)
- **Access and rapport:** The researcher searched for insiders to the communities who assisted in facilitating access to the research participants and helped enable the data collection. This was done after the pilot study, as two participants introduced the researcher to two residents of the communities. Both of them acted as gatekeepers and also assisted with interpretation when required. Also, one other participant from the pilot study acted as a gatekeeper.
- **Selection of Participants (purposive sampling):** The participants from the pilot study introduced the researcher to some community members residing in the Niger Delta

community that were willing to be involved with the research. Their mobile contact was passed on to the researcher with their permission. The researcher then called them to brief them on the purpose of the study and get their consent to proceed before travelling down to their communities to collect the data. The researcher chose the participants because they are members of a Niger Delta community and have resided there for over ten years.

- **Tools for collecting data:** an introductory letter, consent forms for individual interviews, focus groups, printed paper questionnaires, field notes, and an audio recorder.
- **Fieldwork:** The participants for the individual interviews were contacted before the researcher proceeded to the field, and they introduced the researcher to people willing to participate in the research. The focus group consisted of people who are neighbours living in the same area. The researcher contacted one of them before proceeding to the field. That participant agreed to recruit other people who were willing to join in with the criteria given to them by the researcher. However, before the interview commenced, the researcher explained to the participants the aim of the research, and they were provided with a consent form that stated their right to ask for clarification of any question or to withdraw from the research at any point in time (this was also audio recorded). Participants were assured that the study was an academic exercise whose outcomes were intended to benefit their community. Participants for the questionnaire were selected randomly, and they were not the same participants in the interviews and focus groups. Most of them were approached personally by the researcher regarding the cause of the data collection. The informed consent material is shown in the appendix (appendix 3 and 4)

Table 4.3 shows the communities visited, the number of interviews conducted, and the number of questionnaires administered. The researchers had access to the communities selected through the pilot study participants. The Director of the National Emergency Management Agency (NEMA) for the Niger Delta Region (this is the only government agency responsible for flooding in the region) was also interviewed.

Table 4.3 Summary of Data Collected.

Place of Data Collection	No of Interviews	No of Focus Groups	No of Questionnaires Administered
Odi	1	2 (8 participants)	7
Amassoma	4	2 (9 participants)	6
Sabageria	2	2 (8 participants)	24
Tombia	4	1 (5 participants)	8
Agudama	1		10
Oyobu	1		8
Agbura	1		2
Total	14	7 (30 participants)	65

(Source: Compiled by Researcher)

A total of 21 one-on-one interviews, five focus groups (4-5 people) were conducted, and 65 questionnaires were administered in 7 communities. These numbers were reached due to knowledge saturation during the interviews and pragmatic consideration while administering the questionnaires. The participants who filled out the questionnaires were different from the people involved in the focus groups and the one-on-one interviews.

- **Data Storage:** The interviews and focus groups were recorded in an audio format, and the respondents spoke in a mixture of Ijaw, pidgin, and English. After each day of

fieldwork, the audio recording was removed from the recorder and stored on the researcher's university drive. The researcher's laptop used during this process was passworded, and only the researcher had access to it. The participants were anonymous, so the researcher noted the time each interview started and coded (with the place where the interview was conducted), which corresponded with the timing from the audio recording. After all the fieldwork was concluded, the audio recordings were transcribed into written words and deleted. The researcher administered the questionnaire with the paper directly to the participants. At the end of the data collection process, the questionnaire data was inputted into SPSS software, and the papers were shredded and discarded.

4.8 Study Communities

The communities visited are similar in terms of the nature of their jobs and the indigenous languages they speak, which is the Ijaw language (Egere,2021). A typical community is made up of compounds, and most of these communities are in rural areas and dispersed settlements. A compound is a closely spaced set of houses or homes that can accommodate fifty to five hundred members of a single extended family (Akinyoade, 2017). Therefore, a compound is a collection of multiple groups of nuclear households or family members who live amidst their extended relatives. The community members who live in rural areas have low amenities due to a lack of essential utilities like power, clean water, transportation, and commercial and medical services (Akinyoade, 2017). This section will, however, emphasise some unique characteristics of each of the communities visited. The participants are assigned interviewee codes to enable the researcher to identify them anonymously. For participants from Agbura community, they are coded as (AGB), Agudama community (AGU), Amassoma community (AM), Odi community (OD), Tombia community (TM), Sabageria community (SB) and Oyobo community (OY). Table 4.4 shows the participants from the Individual interviews, their

demographics and the codes assigned to them. Table 4.5 also shows the participants from the focus group interviews, their demographics and the codes assigned to them.

4.8.1 Agbura

Agbura community is one of the communities visited, and just like the majority of the communities in the region, the primary occupation of the members of the Agbura community is fishing, farming, petty trading, boat riding and civil services (Ighariemu, Belonwu and Wegwu, 2018). Most of the houses in the community are clustered homesteads of mud houses that are well-supported with bamboo sticks. The Agbura community is known for its coastal and plain topography, with several ponds connected to the stream (Gbonhinbor and Abah, 2019).

4.8.2 Agudama

Agudama community, along with the other communities in the region, sees high rainfall from April through September. Moreover, agriculture and related subsistence farming are the primary sources of income for the community's residents. Most people in this community live primarily by fishing, farming plantains and bananas, and raising cattle, with many raising chickens (Elele, Amawulu and Eniyekedidei, 2021).

4.8.3 Amassoma

Due to the Niger Delta University (NDU) location in Amassoma, it is one of the region's most desirable and popular places to live. Compared to some of the other communities the researcher visited, this one is more comparable to a town than a village, and it is easy to get to both by land and sea (Olalekan et al., 2019). The neighbourhood is characterised by streets comprising compounds that lead from the major routes into the community. The community includes two major connection roads. Fishing and farming are the primary occupations of the residents of the Amassoma community, which are carried out on a subsistence and commercial scale, respectively. In addition to this, the existence of NDU in the town indicates that there are

prospects for professional-level employment in the community. The existence of the NDU may be responsible for the reputation of Amassoma as a commercial community (Alade et al., 2016; Onasoga et al., 2014)

4.8.4 Odi

Odi is a well-known community distinguished by flood plains and is located right next to a river that is both a tributary of the river Niger and the river Nun. The Nun traverses the community to Sabageria and other settlements farther downstream before the river finally discharges its water into the Atlantic Ocean (Akpofure and Eteh, 2022). The Odi community is known for its rigid political order and collection of twenty-seven separate compounds. The Odi community is administered by the Traditional Council, the Community Development Committee (CDC), the Youth Council, and the Women's Group. The community king, the Amananaowei, is the Traditional Council's leader. These four organisations are particularly efficient at ensuring the community is well-organised and its members coexist peacefully (Akpofure and Eteh, 2022; Akinyoade, 2017).

4.8.5 Tombia

The Tombia community is situated near the main road that leads to Amassoma. The Tombia community, just like most of the other communities in the Niger Delta, is subjected to heavy rainfall on an annual basis (Iyorakpo, 2015). Most of the community is covered in a freshwater swamp forest; however, some regions also have mangrove swamp forests and coastal barrier forests. The vegetation of the community can be described as wet and swampy. Fishing, farming, palm oil milling, lumbering, palm wine tapping, local gin making, trading, carving, and weaving are the primary occupations of the community's members (Ezonfade and Chima, 2018). White-collar jobs and opportunities are available in and around the community because of the well-known Bayelsa State School of Nursing, which is located in the community.

4.8.6 Sabageria

The presence of Lake Effi in the Sabageria community has contributed to its popularity. The lake is a significant natural resource, and it is there that the well-attended fishing competition for the community takes place. This competition is also known as the bountiful fish harvest. The lake is always clean and fresh, and it is believed to be self-purifying as it is a mystery how the leaves and debris from the forest fall into it, but it remains clean all the time. The lake is surrounded by a dense forest of approximately 2 square kilometres (Bekewuru and Agbai, 2021). The lake also provides the community with a plentiful supply of fish, most of which are harvested during the rainy and flood seasons. On the other hand, it is essential to point out that community members will also kill and consume crocodiles during the festival. This festival is held once a year in June, and community members who do not currently reside in the community travel to the festival's location to participate in the festivities. Various entertainment is available, including canoe rides, a boat race, cultural dances, and fishing competitions (Bekewuru and Agbai, 2021).

4.8.7 Oyobu

Oyobu is a small community in the Kolokuma/Opokuma Local Government Area of Bayelsa State, Nigeria. The setting of the Oyobu community and its activities, just like most of the other communities in the Niger Delta region, is affected by two distinct seasons: the dry season (which begins in November and continues through February) and the rainy season (which begins in March and continues through October) (which starts from March to October). The members of the community's primary economic activities are fishing, trading, and farming; in particular, the community is well-known for cultivating cassava, plantain, and vegetables (Ebiowei and Oluseye, 2013).

Table 4.4: Table showing the interview participants, their demographics and code assigned.

Participants	Demographic	Code Assigned
Participant 1	Odi	OD1
Participant 10	Amassoma	AM1
Participant 11	Amassoma	AM2
Participant 12	Amassoma	AM3
Participant 13	Amassoma	AM4
Participant 23	Sabageria	SB1
Participant 24	Sabageria	SB2
Participant 33	Tombia	TM1
Participant 34	Tombia	TM2
Participant 35	Tombia	TM3
Participant 36	Tombia	TM4
Participant 42	Agudama	AGU1
Participant 43	Oyobu	OY1
Participant 44	Agbura	AGB1

Table 4. 5: Table showing the focus group participants, their demographics and code assigned.

Participants	Demographic	Code Assigned
Participant 3	Odi	OD2

Participant 3	Odi	OD3
Participant 4	Odi	OD4
Participant 5	Odi	OD5
Participant 6	Odi	OD6
Participant 7	Odi	OD7
Participant 8	Odi	OD8
Participant 9	Odi	OD9
Participant 14	Amassoma	AM5
Participant 15	Amassoma	AM6
Participant 16	Amassoma	AM7
Participant 17	Amassoma	AM8
Participant 18	Amassoma	AM9
Participant 19	Amassoma	AM10
Participant 20	Amassoma	AM11
Participant 21	Amassoma	AM12
Participant 22	Amassoma	AM13
Participant 25	Sabageria	SB3
Participant 26	Sabageria	SB4
Participant 27	Sabageria	SB5
Participant 28	Sabageria	SB6

Participant 29	Sabageria	SB7
Participant 30	Sabageria	SB8
Participant 31	Sabageria	SB9
Participant 32	Sabageria	SB10
Participant 37	Tombia	TM5
Participant 38	Tombia	TM6
Participant 39	Tombia	TM7
Participant 40	Tombia	TM8
Participant 41	Tombia	TM9

4.9 Research Validity and Reliability

Validity and reliability are essential principles a researcher uses to ensure good quality research (Jordan, 2018). Validity in social sciences considers whether the chosen method of a research inquiry investigates what it is supposed to investigate, while reliability focuses on reproducing the data by the research instrument under a similar methodology (Bailey, 2015; Jordan, 2018; Golafshani, 2003). According to Golafshani (2003), validity focuses on research generalizability. Therefore, the quality of research can determine the generalizability of its result, increasing the research's validity. Reliability is a concept that is well-known for testing or evaluating quantitative research. However, it can be used in all kinds of research as it focuses on testing for quality.

4.9.1 Validity

This study, however, considers the following types of validity.

- **Descriptive validity:** The researcher made sure the research was valid by using the exact and accurate experiences of the interview participants, as the interviews were transcribed verbatim.
- **Interpretive validity:** The researcher ensured that the participants' meanings, interpretations, terms, intentions, situations, and flood experiences were interpreted correctly. As some of the respondents spoke Ijaw and pidgin English, the researcher clarified the meaning of some words with the participants to ensure that they were communicating and expressing themselves in the way they intended. The interviews were solely transcribed by the researcher, who speaks and understands the Ijaw language and pidgin English and could interpret the interviews correctly.
- **Conceptual validity:** The researcher considered the concepts backing this research and explained them in detail concerning the purpose of the study.
- **Bias Validity:** While conducting the individual interviews and focus group discussions, the researcher made sure the problem of bias (which can be a persistent problem when interviewing) was addressed by making sure the participants were at ease during the interview by using appropriate language, observing, actively listening, and questioning when needed (Bailey, 2015). The researcher spoke Ijaw and Pidgin English when necessary to participants, as some of them were more comfortable speaking those two languages. However, the researcher clarified the meaning of some words when needed. The researcher also closed the interview by checking if all the questions had been asked and further asked the participants if they had any questions or contributions to the research. Furthermore, this enabled the participants to add valuable points and ideas through their perspectives and understanding of the research.

The validity of the research findings was also increased through the framework validation process, which involved conducting a telephone interview with seven representatives from the

communities, who are part of the flood management process in the Niger Delta region, to check the relevance of the developed FRM framework for the NDR which is discussed in detail in framework chapter (chapter 6) of this thesis.

4.9.2 Reliability

One of the reasons for conducting the pilot study in the research was to increase the reliability and validity. It is important to note that five pilot interviews were conducted, and the purpose of the pilot study was not only to prepare the researcher on what to expect in the field but also to review the design of the data collection method. The five interviews were beneficial in testing and reviewing the interview questions to eliminate unnecessary questions. The data collected from the pilot study also fed into the questionnaire design (which was not piloted). However, this final interview and questionnaire schedule were influenced by relevant literature and findings from the pilot study.

4.9.3 Triangulation

Triangulation is defined by Turner, Cardinal, and Burton (2017) as the use of multiple research approaches to generate a better understanding of a given theory or phenomenon. It is an application of mixed method design to justify the credibility or increase the confidence of a finding using different research sources (Maruyama and Ryan, 2014). According to Guthrie (2010), triangulation is the process of using multiple data types to explore one problem and different data collection techniques to study an issue from different perspectives. This is what the study did by using questionnaires (quantitative data collection techniques), interviews and focus groups (both qualitative data collection techniques) to understand the various perspectives on the flood coping and adaptive strategies of the communities in the NDR of Nigeria.

4.10 Analytical Methods

The data analysis for this study was based on the responses obtained from the open-ended interview, focus group questions and structured questionnaires. The questionnaire analysis was conducted first because the research found the task easier. However, the results of the analysis were reported together.

4.10.1 Quantitative

The data generated from the questionnaire were coded and analysed using the Statistical Package for Social Sciences (IBM SPSS Statistics 26) software. The data analysis was conducted to determine descriptive explanations about the ND communities' existing flood coping and adaptive strategies and how often they employ them before, during, and after a flood disaster. The responses were given numerical code, and graphs (generated using the SPSS tool) were used to describe the data and show the frequency of occurrence of the existing flood coping and adaptive strategies of the communities.

4.10.2 Qualitative

The interviews and focus groups conducted with the participants were transcribed manually by the researcher from audio to written words. The transcripts were then examined for common themes (Creswell, 2015; Marshall and Rossman, 2016). Reading the transcripts while listening to the audio stream allowed for a better understanding of the content of the interview, as well as the nuances, perceptions, and emotions contained within the words of the participants. There are various ways to analyse data: content analysis, grounded theory, and discourse analysis, but this research adopted the thematic analysis. Thematic analysis is flexible and can be used for both objective and subjective research philosophy (Saunders, Lewis, and Thornhill, 2019)

4.10.3 Thematic Analysis

Thematic analysis is identifying, analysing and reporting patterns or themes within a data set to interpret various aspects of the research topic and meet the research aims and sub-aims (Braun and Clarke, 2006). According to Grbich (2012), it is one of the primary data analytic options for qualitative research. Since the reason for the use of interviews in this study is not based on generalisation or randomisation. Still, an in-depth investigation of the flood coping and adaptive strategies of the Niger Delta communities, a descriptive thematic analysis was adopted. According to Braun and Clarke (2006), the descriptive thematic analysis is instrumental when researching an under-studied area (which is regarded as one of the unique challenges of the Niger Delta communities). The coping and adaptive strategies of the NDR communities were identified from the data collected and categorised into themes/patterns for further analysis of how they contributed to improving community resilience. The thematic analysis was done by following the six phases of doing thematic analysis suggested by Braun and Clarke (2006).

- **Phase 1: familiarise yourself with the data.**

In this phase, the researcher made efforts to be involved with the interview-generated data. The researcher solely recorded, transcribed, and typed up the 21 interviews, which offered an opportunity to familiarize myself with the collected data. The researcher also read the transcripts repeatedly and, in so doing, made notes and marked up ideas for coding. According to Braun and Clarke (2006), this phase forms the bedrock for the rest of the analysis.

- **Phase 2: generating initial codes.**

In this phase, the researcher started to develop the codes for the analysis. The codes were data-driven since this study was not based on any theory. However, the codes were also created concerning the research concepts (discussed in Chapter 2), which enabled the researcher to be

familiar with the issues emerging from the data and identify the relevant features of the data set to the codes generated. The coding was also done manually by writing notes on the text during phase 1.

- **Phase 3: searching for themes.**

After the data was initially collated and coded, the researcher collated the codes into potential themes and ensured that all data relevant to a theme was collected. The researcher carefully considered what counted as a theme, and the chosen themes were closely related to the relevance of what was captured within the data and the research sub-aims. These themes were, however, consistently evident within the data set. The researcher also considered the relationship between the codes, the themes, and the different levels of the themes in this phase, which then led to the emergent candidate themes and sub-themes. The themes and sub-themes provided the researcher with an understanding of the significance of each theme and code. Any code that did not belong to the themes created was categorised into the miscellaneous theme as it could still be relevant to the study.

- **Phase 4: reviewing the themes.**

The devising of the candidate themes enabled the researcher to start subsequent readings of the transcripts to review and modify the candidate themes as necessary. It then became evident to the researcher that some candidate themes did not have enough data to support them as individual themes, so they were merged. During this phase, the researcher also checked for a coherent pattern amongst each candidate theme and reviewed them to decide if they needed reworking or if generating a new theme was necessary. When the researcher was satisfied that the candidate themes adequately captured the essence of the data, a refined candidate thematic map was created. The researcher then proceeded to the second level of this phase, which involved reviewing the entire data set to ascertain whether it adequately reflected the meanings

that emerged from the data. The researcher also read the data set again to determine the satisfaction of the themes and decide if any themes needed refinement or additional codes were required due to them needing to be included in earlier coding stages. The researcher had a relatively good idea of the themes and how they fit together at the end of this phase.

- **Phase 5: defining and naming the themes.**

At this phase, the researcher was satisfied with the thematic map. The researcher further refined and defined the specifics of each theme, reflecting the overall data that emerged from the analysis, which helped to generate clear definitions and names for each theme.

- **Phase 6: Write up the findings.**

The phase started with the researcher having a complete set of worked-out themes for final analysis and writing. The researcher told the story of the data findings by showing the relevance of the data to the research aim and sub-aims, which merited the validity of the analysis.

4.11 Framework Development & Validation

In developing the framework, the researcher reviewed some literature to understand the various frameworks discussed in the previous chapter (2.5). With the knowledge acquired, the framework suitable to meet the sub-aim (4) was established, which was justified. The framework was then developed using the results obtained from the research as a guide and a literature review on the characteristics of an operational framework. However, the researcher chose the operational framework because the study is aimed at providing recommendations that will assist the stakeholders responsible for flood risk management in the Niger Delta communities in making timely decisions as regards how to respond to both the regular and severe flood events they experience. The researcher developed several versions of the framework (appendix 5), which went through scrutiny and feedback from the supervision team before the final one was created (Figure 6.3). After the framework was developed, it underwent

validation. The framework validation interview questions were designed to find out how viable the implementation of the framework will be in the Niger Delta communities. Several versions of the questions were created before the final ones, which were put through the ethics committee of the University of the West of England (UWE) for consideration and approval. The participants were contacted after the researcher obtained approval for the validation process. Seven (7) respondents (part of the initial participants) comprised two community leaders, two compound leaders and three community members. Table 4.6 below shows the validation participants, their demographics and the code assigned. The participants were provided with a visual representation of the framework and a written explanation summarising the purpose of the framework and the decisions it is aiming to influence. This mode of representation was selected for easy understanding and comprehension as most of the stakeholders are not experts in the field of disaster management. Each participant provided their availability, and the telephone interviews were scheduled. The framework validation was done over the phone as a telephone interview, which lasted 15-20 minutes. Before the telephone interview, the framework document was sent to the participants via email to go through before the scheduled interview.

The following questions were asked during the telephone interview:

- What do you think of the framework?
- How do you think the framework can improve the flood resilience in the community?
- What is your opinion on the practicality of the framework?
- How can this framework be implemented?
- Do you have anything else to say?

The interviews were recorded and transcribed using a voice recorder. After the transcription, the voice records were deleted. In analysing the interviews, the researcher grouped similar ideas and responses from each participant using the thematic analysis process discussed in section

3.8.3 but not with NVivo. Chapter 6 (the framework chapter) discusses the respondents' feedback. All the information and consent forms sent to the participants before the validation interview are shown in Appendix 6 and Appendix 7.

Table 4. 6 Table showing the framework validation participants, their demographics and the code assigned

Participants	Demographic	Code Assigned
Participant 1	Odi	VOD1
Participant 2	Amassoma	VAM1
Participant 3	Odi	VOD2
Participant 4	Amassoma	VAM2
Participant 5	Sabageria	VSBI
Participant 6	Sabageria	VSBI
Participant 7	Odi	VOD2

4.12 Chapter Summary

This chapter justified the methodological approach employed in this study. It started discussing the ontological and epistemological stance of the research and justified the researcher's choice of philosophy based on the nature of the study. It further discussed the mixed method research design as appropriate for the research and highlighted the sampling and case study choice. The research used questionnaires and semi-structured interviews/ focus groups to collect data from the study site, which were analysed individually. The issues regarding validity and reliability were discussed. The chapter explained the data analysis choices for both the quantitative and qualitative data. The next chapter will present the data findings and quantitative and qualitative data analysis. The unique challenges, such as the Niger Delta communities facing insufficient

flood risk management and being under-studied even though they are endowed with natural resources. They suffer the worst flood in the country, influencing the methodological choice and design employed by the research as the exploratory nature of the study investigates the flood experiences of the communities to highlight the narrative of the flood situation in the Niger Delta communities.

Chapter 5 Results

5.0 Introduction

“This is our community, our home, and we cannot leave here. We can only prepare ourselves against floods and pray it is not as bad as before, and we will continue to extend our coping strategies. Flood is not manmade. It is a natural thing and does not stay forever. It is the terrain in which we find ourselves. Flooding is of God; You cannot contest with God”. (ODI Respondent)

The chapter presents the study's results and analysis of the empirical data collected from the individual interviews, focus group discussions and face-to-face questionnaire survey based on the participants' perceptions. The chapter discusses the key themes of the study obtained from the data collection, which are as follows;

- Regular flood events
- Severe flood events
- Coping Responses
- Adaptive Response
- Community communal activities
- Indigenous Knowledge

The theme of community communal activities and regular and severe flood events emerged from the data collected, as this was only considered after the fieldwork. The chapter also defines some key terms used to reflect the interpretation of the participant's perception in discussing the results analysis of the study. The chapter generated evidence used in developing the operational framework. Also, when reporting direct quotes from the participants, data from the participants are presented using interviewee codes. For participants from Agbura

community, they are coded as (AGB), Agudama community (AGU), Amassoma community (AM), Odi community (OD), Tombia community (TM), Sabageria community (SB) and Oyobu community (OY). Tables 4.4 and 4.5 in the methodology chapter show the participants' demographics and the participant number and codes assigned to them. Section 5.1 presents the demography of the participants. Section 5.2 presents the regular and severe flood experiences of the Niger Delta (ND). Section 5.3 presents the findings about the coping strategies that are being practised in response to flooding. Section 5.4 presents the findings on the communities' adaptive strategies geared towards flood hazards. Section 5.5 presents the communities' indigenous knowledge towards preparing and mitigating flood hazards. Section 5.6 discusses the communal activities the communities engage in to reduce flood losses. Section 5.7 presents the communities' perceived solutions to improve flood resilience. Section 5.8 presents the lessons learnt from past flood events. Section 5.9 presents the communities' narratives on flood hazards when residing permanently in a flood-prone region. Section 5.10 summarises the chapter in preparation for the framework development. Figure 5.1 of the diagram shows the framework used to structure the analysis of the data collected. The diagram also presents how the findings are reported in this chapter.

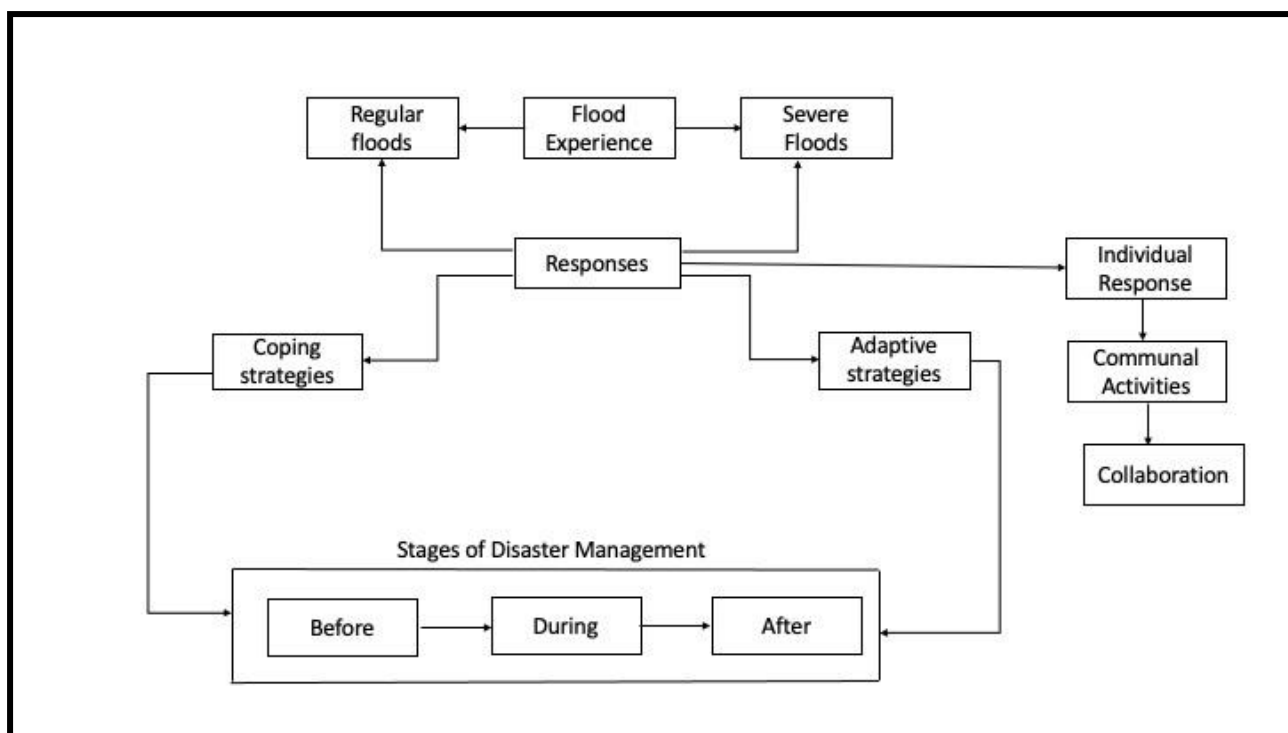


Figure 5.1 Framework for structuring the findings based on the themes that emerged from the data collection and terms used in the result analysis.

The table below (table 5.1) shows the key terms used in reporting the findings of the data collected and what they mean in this study.

Table 5.1: Define the terms used to structure the findings.

Key Terms	Meaning
Regular Floods	These are flood events that are expected to occur yearly during the flood season.
Severe Floods	These are flood events during the flood season which occurrences have an unexpected devastating effect on the communities.
Responses	For every flood event that occurs in the communities, there are some planned and unplanned responses. These responses are sometimes geared towards coping with a current flood event or adapting to a past flood event or an anticipated future flood event.
Coping Strategies	In this chapter, coping strategies refers to people’s immediate response to a flood event,

	aimed at primarily protecting their basic welfare and providing basic human security after the flood event has occurred (IPCC 2012).
Adaptive Strategies	These are strategic and focused responses to anticipated flood events aimed at proactively addressing it. The strategies are being practiced before or after the occurrence of a flood event in anticipation of a future flood event (IPCC 2012).
Stages of Disaster Management	Before: These are the practices of the communities before the flood events occur.
	During: These are the practices of the communities during the occurrence of the flood events.
	After: These are the practices of the communities after the flood events have occurred.
Communal Activities	This explains activities that the community engage in collectively with the aim of improving their flood resilience both individually and as a community. In this result chapter, communal activities also include other social activities that the communities engage in collectively that can suggest the viability of them successfully working together for a common cause.
Community	A group of people who share the same beliefs and physical environment.

The leadership structure of the Niger Delta Communities is shown in the diagram below (Figure 5.2), as it gives an understanding of some of the narratives of the participants. The knowledge and information used in creating the leadership structure of the Niger Delta

communities was gathered during the data collection process. The participants shed light on the leadership structure of their communities, how the leadership contributes to how the flood events are being responded to, and the impact of the leaders' decisions on their flood experiences.

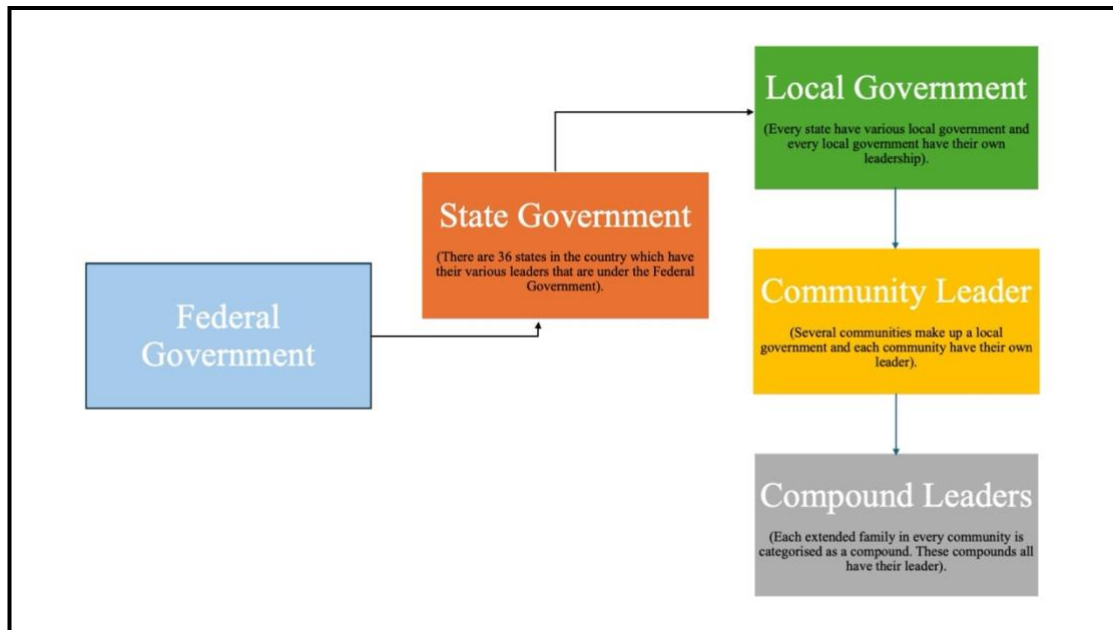


Figure 5.2 Leadership hierarchy of the Niger Delta Communities

(Source: Created by the Researcher)

5.1 Demographic characteristics of participants

There were 109 participants collectively for the focus groups (30 participants), individual interviews (14 participants) and questionnaires administered (65) (as shown in Table 5.2), all of which were different. They were selected because they are Indigenous people of the seven communities visited and have resided in the community for not less than six years. Forty-two participants mentioned that they were farmers who engaged in small-scale farming and fishing during individual and focus group interviews. The occupation of the respondents reflects the make-up of the communities visited, where the primary occupations of the residents are

farming and fishing. Also, 42 individual and focus group interview participants mentioned that they owned their own homes or were living with family members. Table 4.3 in the methodology chapter shows the community visited in order of the sequence of visits and the number of participants.

5.2 Experience of Flood Events

Although it is understood that the Niger Delta communities experience annual seasonal wet and dry seasons and frequent flood events, the interviews revealed distinct categorisations of these events in the shared experience of the local communities visited. Regular seasonal flooding is part of the everyday experience of the communities, whereas more severe floods leading to significant disruption are seen as outside everyday experiences. Participants described the two different categories of floods in other terms. The regular seasonal floods, which occur yearly, sometimes have severe flood experiences in living memory, as shown in Figure 5.3.

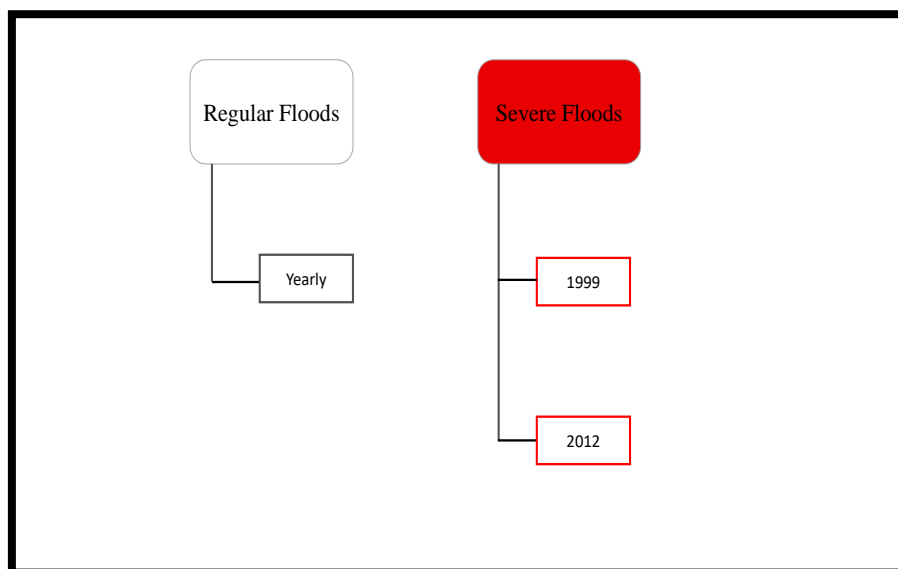


Figure 5.3 Frequency of community flood experience

(Source: Participants from interviews and focus groups on the field)

5.2.1 Regular Flood Experiences

Interviewees reported that regular flooding happens yearly and is usually caused by excessive rainfall. It occurs during the traditional flood months, from July to October. According to the respondents, they start to see signs of the flood in May and then by July, the flooding begins. Flooding peaks in September, and the water starts to recede by the end of October; everything will dry by November. Most respondents have lost count of how many regular flood events they have experienced as they have lived in the community all their lives. The regular flood event is perceived as expected, which suggests that people may have become used to it and not migrate temporarily because the floodwater does not get into their houses. In expressing the normality of the regular flood events, respondents made statements like

“We have lived with it for long, and it is normal. I have lost count of how many yearly floods I have experienced. We do not move, and it does not get into the house. We are used to it. The yearly flood is not usually that bad, so we can stay and be safe,” ODI Respondent

In describing the regular flood, respondent OD1 from the Odi community said, *“It sometimes brings us very good tidings.”* Respondent TM7 from the Tombia community said, *“(…) there is abundant of fish* and respondent TM2 from the Tombia community also said, *“We have a surplus of snails, and people are happy that season”*. They also mentioned that because of the surplus of fish, the fishermen make more income as they sell fish to people in the cities and a fishing festival is celebrated during that season. Most people negatively affected by the regular floods are farmers who farm in the lowlands (which are severely flood-prone).

5.2.2 Severe Flood Experiences

Interviewees reported no pattern to the frequency of severe floods, as these can occur when the flooding during the expected traditional flood months becomes excessive and unbearable. Most people narrated their experiences from the 2012 flood; a few referred to the 1999 severe flood events. Most respondents perceived that the flood that occurred in 2012 was the most severe in

their recent memory. Therefore, most of the findings regarding severe floods are about the respondents' experience over the 2012 flood event. The 2012 flood lasted for over eight weeks and was experienced as a series of consistent and heavy rainfalls in August, causing the rivers to overflow. Respondents AGB1, OD7, TM3, AGU1, TM5 respectively described the experience as “(...) *terrible, (...) terrifying, (...) inexplicable, (...) difficult and (...) uneasy*”. One respondent, SB2, in the Sabageria community, said, *"It was something I have never experienced in my life before"*. Respondents narrated how some houses in Agbura and Oyobu communities (especially the mud houses) collapsed with the flood, and properties were destroyed. Some people in Odi and Tombia communities lost all their crops as their farmlands were destroyed. Some people moved out of the community while some slept on the major road, which was not flooded (because it was high). The government provided some makeshift relief camps; although some respondents said it was sufficient, some said the conditions in the makeshift relief camps were very unhealthy. They had to move back to their flooded homes as it was a better option for them. Respondent OD2 from the Odi community, who complained negatively about the makeshift relief camp, said, *"Feeding was so poor, and people were overcrowded in a room"*. Most respondents said there was hunger everywhere; food was scarce and expensive. The drinking water was also contaminated. However, few respondents in the Odi community gave counter opinions, saying that food was not much of a problem and the government was supplying them with food, water, mosquito nets, drugs, and immunisation. Respondent AM 7 from Amassoma said, *"We get a lot of fish from the flood"*. While respondent TM9 from Tombia commented that “(...) *the flood became enjoyable because of the abundance of fish*”. However, similar to regular flooding, severe floods can bring fish to communities that are prepared to collect them. Respondents from the Sabageria community explained that they experienced severe flooding a few days after some other communities, like the Odi community, which allowed them time to prepare before the floodwater got to them.

There are some direct and indirect impacts of flooding, as some interviewees also reported snakes and reptiles everywhere; snakes attacked some people, and people were scared for their safety. Wild animals were out of the forest. Some people lost their lives due to drowning during the flooding. The mobile phone networks crashed, which made telecommunication difficult. There were no power sources, and people had to rely on alternative lighting sources, such as candles and kerosene lanterns. The transport system almost collapsed as the motorway that allows for an exit out of the ND region was broken and disconnected. People had to use canoes to start their journey and a car to complete it. As a result, movement was restricted, and transportation out of the community was expensive, indirectly impacting business, supplies and family life.

5.3 Coping Responses to Flood Events

The researcher went to the field without prior knowledge or consideration of the communities' (respondents') different flood experiences of severe and regular floods. This distinction was not made in the questionnaire survey design. However, most of the coping responses included were elaborated on in the individual interviews and focus group discussions, which gave more insight into whether they are practised before, during and after a severe or regular flood event. Therefore, this emerging theme was coded and presented in the qualitative findings throughout this results chapter.

5.3.1 Coping Responses to Flood Events obtained from the Questionnaires

The frequency of adoption of suggested structural coping strategies (figure 5.4) from the survey showed that about 92% of respondents are likely to construct footbridges, 93% of respondents are likely to use blocks, stones, and furniture to block water inlets, 95% of respondents are likely to use sandbags for barriers, 94% of respondents are likely to raise their kitchen platforms, 85% of respondents are likely to dig drainage around their houses, 99% of respondents are likely to raise their storeroom platforms, 97% of respondents are likely to

elevate their beds using bricks, and 74% of respondents are likely to tie their bed to wooden pillars during the flood.

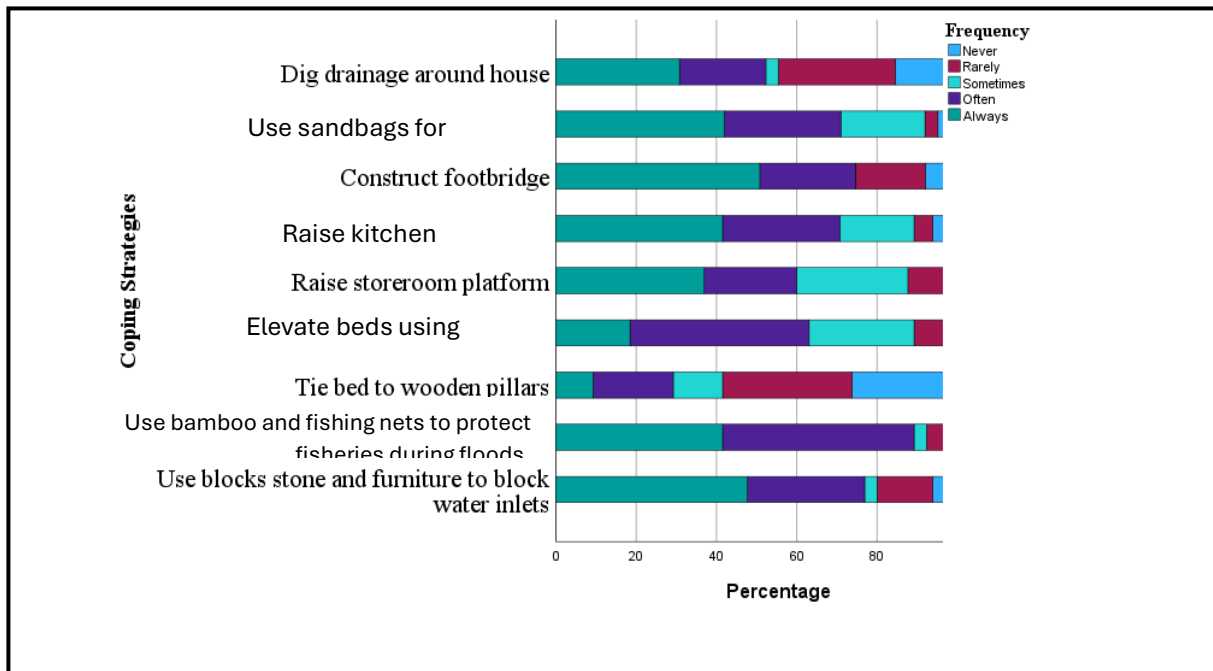


Figure 5.4: Reported frequency of adoption of suggested structural coping strategies.

The frequency of adoption of coping strategies affecting and maintaining livelihood in the communities (Figure 5.5) showed that 54% of respondents are likely to use bamboo to make rafts for movement, about 62% of respondents are likely to sell their livestock, about 50% of respondents are likely to sell their assets and about 63% of the respondents are likely to reduce the number of meals they eat per day as a means of coping with flood events. However, 94% of respondents are likely to move their assets to a safe place, 97% of respondents are likely to migrate temporarily, 59% of respondents may rely on inexpensive food, and 60% are likely to look for alternative sources of income.

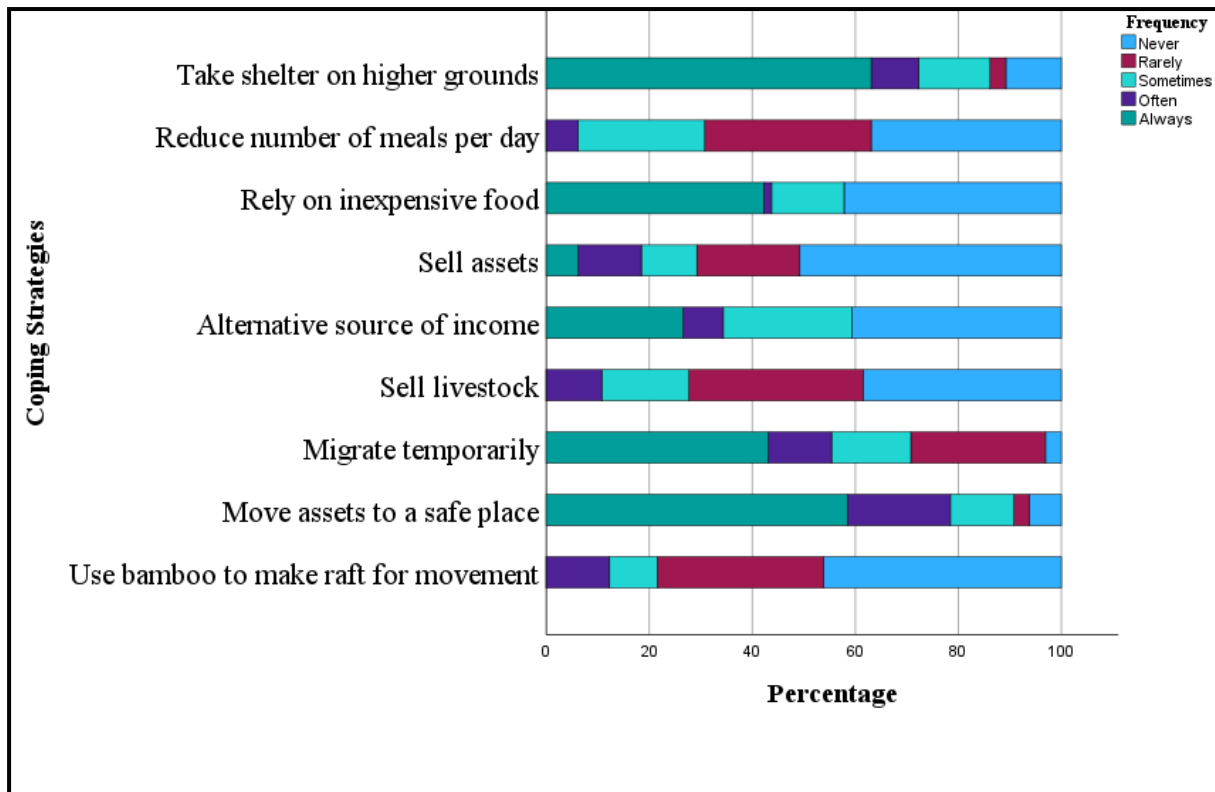


Figure 5.5 reported the frequency of adopting coping strategies that affect livelihood maintenance.

Regarding coping strategies from local knowledge (Figure 5.6), the Survey shows that about 42% of respondents are likely to use water purifying tablets, 48% of respondents are likely to use special plants to collect drinking water, and about 59% of respondents are likely to use potassium alum to purify water for drinking. However, 94% of respondents are likely to boil water for drinking as a way of purification, 86% of respondents are likely to preserve their food by drying, and 99% of respondents are likely to preserve their food in barns.

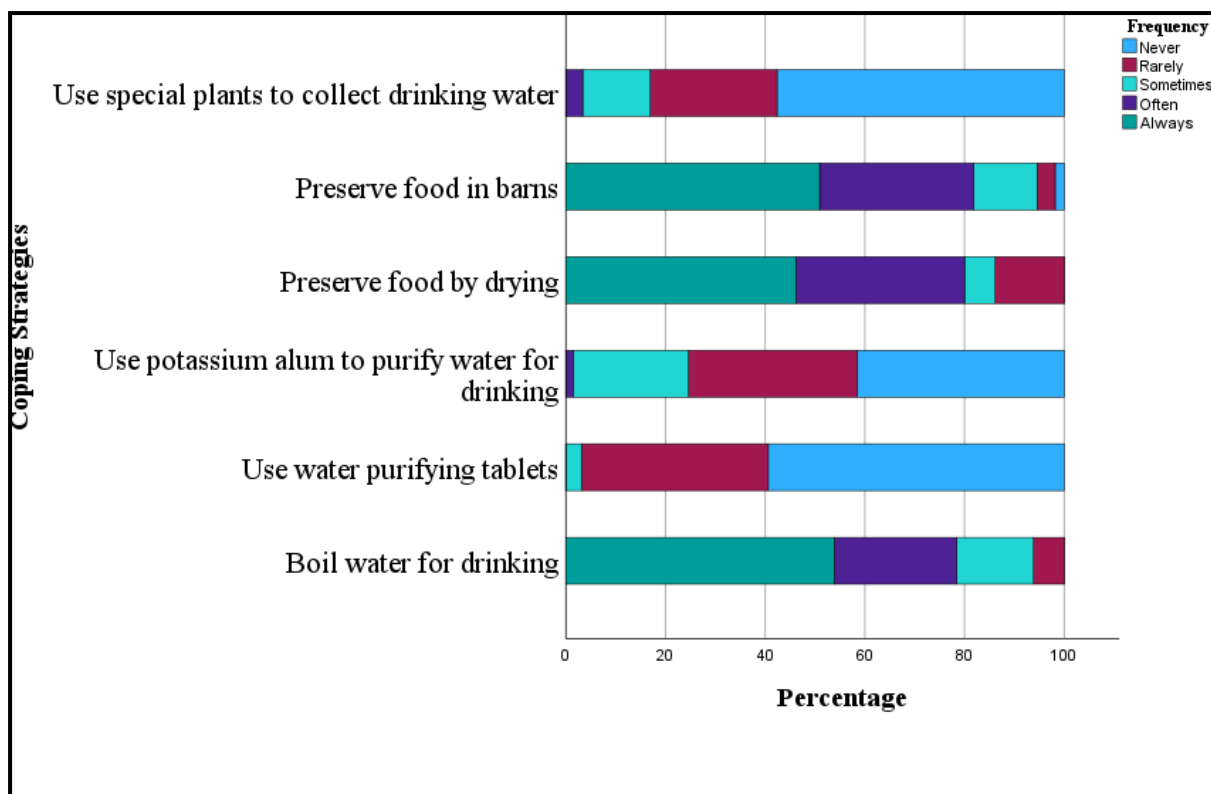


Figure 5.6 reported the frequency of adopting suggested coping strategies for food and drinking water supply.

Table 5.2 below summarises the coping strategies included in the questionnaire, the strategies that were mainly practised and those that were changed or locally adapted by the ND communities. The strategies that were being altered or locally adapted are discussed as follows;

- Tie bed to wooden pillars: The community members do not necessarily tie their beds to wooden pillars, but they secure the beds from high water currents using bricks and heavy furniture.
- Use of bamboo and fishing nets to protect fisheries during the flood: Fish ponds are protected during the flood but not with bamboo. The communities use a special wire to

Protect their fish pounds.

- Rely on inexpensive food: Some food becomes affordable and available in excess during the flood season, which is the food the communities rely on by default.
- Use bamboo to make rafts for movement: The communities move around with boats and canoes but not rafts made from bamboo.

However, the strategies coloured blue, and green were included in the final framework in the table below (5.2).

Table 5.2 Comparison of Niger Delta communities coping strategies with strategies suggested by the literature

Categories	Coping Strategies from Survey	Coping Strategies from Surveys mainly practiced in the communities	Coping Strategies from literature locally adapted in the communities
Structural Coping Strategies	Use blocks, stone, and furniture to block water inlets	Use blocks, stones, and furniture to block water inlets.	
	Use bamboo and fishing nets to protect fisheries during floods.		Use bamboo and fishing nets to protect fisheries during flood
	Tie bed to wooden pillars		Tie the bed to wooden pillars.
	Elevate the bed using bricks.	Elevate bed using bricks.	
	Raise storeroom platform	Raise storeroom platform	

	Raise kitchen platform	Raise kitchen platform	
	Construct footbridge	Construct footbridge	
	Use sandbags as barriers.	Use sandbags as barriers.	
	Dig drainage around the house	Dig drainage around the house.	
	Use bamboo to make a raft for movement.		Use bamboo to make a raft for movement
Behavioural Coping Strategies	Migrate temporarily	Migrate temporarily	
	Sell livestock		
	Alternative source of income	Alternative source of income	
	Sell assets		
	Take shelter on higher grounds.	Take shelter on higher grounds.	
	Move assets to a safe place.	Move assets to a safe place.	
Coping Strategies Impacting Food and Water Consideration	Rely on inexpensive food.		Rely on inexpensive food.
	Reduce the number of meals	Reduce the number of meals	
	Boil water for drinking.	Boil water for drinking.	

	Use water-purifying tablets.		
	Preserve food by drying.	Preserve food by drying.	
	Use potassium alum to purify water for drinking	Use potassium alum to purify water for drinking.	
	Preserve the food in barns.	Preserve food in barns.	
	Use special plants to collect drinking water		

5.3.2 Coping strategies in response to regular flooding were obtained from the individual and focus group interviews

Implementing coping strategies for flooding can occur before, during, and after flood events. The interpretation of the interview data regarding the communities' coping responses to regular flood events reflects that their coping response occurs before and after a flood event rather than during the flood event. The diagram below (Figure 5.7) shows the coping response of the communities to regular flood events in the sequence of the stages of disaster management obtained from the individual and focus group interviews. Figure 5.7 does not include any strategy for during the flood events as the results reflect that coping strategies are not employed during the regular flood events.

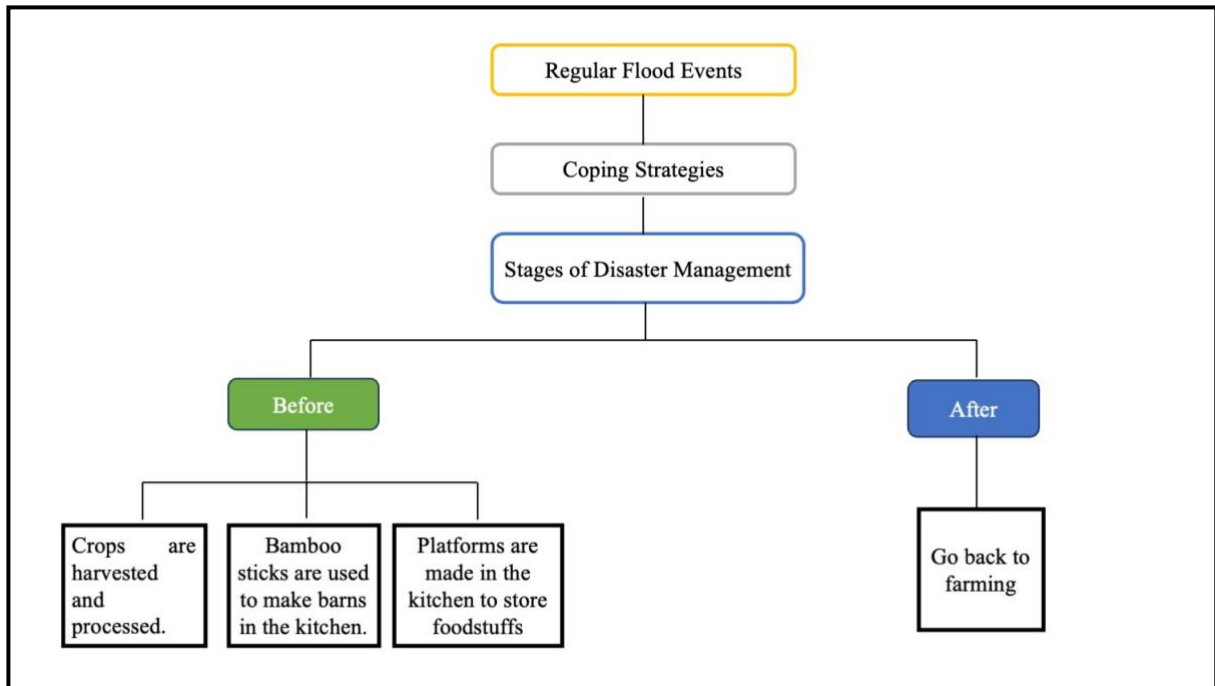


Figure 5.7: Coping Response to Regular Flood Events

As a way of coping after the regular flood, people return to farming immediately in preparation for harvesting before the next flood season, which is critical for maintaining livelihoods.

5.3.3 Coping strategies in response to severe flood events were obtained from the individual and focus group interviews

Therefore, the communities engage in additional coping responses during and after a severe flood. Below is a diagram (Figure 5.8) that shows the communities' coping responses to severe flood events. Figure 5.8 does not include any strategy before the flood events, as the results reflect that coping strategies are only employed after severe flood events.

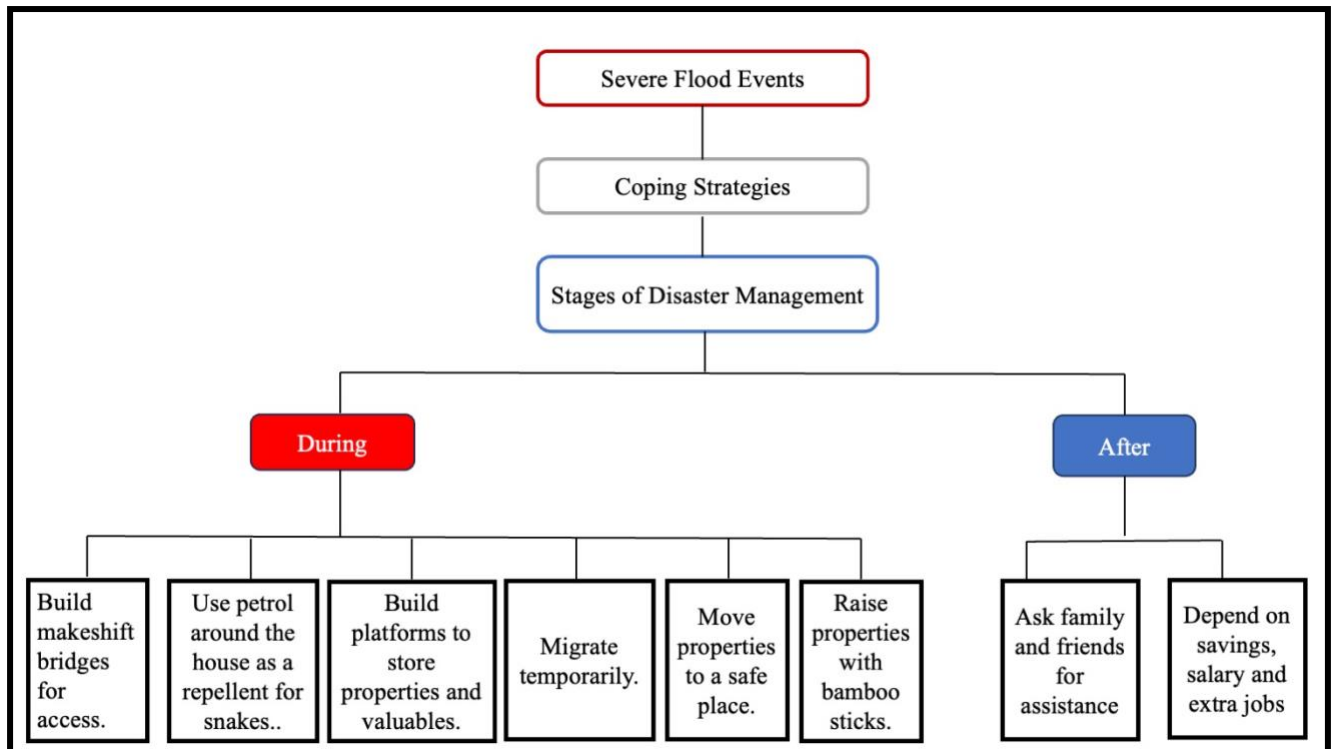


Figure 5.8: Coping Response to Severe Flood Events

The respondents mentioned that during severe flood events, they built makeshift bridges (with wood and bamboo) for access, and it is also evident in the Survey, as Figure 5.4 shows that about 92% of the respondents are likely to construct footbridges in response to a flood event. As mentioned earlier, the respondents experienced confrontation with dangerous snakes and reptiles during the severe flood events. In response, they used petrol around their house to chase snakes and reptiles away as the smell of the petrol repels the reptiles. People also built platforms to store their properties and valuables away from the flood. Also, to protect their personal belongings and properties, people move them to a safe place. Most persons migrate temporarily during the severe flood event. As respondent AM 9 from the Amassoma community said, "***We moved out of the community (...) it became unbearable (...) we could not stay here***". Coping responses after severe flood events are focused primarily on immediate disaster relief, such as cleaning and repairing damaged houses. Also, people whose livelihood relies on farming and fishing, who are more affected, rely on friends and relatives for financial assistance. The few people who work for the government rely on their monthly salary and are more economically

resilient. Some respondents mentioned that they go on to look for jobs after the severe flood events, while some rely on their savings.

5.4 Adaptive strategies in response to flooding

The communities practise adaptive strategies for regular flood events because they are predictable, and the community members know what to expect during the flood season. The respondents, however, mentioned their adaptive strategies during the individual and focus group interviews. As mentioned, the researcher needed to categorise the questionnaire design to reflect adaptive strategies for regular or severe flood events.

5.4.1 Adaptive strategies in response to flooding obtained from the Questionnaires

Evidence from the questionnaire survey in Figure 5.9 shows that about 65% of participants are likely to plant catkin reeds to control floods, about 62% of respondents are likely to plant water hyacinths as barriers and about 70% of respondents are likely to plant coach grass to guard against erosion. Also, about 70% of respondents are likely to plant plantain around their houses as an adaptive strategy to control erosion, which they have acquired as local knowledge. Also, about 95% of respondents will likely follow their community's traditional crop planting calendar.

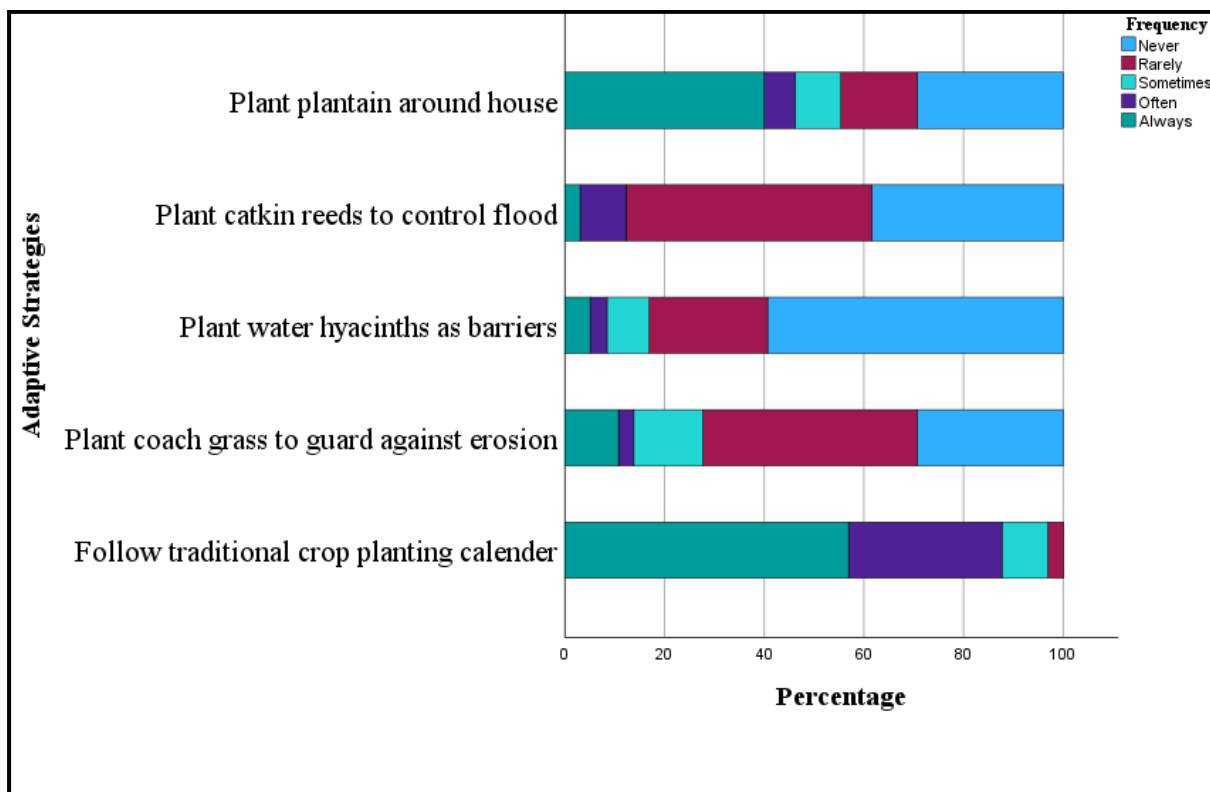


Figure 5.9 Reported frequency of the adoption of structural adaptive strategies.

Regarding structural adaptive strategies shown in Figure 5.9, the survey result shows that about 30% of respondents are likely to construct floating houses, 72% of respondents are likely to build water pipes above their lintel level to drain water, and 32% of participants are likely to use separable materials for building. Also, about 95% of respondents are likely to build high tables in preparation for flood events, 92% are likely to raise their homes before a flood event, and 65% are likely to build protective walls.

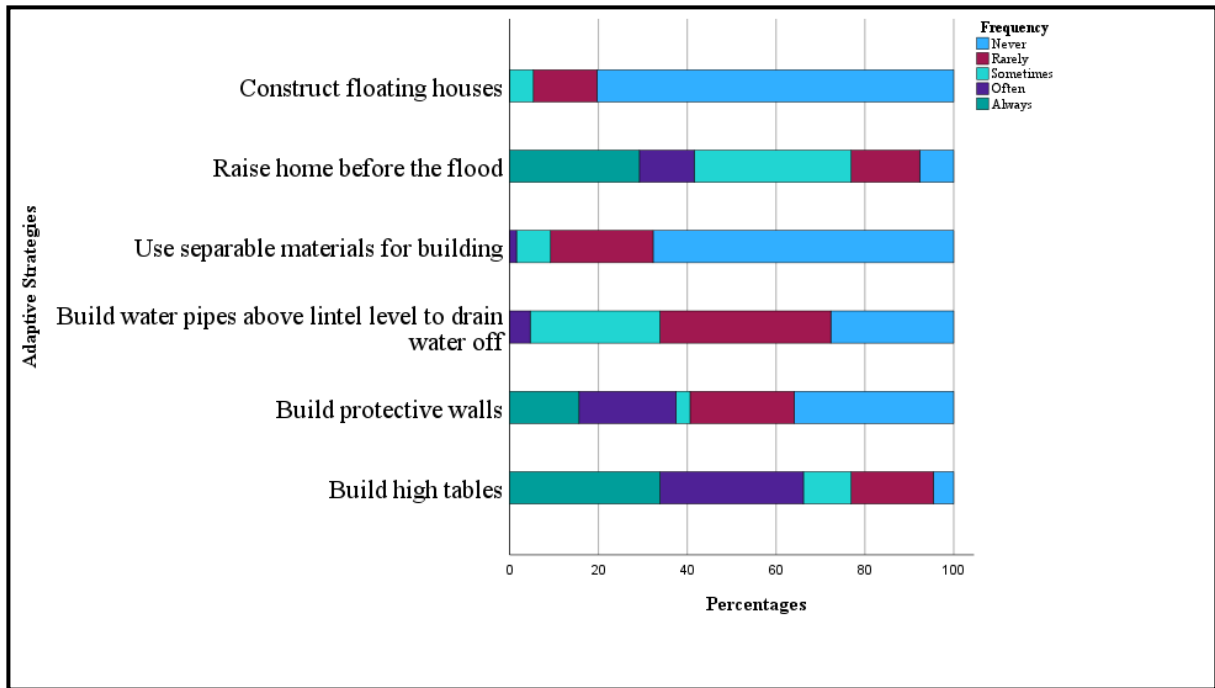


Figure 5. 10 Reported frequency of the adoption of suggested land use adaptive strategies.

5.5.2 Additional Adaptive strategies in response to flooding emerging from the individual and focus group interviews

From the individual and focus group interviews, the respondents' adaptive responses were primarily focused on flooding, which affected their buildings, fishponds, and farmlands. Figures 5.11 and 5.12, however, show the communities' adaptive strategies regarding their building considerations and agricultural practices, respectively, in response to flood events.

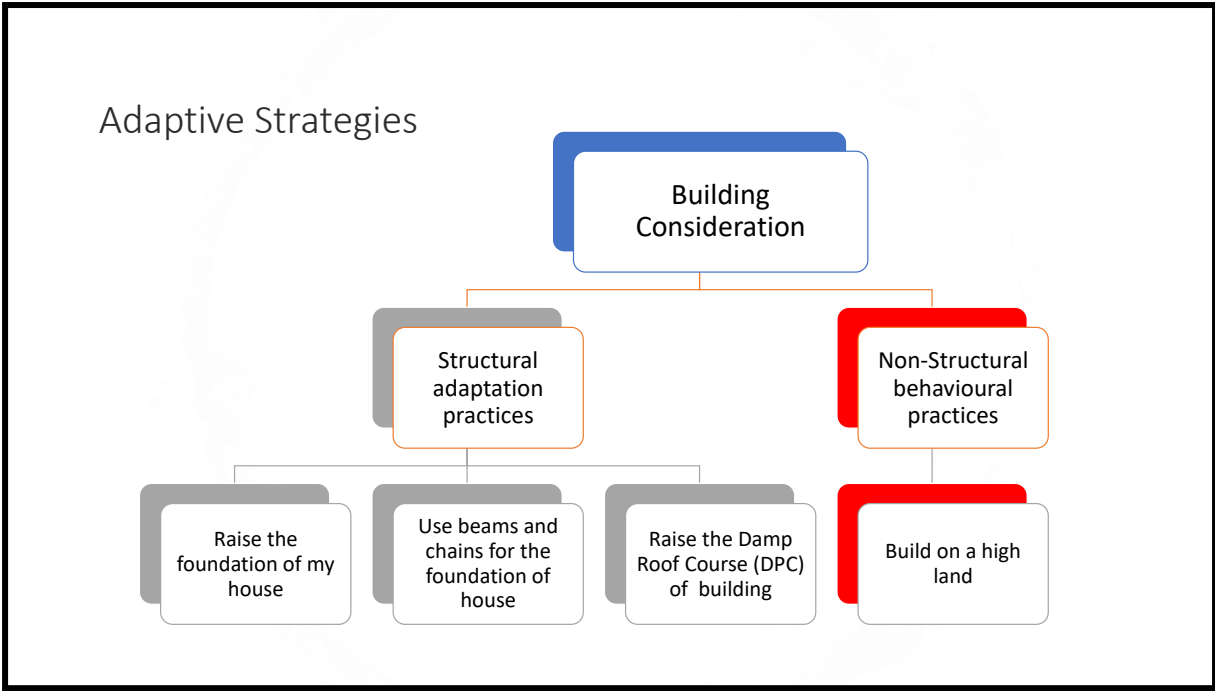


Figure 5.11: Adaptive Strategies Toward Building

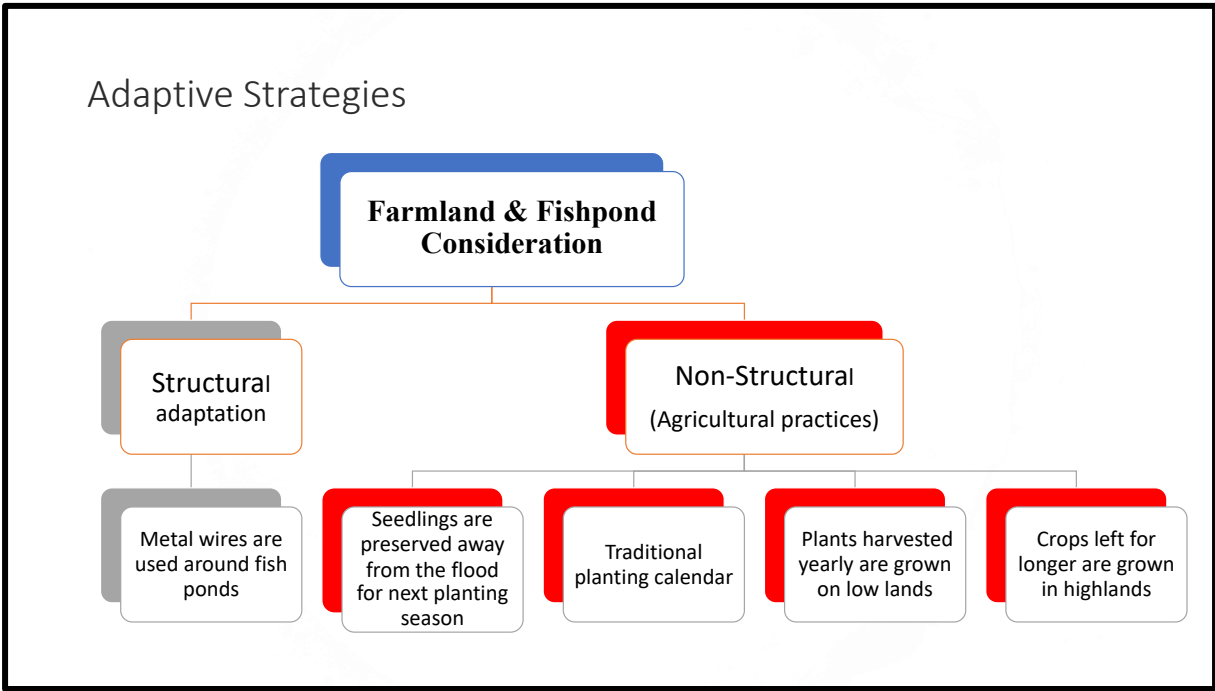


Figure 5.12: Adaptive strategies towards agricultural practices

The adaptive strategies can be categorised into structural adaptive practices and non-structural behavioural strategies. The communities engage in structural adaptation practices and non-structural behavioural practices in response to the flood events regarding their buildings. Their structural adaptation practices include raising the foundation of their buildings by making the

Damp Proof Course (DPC) high and then using beams and chains to protect the building from collapsing due to heavy water currents during flooding. They build on higher land levels in the community for their structural adaptive practices. The adaptive strategy is evident as respondent SB10 from the Sabageria community said, *"Where my house is situated, the topography is high to an extent (...) I considered the flood season when building and the DPC of my house were elevated to an extent."* Since the communities are flood-prone, people tend to locate the areas with higher landscape topography and build in such places, just as respondent SB10 indicates. Most of the respondents also mentioned that during severe floods, the majority of the houses built on higher-level lands do not get flooded, which means that over time, members of the communities have migrated to the areas that do not get severely affected by the regular flood events, which has contributed to their individual and collective resilience as a community to the regular flood events. As regards their farmlands, the community members preserve seedlings (using a local method) away from the flood towards the next planting season. They also follow a traditional planting calendar, such that crops (like cassava) are harvested yearly and grown on lowlands.

In contrast, crops left longer than one year are grown on highlands so that they are not affected by the regular flood events. The respondents said they have a planting calendar that considers the flood season. November to March is planting time, and June to August is harvesting time in the calendar. Metal wires are used around fishponds so that when a flood event occurs, water flows in and out of the fishpond, while the metal wires serve as a barrier stopping the fish from flowing out of the pond. The protection of fish ponds using metal wire is evident as respondent OD1 at Odi community said, *"I have wires around my fishpond in case of the flood"*. Table 5.3 below summarises the adaptive strategies in the questionnaire, including the mainly practised strategy and those that were changed or locally adapted by the ND communities. The only strategy which is being altered or locally adapted is the building of protective walls. The

ND communities do not build protective walls around the community but build barriers around the riverbanks.

Table 5.3: Comparison of Niger Delta adaptive strategies with strategies suggested from literature.

CATEGORY	Adaptive Strategies from Survey	Adaptive Strategies from Surveys mainly practiced in the communities	Adaptive Strategies from the Survey that were changed or locally adapted
Building Adaptations	Build high tables	Build high tables	
	Build protective walls		Build protective walls
	Build water pipes above lintel level to drain water off	Build water pipes above lintel level to drain water off	
	Use separable materials for building		
	Raise home before the flood	Raise home before the flood.	
	Construct floating houses		
Agricultural Adaptation	Follow traditional crop calendar planting	Follow traditional crop calendar planting.	
Land Use Adaptations	Plant coach grass to guard against erosion	Plant coach grass to guard against erosion	
	Plant water hyacinths as barriers	Plant water hyacinths as barriers	
	Plant catkin reeds to control flood.	Plant catkin reeds to control flood.	
	Plant plantain around the house	Plant plantain around the house	

5.6 Indigenous Knowledge

The structural adaptive building practices are born from the communities' intra-generational and inter-generational indigenous knowledge. The importance of the existing indigenous knowledge, experiential and social learning and their inclusion in the framework is discussed

in Chapter 6 (session 6.4.2). As mentioned earlier, the use of beams and chains in the foundation of buildings (as shown in Figure 5.13) is peculiar to how houses are built in the Niger Delta Region. The communities' Indigenous Knowledge can be categorised as experiential learning. When asked how this building technique was learnt, respondent TM7 from the Tombia community said, "*We use our logic and experience over time. This community is a swampy area*". This knowledge is passed on informally through social learning as distinct from experiential learning, as respondents mentioned that advice is given randomly by other community members on how to build, which was confirmed by respondent OD1 at Odi community, who said, "*It is common reasoning, and there is no formal place where this is being taught. People just copy from each other. People pick an experience from one another and apply it*". Respondent TM 7 from the Tombia community also said, "(...) *Within the community, we communicate between ourselves and share the techniques we use for anyone to emulate if they wish*".

Figure 5.13: Example of beams and chains used for the foundation of buildings.



Source: Picture taken by the researcher in the field.

In using their indigenous knowledge for agricultural practices, the respondents state that yams are preserved with an open barn method where they are tied vertically, and even when it rains on them, they do not go wrong. There is also evidence of experiential learning as the respondents mentioned that over time, they have learnt to preserve their yams through the open barn vertical method, as they were previously being preserved horizontally and were affected by the flood events. However, they have adapted through learning that such actions could lead to increased resilience. The communities also preserve one of their food staples known as fufu (a cassava product) inside water, which can stay in this form for more than a year. The fufu is made from fermented cassava, packed within a non-porous sack, and stored inside a drum of water for preservation. Garri, another food staple (produced from cassava), is made by processing the cassava and frying it to produce garri. The garri is then stored in an airtight sack and placed on a platform where water cannot reach it. Respondent OD1 mentioned that.

.... **"What used to happen is that the cassava is harvested, fermented, and then smoked in the kitchen..... But that was then, and you cannot find that method now because people do not do it again. This changed because people began to see the stress of this method, so they innovated another easy means that still preserved the cassava".**

The community members also have nature-based indigenous knowledge about recurrent areas that flood and processes of inundation, which has improved their resilience by learning through experiences. Respondent SB 10 from the Sabageria community mentioned that.

“Some locals know what it takes to study the flood to an extent. (...) They may not be very vast in terms of studying the flood, but for the fact that they have been here, they know when the flood starts rising and the month, especially in September, where it will get to and then early November or the second week of November how it begins to recede.

Respondent TM9 from the Tombia community also said, *“I can show you all the areas we use to predict that the river is about to overflow”*. Some other respondents also expressed that people recognise flood-prone places when not flooded. This is mainly because they go around during the flood season to observe flooded areas (a practice done for years), which is a cognitive mapping of flood risk. Also, certain trees and grasses like the Dot leaf Waterlily (*Nymphaea ampla*) (figure 5.14) would usually grow in flood-prone areas and nowhere else. This species indicates the likelihood of flood severity in a particular location. The flood-prone area is unknown to strangers or residents who may be new to the communities. Respondent SB10 from the Sabageria community further said that,

“Where the flood does not normally get to, the grasses that grow there are different. The elephant grass grows where the flood goes, and there is a particular grass that does not grow in places submerged yearly. We, as indigenes, know the grasses, but there is a tree that we use as a guide that, when the flood comes, this particular land will not be submerged. When you plant in those places, you know your plants can stay for years, and you can harvest at your own time”.

Figure 5.14: Picture of Dot Leaf Waterlily identified in the community as indicative of land vulnerable to floods.



Source: The picture was taken from Creative Commons and confirmed by a respondent as the plant.

Figure 5.15 below summarises the indigenous knowledge that exists in the Niger Delta communities.

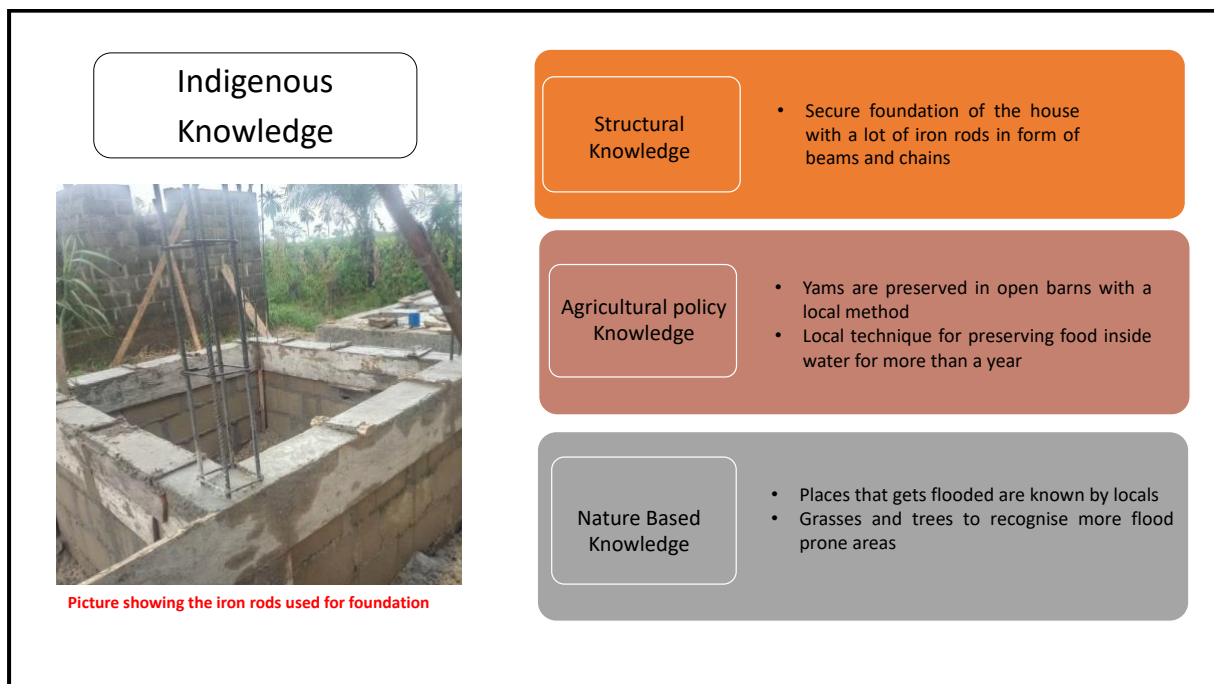


Figure 5.15: Summary of the Indigenous Knowledge existing in the Niger Delta communities

5.7 Communal Activities

The results showed that most of the participants in Agbura, Amassoma, Odi, Oyobo, and Sabageria communities mentioned that they do not collaborate or engage in communal

activities in response to the flood events they experience. Respondent AM9 from the Amassoma community said, *“Everyone fend for themselves”*. How people prepare for the flood is solely their responsibility, and it is expected that they should be aware of the necessity of preparing for the flood season without being instructed by the local and national authorities. This, therefore, implies that most of the participants' activities, responses and actions are practised individually. However, the Tombia community was an exception as most of the participants in the community responded that they collaborate and engage in communal activities like collectively cleaning their drainage channels regularly in response to the flood events they experience. Respondent TM7 from the Tombia community said *“(...) If the flood situation is very destructive, then we collaborate to help each other”*. This means they do not particularly collaborate to prepare for the regular flood but collaborate to respond during severe flood events. Communities that do not necessarily engage in communal activities collaborate during severe flood events. As respondent SB10 from the Sabageria community said,

“The community comes together to help alleviate the pain that comes with the flood when it is too much. I think we have done that often, but one major thing we should keep at the back of our mind is that if it is a normal flood, there is nothing much the community can do together”.

Some of the respondents in Sabageria communities believed communal activities are viable in the community and valuable both during regular and severe flood events, and respondent SB5 from the Sabageria community said, *“United we stand. I think if people can also come together, share their views and ideas, it will always be better”*. Some participants in Odi and Sabageria communities also perceived communal effort as more effective than individual effort. On the contrary, some participants said that it is difficult to do things communally and that communal effort is unachievable because of the leadership of their community. During one of the focus group discussions in the Odi community, respondent OD 5 said, *“(...)*

civilisation has brought into the community many problems as regards to doing things communally”, which was a reaction to respondent OD4, who said the Odi community was not as collaborative compared to the past and that it is possible to go back to how things used to be. There was a counterargument by other respondents who claimed that civilisation was not a threat to communal effort and that people had just lost the culture of doing things communally. Respondents OD7 and SB10 even referred to a case in memory when collaboration was beneficial, and the Odi and Sabageria communities achieved a construction task that could not have been achieved individually. Respondent SB10, in narrating the case in memory, said,

"We organised ourselves as youths of the community and locally tarred and made this road with our local technology. We also have a name for it. We dug from the ground and increased the mud until it reached the water level; we went to the river to fetch very sharp sand and spray on it to remove the muddy surface. We did this together".

The Tombia community has more cohesion. Respondent TM8 from the Tombia community said, “(...) we tend to leave together and assist each other with food when necessary. We do not have much misunderstanding in this community.”

During the interview of this study, an OD5 respondent in the Odi community mentioned that he and some groups of people lived in a multi-storey building with their immediate family members. During the severe flood in 2012, there was cohesion as the men collectively searched for food for their household. Another respondent, SB3, in the Sabageria community, mentioned how he and some other community members were collectively collaborating (by hunting for food and helping each other build makeshift bridges into the entrance of their houses) to respond to the severe flood in 2012. Therefore, some collaborative work exists in communities with stronger community cohesion to help cope with severe flood events. Figure 5.16 shows a summary of the findings concerning communal activities in the Niger Delta communities.

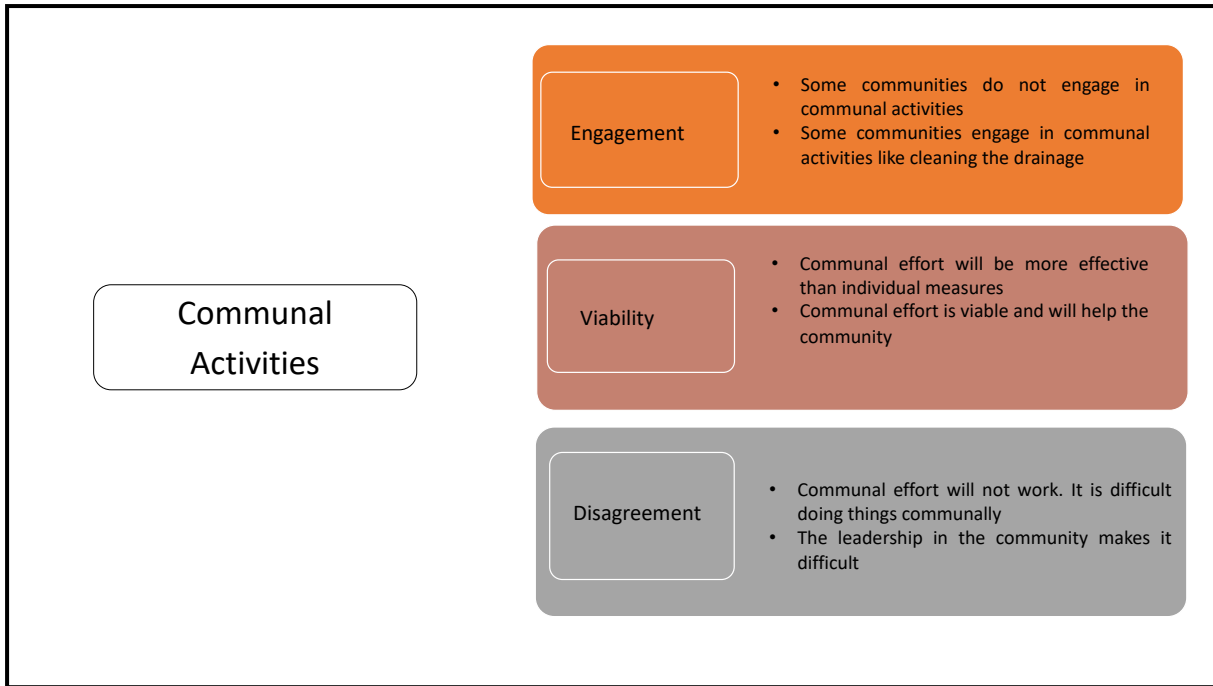


Figure 5.16: Summary of findings concerning communal activities in the ND communities.

5.8 Lessons learnt from past flood experiences

Over time, all the communities have increased their resilience to regular flood events, which can be attributed to the lessons they have learned from their past experiences.

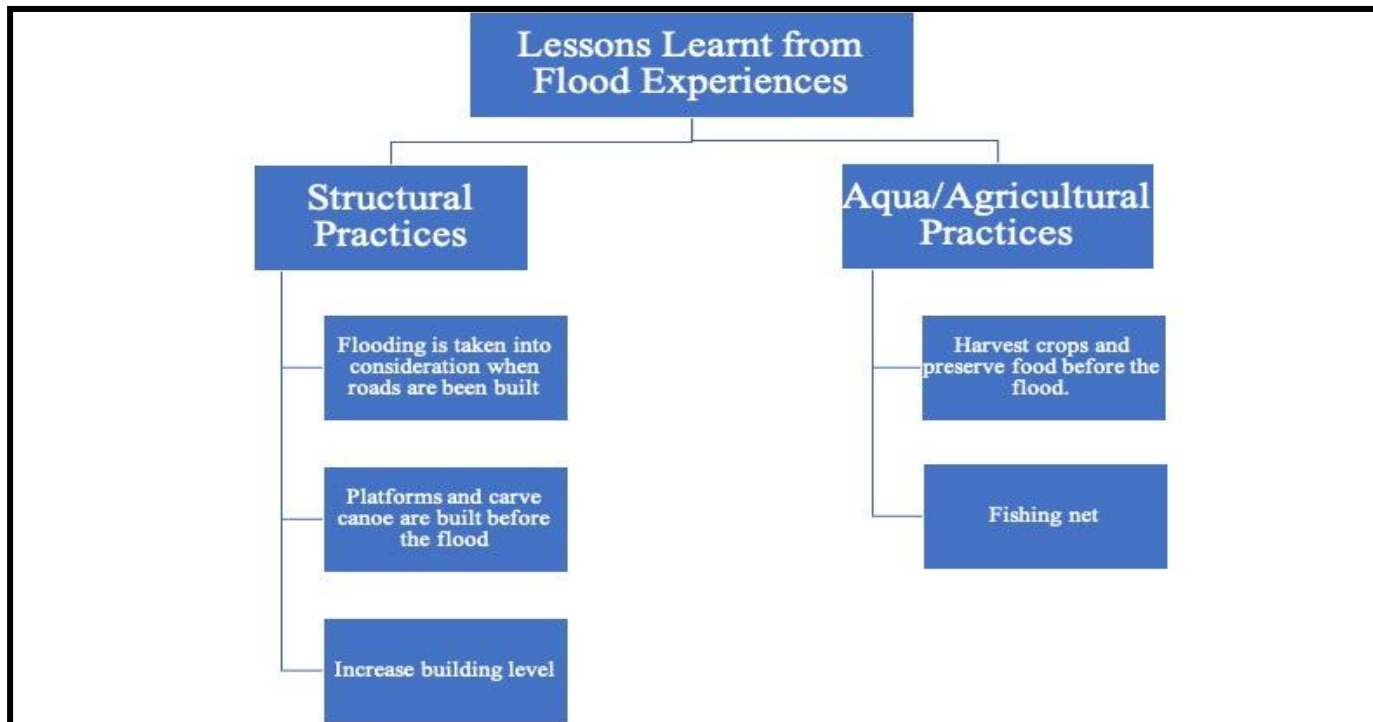


Figure 5.17: Lesson Learnt from Flood Experiences

Regarding the structural lessons they learned, flooding is considered when roads are built; sometimes, they carve canoes and make platforms before the flood. Lastly, most of the community members who can afford it engage in adaptation by increasing the levels of their buildings, and this helps because, most times, during regular flooding, even if their surroundings get flooded, their houses do not get flooded.

Regarding their aqua and agricultural practices, the communities have learnt to harvest and preserve their crops over time before the regular flood. They have also evolved in the way they preserve their food. Regarding how to process their fufu and garri, one respondent in the Odi community expatiated on how that has evolved and why. Respondent OD9 said,

“People saw their mother's dry cassava, but, in their time, they felt let us try it another way and see if it works. It is a trial because they did not research like you are doing. After they tried it, it worked. They also tried it with the water process. They bag it, throw it into the water, and keep it. It can be soaked in water throughout the year. It remains fresh, and no maggot can penetrate because it is submerged. Along the line, issues of theft within communities became prevalent, so people now started preserving their cassava in drums that they can keep very close to them and protect it”.

Another preparedness action for routine flooding is having fishing nets ready, as the flood season is considered the fishing season.

5.9 Suggested Solutions to Improve Community Resilience

Respondents suggested solutions that can improve the collective resilience of communities to both regular and severe flood events.

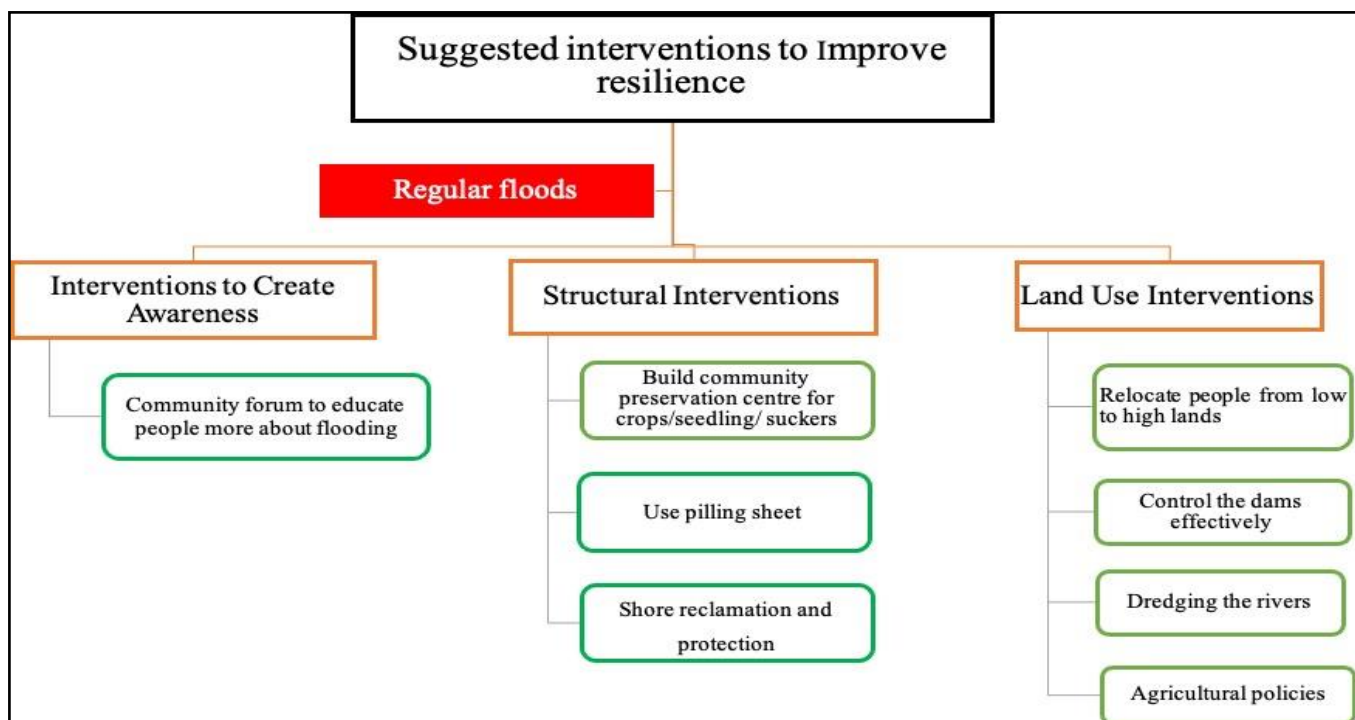


Figure 5.18: Adaptive suggestions from respondents on how to improve resilience to regular flood events.

Some respondents had some behavioural suggestions as they believed creating awareness by educating people more about flooding through a community forum is needed to improve resilience. This approach has proven successful in NDR with some disease awareness, such as Cholera and Typhoid. Respondents also mentioned that it would be helpful for the government to bear the cost of permanently relocating people living on the low land to the high land, which means moving people to the less flood-prone area of the communities, which can improve community resilience. There were also some structural suggestions, such as building a community preservation centre for crops, seedlings and suckers for planting, which will be driven, managed, and maintained by the community members. Respondents suggested that piling sheets (metal sheets used as barricades around the river, as seen in Figure 5.19) should be frequently used to limit the overflow level during the rainy season, which would result in mitigating or preventing flood events. Although piling sheets have been used to control the flood, they have yet to be maintained or upgraded, as the respondents perceive this to be the

government's responsibility. The respondents also suggested that it would be helpful if the government could provide barricades at the waterfront, protection and reclamation of the river shores, dredge the river more often and control the dams overflowing into the rivers within the more expansive Niger Delta.



Figure 5.19 Example of Piling Sheet used at the riverbank and canoes used for moving during the flood season at Tombia Community.

Source: Picture taken by the researcher in the field.

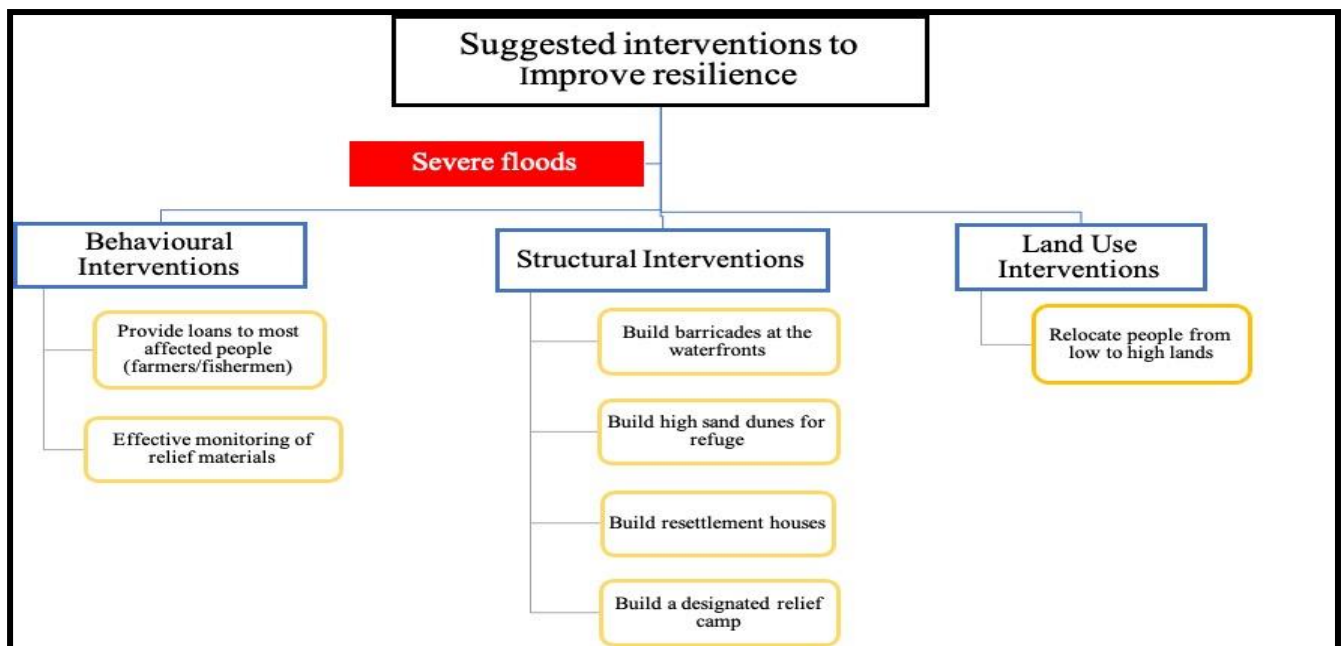


Figure 5.20: Respondents suggest how to improve resilience to severe flood events.

The respondents' suggestions were based on structural practices and longer-term solutions that will improve their livelihoods, which are intensely focused on government actions. For the structural practices, respondents suggested that having a designated relief camp for times when the flood may be severe is necessary as the relief camps during severe floods are makeshift camps that are poorly managed. Therefore, suggesting a designated relief camp encourages the move from coping to adaptation. The respondents also suggested that the government should build resettlement houses for people who lost their homes during severe floods, as this could help improve their recovery and resilience. They also suggested the government's building of high dunes for refuge and temporary relocation to a designated area. If people know that the dunes are for shelter during a severe flood, their resilience will be improved, emphasising the importance of community education. It is suggested that the government should intervene because it is perceived to be expensive to achieve these suggestions, as mentioned earlier. The communities need more resources. Respondents also noted that there should be provision of loans from the government to people whose livelihood is dependent on fishing and farming (as they seem to be most affected after a severe flood event), as this could help them bounce back

better and improve their resilience. Most of these suggestions could indicate a reliance on government action. Also, some of the suggestions could imply that the community members, who are heavily involved with individual responses to their flood experiences, have come to the limits of their responses. The suggestions can further signal that the communities need a system that encourages collaboration, as even though people are proactive, their proactivity needs to be coordinated for their efforts to be effective. This research focuses on a flood risk management framework developed and discussed in the next chapter (chapter 6) to encourage community collaboration.

5.10 Community Narratives as Context

These are general narratives from the respondents that show their sense of belonging, perception of risk, sense of urgency, structural concern, and their responsibilities in the role of the implication of the coping and adaptive strategies they practise. The respondents spoke about how their indigenous knowledge has been passed down from generation to generation. As OY1 from the Oyobo community said, most respondents appeared to have a place attachment and a sense of belonging to their communities.

“(...) This is our community, our home, we cannot leave here. We can only prepare ourselves against floods and pray it is not as bad as before, and we will continue to extend our coping strategies. It is our hometown, and we cannot stay elsewhere forever. Even though a flood that is more than 2012 comes, I will still live in my community. This is my house; it is my place. No need to leave”

They do not have trust and confidence in the government intervention, as respondent AG1 from the Agbura community said, *"Our government do not have any plans for us."* also, some respondents have confidence in their coping as they believe that.

“(...) being someone always with water, we are just like fish. (...) We can cope well, although we were greatly affected. (...) As people who grew up in the riverine area, we are almost like fishes. (...) Living with or inside the flood is no longer a problem. (...) We are used to it, born into it and grew out of it.”

This suggests that they also rely on their current coping and adaptive practices. Therefore, they have to be self-sufficient, but not by choice.

5.11 Summary

The finding is based on the perception of the respondents. It has shown that the communities in the Niger Delta Region of Nigeria have a traditional flood month from July to October. They experience regular seasonal flood events and severe flood events, which occur when the flooding is excessive. The community members prepare for the regular floods and react to the severe flood events. They engage more in coping responses for severe and adaptive responses to regular floods. The local communities respond to the regular flood situation with traditional and low-cost measures; however, they would like the government to intervene with more significant and higher levels of structural flood management measures to mitigate the severe flood events they occasionally experience. These measures include building barricades at waterfronts, resettlement homes, and high dunes for refuge. Generally, their coping and adaptive responses are centred on their buildings, farmland, and food preservation, as the primary occupation of the people is farming and fishing. There is a relationship between their coping and adaptive responses as they have transitioned from coping to adapting, geared towards regular flood events. Although the effectiveness of the coping and adaptive responses was not measured in this study, the confidence of the respondents towards their coping and adaptive response to the regular flood events could suggest that they have achieved some resilience over time with lessons learnt during the processes of their trial-and-error

experimental experience. The findings also show that the coping and adaptive responses of the communities are closely informed by their indigenous knowledge.

The social and experiential knowledge concepts that emerged from this chapter will now contribute to developing the framework, as discussed in Chapter 6. The topic of communal and collective response by communities will be explored as it is one of the concepts informing the development of the flood risk management framework. The communities coping and adaptive strategies identified in this chapter will also contribute to developing the flood risk management framework (for both regular and severe flood events) in the next chapter. These coping and adaptive strategies identified as shown in table 5.3 and table 5.4 are therefore listed below:

Coping Strategies

- Construct makeshift bridges.
- Move belongings to a safe place.
- Building of designated relief camp.
- They are creating barriers with sandbags.
- Temporary migration.
- We are elevating beds using bricks.
- Tie beds to pillars to secure them.
- Buy package water for drinking or boil water to purify it.
- Fall back to salaries, alternative jobs, or savings after flood events.
- I am planting as soon as the flood stops.
- Ask for financial help from friends and family if needed.

Adaptive Strategies

- Shore protection.
- Dam control.
- Permanent relocation to higher lands.

- Local food preservation methods.
- Fishpond protection using wires.

Operational Framework for Building Flood Risk Management in the Niger Delta Communities of Nigeria

6.0 Introduction

This chapter presents the operational framework for building community flood risk resilience in the Niger Delta communities of Nigeria. The framework has been developed in response to the prevalent flood events that the communities experience yearly and the occasional severe flood. It sets out how the communities in the Niger Delta can systematically and effectively address the flood risk in the communities. The framework is intended for the community members, leaders of the communities, the local government, and the regional National Emergency Management Agency (NEMA). However, the main focus and scope of the framework is at the local level of government and authorities in the Niger Delta communities. The development of the operational framework is also aimed at fulfilling one of the research sub-aims (sub-aim 4), which is " To develop a practical framework for effective Community-Based Flood Risk Management (CBFRM) in the Niger Delta region by critically contextualising coping and adaptive strategies practised in the communities". The previous chapter (chapter 5) explains the flood coping and adaptive strategies practised in the ND communities. This reveals that limited community-scale flood risk management strategies are embedded in the practice of the Niger Delta communities. The findings also revealed the lessons learnt from past flood events and the indigenous knowledge of the communities that influence their decisions and responses to flooding. These also included suggestions from the residents of the communities on how their resilience to flooding can be improved. All of this has been integrated into the development of the operational framework.

Section 6.1 of the chapter discusses the framework rationale; section 6.2 highlights the framework's goal, while section 6.3 discusses the framework's objectives. Section 6.4 of the chapter discusses topics to consider when building community-based flood risk resilience.

These topics emerged from the results chapter as it is evident that they exist in the ND communities. The topics include flood risk management, community cohesion/action, social and experiential learning through events, and communication within and between villages. The section also discusses stakeholder engagement. Section 6.5 discusses the various roles and responsibilities of the stakeholders in ensuring that the framework is effective and sustainable. Section 6.6 discusses the stages of the framework implementation. Section 6.7 discusses the framework validation, and section 6.8 summarises the chapter.

6.1 Framework Rationale

"Our government do not have any plans for us." SB2

The quote above from a respondent during the data collection is an indication as to why it is relevant for communities in the Niger Delta (ND) region of Nigeria to build their resilience to the regular and severe flood events they experience, as they have little or no help from the state and federal government to support them before, during and after their flood experiences. The federal government is responsible for implementing flood management policies (as discussed in Chapter 3, section 3.4.1 and 3.4.2), but this is not the case in practice as they are not adequately responsive, nor do they implement their policies. According to the residents of the communities, the government only reacts to severe flood events after they have occurred, while the community members are left to respond to the seasonal flood events they experience (which are termed regular flood events in this thesis). According to Šakić Trogrlić et al. (2019), the participatory approach of including communities in identifying the flood risks, selecting, prioritising solutions, implementing solutions, and monitoring their operation is a practical approach in community-based flood risk management. The participatory approach also increases community resilience by empowering the communities, strengthening their local capacities, and encouraging local ownership, further increasing community cohesion. Community cohesion is relevant in the Niger Delta as the residents of the communities are the

primary actors in responding to the regular flood events with limited assistance from the local, state, and federal governments. Community cohesion can be challenging as most of the communities' efforts to respond to flood events are individual or informal community-led measures that need more governance structures and an institutional framework for implementation. However, the community-led measure has some advantages as the community members can observe first-hand and act quickly, as well as the flexibility of response. The community has first-hand experience with flood events and hence has valuable flood knowledge but also first-hand impact on livelihoods, which is one reason why this study is aimed at developing a community-based flood risk management framework for the Niger Delta Communities which will encourage collaboration between the communities and the various levels of government in responding to both the regular and severe flood events. This framework will also include the roles and responsibilities of the different levels of stakeholders involved in responding to the flood situation in the Niger Delta region but most significantly, it is aimed at ensuring that the flood risk management process for the Niger Delta region is community-based. For this to be effective, there needs to be effective communication between the residents within and across different communities in the Niger Delta region. Also, it is relevant for the residents of the Niger Delta communities to understand why they need to be in control of their flood risk management even though they perceive that the Federal government should have more power than them. From the results, it is evident that the communities have perceptual issues as regards the deferral of responsibilities in managing the flood risk.

6.2 Framework goal

The goal of the framework is to provide an understanding of how to enhance the resilience of the Niger Delta communities to flood risk by critically evaluating relevant information needed to support the decisions on how to prepare for, and respond to, the regular and occasional severe flood events that they experience. It is relevant to improve and strengthen the flood resilience

of the community members of the Niger Delta communities as regular flood events confront them due to the exposed terrain that they reside. However, they sometimes experience severe flood events during the seasonal flood months, which is anticipated to increase due to climate change (Akinyoade, 2017). The framework, therefore, aims to achieve its goal by suggesting practical roles for the various stakeholders as well as creating a decision-making guide that could enable the communities to build the capacity to effectively anticipate, prepare, respond, and recover from more severe flood events that are expected to occur more frequently. The framework is, therefore, an operational framework for the Niger Delta communities.

Specifically, this framework aims to:

- Identify best operational practices in a community-based context (peculiar and relevant to the current situation in the Niger Delta communities) that are required in building a comprehensive flood risk management plan and promoting community-based flood risk resilience.
- Suggest stakeholders responsible for flood risk management in the region by highlighting their roles in the decision-making on how to effectively mitigate, prepare, respond to, and recover from the flood hazards posed by the flood events, which are anticipated to become more severe.

6.3 Framework Objectives

The objectives of this framework include

- Suggest collective knowledge sharing and actions.
- Highlight ways to reduce the damage to properties and infrastructures during a flood disaster.

- Suggest practices to encourage effective communal coping and adaptation using local community knowledge.
- Inform on the relevance of collective proactive response by suggesting flood preparedness activities.

6.4 Considerations in Building Community-Based Flood Risk Resilience

6.4.1 Process of Flood Risk Management

A flood risk management process consists of strategies and actions aimed at controlling and reducing or avoiding the threats from flood hazards within an exposed situation with vulnerable people and activities. It can also be said that the process of before, during, and after response to a flood event's physical and social impact can be described in (Crinion, 2018). The flood risk management process can be challenging, especially in communities like those in NDR, where the flood events experienced are sometimes severe, and the severity of the flood events is still being determined. However, the flood risk management process can follow the standard risk management cycle. The cycle includes flood risk mitigation/ prevention, preparedness, response, recovery from flood events, and the need to 'bounce back better'. The measures and responses in each cycle phase can be adapted to suit the severity of the anticipated flood event (Thurairajah et al., 2008). The mitigation and preparedness phases can occur before and after a flood event. It can happen before an anticipated flood event or after the recovery stage in response to the risk of future flood events. The phases in the flood risk management process can occur in various order within a planned duration, as often, the duration of a phase depends on the disaster's severity. However, in the case of the Niger Delta communities, the start of the process can sometimes be planned and anticipated as the flood events experienced occur during the seasonal months, which implies that the floods can be expected but not their severity.

6.4.2 Social and experiential learning through events (and before and after)

Although there is no agreed definition of social learning due to the large area of literature, researchers from psychology and pedagogy first defined social learning as an individual's learning process determined by their social interaction, which includes observing and copying the behaviours and attitudes of other people (Samaddar et al., 2015). This definition did not seem compelling from an environmental planning and management perspective because of its narrow focus. Therefore, researchers in environmental planning and management defined social learning as the learning of a group of people through interactions and collaboration (Tran and Rodela, 2019). According to López-Marrero and Tschakert (2011), social learning is the collaboration of multiple participants by sharing diverse flood risk perspectives and thoughts on responding to flood events. It also involves the acting together of these participants to enhance their shared knowledge, awareness, and skills of their already existing knowledge of how to adapt to the prevalent flood risk by deciding what strategy is required at what time and the flood risk management options available to them. Social learning involves refining knowledge that already exists and generating new knowledge that can be used to guide the flood risk management process. Social learning is existing and relevant to the Niger Delta communities and was identified during the analysis of the results (Chapter 5) and an example is the cassava preservation method discussed in section 5.6. Also, social learning is evident as respondents from the interviews mentioned that there are no formal places for accessing information on how to prepare or respond to flooding, and they pick up the coping and adaptive strategies they implement from each other. Even though the respondents in the study have demonstrated knowledge of coping and adapting to floods, their comprehension needs to be clarified to reduce misunderstandings and fill the required information gaps (López-Marrero and Tschakert, 2011). From the results chapter of this study, it was established that the residents of the Niger Delta communities explore the use of their local knowledge by applying this

knowledge to how they individually respond to flood events, which is an already existing knowledge in the communities. On this basis, this framework will explore the existing knowledge to create and suggest a guide for the communities to manage their flood risk collectively. The existing knowledge provides a resource for social learning in the communities as the residents of the communities have, over time, developed flood coping and adaptive strategies based on their existing individual knowledge, which has become common knowledge. According to López-Marrero and Tschakert (2011), social learning can be beneficial in the process of communities developing their flood risk management plans or strategies as it allows for the group of participants to bring in their variety, perspectives and broad knowledge of the flood risk issues, the community dynamics and setting. A response by respondent OD5 in chapter 5 (section 5.6) created an instance of social learning OD5 during the research process (focus group discussion) as another respondent learnt from the respondent's comment, who had more insights into the issue of collaboration and communal activities due to his position as a community chief. The remarks from OD5 respondents further buttress the point that the decisions and responses made regarding flood event(s) and the effectiveness of a flood risk management framework can be enhanced through multi-level stakeholder collaboration and participation between the communities and the federal, state and local levels of government. This multi-level stakeholder collaboration and participation can lead to social learning. The various stakeholders will learn from each other as they collaborate to plan and carry out their shared visions (Benson et al., 2016; O'Donnell et al., 2018). Also, the importance of social learning is relevant as collaborative efforts amongst stakeholders are more effective than independent and individual actions and therefore, social learning can be a crucial criterion for the operationalisation of a flood risk management framework (Herath, Wijesekera and Rajapakse, 2021). The framework in this thesis also includes suggested

stakeholders' roles in the flood risk management process, allowing for the integration of diverse inputs into collective efforts (Tran and Rodela, 2019).

Experiential learning is a process of learning or acquiring knowledge when the learner is involved with actions or learning from a life experience as the primary source of knowledge. This could also be translated to learners learning from what they do and experience rather than what they have read, heard, or seen someone or people do (Kolb, 2014). Learner learning distinguishes it from social learning, as social learning can occur through observing someone else's experience. Kolb's theory aims to explain how experience is translated into learning and valuable knowledge and the process of doing this. Not all experiences will translate into learning or knowledge if specific thought processes do not occur. According to Kolb (2014), learning is a holistic process that results in adaptation; a person should be able to deduct some knowledge from their experience that can be translated to a better decision or response should they have the same or a similar experience again. Altamimi (2015, p. 17) stated that the Kolb's experiential learning proposed learning as:

- “Best conceived as a process but not in terms of outcomes.
- As a continuous process grounded in experience.
- Requiring the resolution of conflicts between dialectically opposed modes of adaptation to the world.
- A holistic process of adaptation to the world.
- It results from synergetic transactions between the person and the environment.
- As the process of creating knowledge”.

With these propositions of experiential learning mentioned above, it can be concluded that experiential learning regarding flooding is present in the Niger Delta communities, as respondents narrated how they have learnt over time, for example, how they have adapted their

food preservation methods and also adapted the way they build houses. Section 5.4 of the results chapter (chapter 5) shows continuous learning of the community. Respondents narrate how they have learnt from past flood events and are looking to keep learning from their experience, which involves them and their environment. Section 5.5 of the results chapter (chapter 5) also shows evidence of knowledge creation using experiential learning. The respondents further narrated how their various indigenous knowledge has developed through their experiences. It is also essential to identify that experiential learning is relevant in developing a framework as it is instrumental in the response to flood events and can positively impact the flood resilience of the communities.

6.4.3 Social Capital as a Resource

According to Lu et al. (2015), social capital is the outcome of a group's collective actions, interaction, and organisation to achieve a shared or common goal effectively. Social capital can also be individuals' connections and the degree to which these connections are characterised by their shared norms of mutuality, reciprocity, and trust (Rydin, 2013). These social connections that occur between individuals within and between a community, as well as between external institutions, are relevant to social capital (Fox, 2014). Social capital is, therefore, the connection that determines how a group plans and acts towards achieving their common goal. Social capital represents a resource in the development of a flood risk management framework in this thesis, as the community members and local, state and federal governments who are stakeholders in the Niger Delta communities have a common goal which is to improve their flood resilience. These stakeholders also connect within and between themselves in various situations. The framework is developed to ensure that communities and the local authorities in community settings have shared rules, norms, and shared knowledge concerning their flood experiences and how to improve the resilience of the communities, as well as create trust and practical cooperation among the stakeholders (Bossabong, 2015).

6.4.4 Relevance of Community Cohesion/Action

The collaboration of community members in carrying out flood actions and activities during the prevention and recovery from a flood event is relevant in community-based flood risk management as this indicates a people-centred approach (Davids et al., 2021; Babicky and Seebauer, 2020). The flood actions and activities could be structural, non-structural, behavioural and land use management activities, which can include (but are not limited to) clearing of debris from drainage systems, setting up of sandbag barriers or the provision of charitable donations by individuals or Non-Governmental Organisations to flood victims in the communities. Community cohesion is the extent to which a community can collaborate, which creates a sense of belonging and promotes trust among themselves. Community cohesion can also be the working together of a community as a single unit to respond to long-term flooding. Community cohesion has been identified as a fundamental element in a community's resilience to flooding (Ludin, Rohaizat, and Arbon, 2019). The presence of community cohesion during hard times could be because, during hard times, community residents might be keen to collaborate to protect their common interests. The cooperation of community residents during hard times is evident in Chapter 5 (section 5.6), where respondents narrated their collaboration experience during a severe flood event. Also, during or after a devastating flood event or disaster, individuals in a community who are victims are often keen to unite to confront the loss they are suffering or have suffered (Chang, 2010). A study by Chang (2010) in Mozambique argued that flood events could strengthen community cohesion, as after a flood event, community members realise the importance of collaborating to achieve mutually desired and beneficial goals, such as building sandbags to block water or reconstructing the community by rebuilding damaged houses. Chang (2010) also argued that the strength of community cohesion can depend on the severity of the floods that people suffered. Community cohesion is more highly strengthened amongst people who were highly affected than people who were

moderately affected. Also, community cohesion can be temporary unless steps are taken to foster it in the longer term, as it is highest in the immediate aftermath. Equity in recovery also affects this as some members of communities will recover more quickly. Therefore, steps to build on trust and foster long-term cohesion are relevant in implementing a flood risk management framework. A study by Wickes et al. (2015), conducted on the Brisbane flood disaster in Australia, narrated how community cohesion strengthened the coping of the flood victims. According to the study, groups of volunteers formed by the residents of Brisbane were helping each other deploy sandbags and move belongings to higher grounds. When the flood receded, and the clean-up commenced, tens of thousands of volunteers (who were the residents of Brisbane) were actively involved, and it was revealed that some neighbours who were working together, sharing information, food, home, and other supplies had never spoken to themselves in some communities. This study promotes community cohesion as the framework developed is a step in achieving this. Therefore, if the framework developed is adequately implemented, it has the potential to encourage and foster community cohesion within and between the Niger Delta communities.

6.4.5 Understanding the Current Practices of Flood Risk Management in the Niger Delta Region of Nigeria

The communities' traditional measures are built from their indigenous knowledge and experiences from previous flood events. These local flood management practices are a product of experiential learning, where most residents have been involved with trial and error of their coping and adaptive strategies. According to the findings (Chapter 5), these measures are adequate for regular floods, as the communities have developed local knowledge and practise for coping and adapting to regular flood events. It does not pose a challenge, as most respondents described the situation as usual during the data collection. However, this may not be efficient as the community needs to share more, collaborate adequately, and have more

resources. Also, they often experience significant impacts when the flood event is severe. The severe flood events, which are anticipated to increase due to climate change, continue to pose a challenge as the residents of the communities need more resources to respond to the severe flood events, which, in effect, impacts their flood resilience. They expect the government to implement measures that will enable them to cope during severe flood events. However, the government's measures must be revised as the research results indicate that the government only provide flood warnings and reacts after a severe flood event. Severe flood events reduce the communities' resources available for regular flood events and sometimes destroy the measures put in place to deal with regular events, thereby reducing their resilience. All this information was gathered from the data collected as there is no formal document for flood risk management for the communities in the Niger Delta region of Nigeria which implies that there is no formal planning by federal, state and local governments towards flood risk management. As more severe flood events are predicted to occur, there needs to be adequate sources of information or plans available to keep the communities aware and enable them to prepare effectively.

6.4.6 Communication (Better communication within and between villages)

Effective communication throughout the flood risk management process phases should be emphasised, as the circulation of vital information within and between the communities is essential (Chan et al., 2020). Effective communication plays a crucial role in the ability of communities to adequately prepare and implement the correct mitigation actions (Bodoque et al., 2019) required to respond to regular and severe flood events.

Addressing the various aspects of communication, such as 'who', 'what', 'why', 'how', and 'when', is critical for the success of the flood risk management process. The community leaders

can organise the communication as they are the highest point of authority within the communities. Community members communicating and sharing their experiences and what they have learnt or are learning at the different stages of flood risk management is relevant. The community members can communicate between themselves through town hall meetings or household meetings. Also, community leaders can communicate between communities and share who, what, why, when, and how to respond to both regular and severe flood events regarding what has been discussed in their communities. The 'Why' is concerned with the need for the multiple stakeholders to understand the benefits of how their actions can contribute to improving the resilience of the Niger Delta communities to the flood events they experience. Stakeholders know why it is essential, as, from the results, most of the residents of the communities see seasonal flood events as usual. The Niger Delta communities need to be more concerned about being proactive before the flood events. The community members are currently somewhat more reactive, affecting them more than anticipated when the flood event exceeds their capacity. Some people showed the willingness to do better but expressed that they lacked the proper knowledge and resources. Communicating the 'why' of the various phases of the flood risk management process and the framework is relevant in improving the communities' resilience. The 'What' concerns the actions and activities to be executed at the various phases of the flood risk management process and framework implementation. It is relevant to establish what should be done at the different stages for the process to be seamless and successful. People must know how to prepare for or mitigate anticipated flood events. At present, there is a tendency that the preparation, response, and recovery measures of the Niger Delta communities may not be efficient, and this can have a ripple effect on their entire flood experience. The importance of what is communicated is relevant, as the stakeholders have to understand what they will be doing and to feel confident with the roles and responsibilities. Diversity plays a role in the ability to act, as some people may have limitations or challenges

when implementing the activities and may need help from other community members. The difficulties anticipated or constraints should be adequately communicated, as when people know what could go wrong, they can think of alternatives.

The 'How' concerns the response process to the various phases, which is subjective because flood events hit communities differently. From the findings in Chapter 5, some respondents mentioned that they responded better to the flood event because it took three weeks to get to their community after impacting the first community. So, communities that usually experience flooding a few weeks after they affect frontline communities may prepare and respond differently. The 'When' is concerned with the timing of 'what', and this should be an ongoing communication to encourage the stakeholders of the communities to be more proactive. The framework enables the stakeholders to be proactive, which requires engaging with the various phases of the flood risk management process. The flood risk management process includes bouncing back better and preparing before and after a flood event, as well as recovery actions that may increase resilience to future events.

The 'Who' is concerned with the right stakeholders involved in a specific activity or activities to respond to the flood events at the various phases of the flood risk management process. From the results (chapter 5; Section 5.9), the respondents mentioned some suggested interventions, if implemented by specific individuals, could help improve their resilience to both the regular and severe flood events they experience. They also explicitly noted that the federal government must implement some possible structural interventions because of the cost implications. It is, therefore, relevant to establish the roles of the various stakeholders in implementing the framework.

6.4.7 Stakeholder Engagement

Stakeholder engagement is relevant to the success of executing a flood risk management plan as it integrates the inputs of the various stakeholders involved. Thalet and Levin-Keitel (2016) defined stakeholder engagement as the collaboration or working together of different social groups to solve a common problem. Geaves et al. (2016) give a more robust explanation of stakeholder engagement, stating that it involves the coming together of a group of people (or people with the same interest regarding an issue which affects them) to decide on practices that influence their response and experience of the common problem that confronts them. They also highlighted that stakeholder engagement is collaborative and is not individualistic. In light of this explanation, it is relevant to mention that this framework provides knowledge that seeks to promote the collaboration of different communities within the Niger Delta region.

Flood risk management is more effective and sustainable when the stakeholders at the community level are very well involved in the planning process, the response, and the recovery phase of any flood event (Thalet and Levin-Keitel, 2016). Recognition of the importance of involving stakeholders at the community level in the flood risk management process is mainly why this framework is focused on the local presence, perception and involvement of the Niger Delta communities. However, the local communities may need more capacity and adequate resources to execute a sustainable flood risk management plan effectively, and this is where the collaboration with the other stakeholders involved in local FRM is essential, which explains why the framework is community-based rather than community-led.

6.5 Stakeholders' Roles and Responsibilities

It is relevant to understand the strategic roles and interventions of the various stakeholders in the Niger Delta communities in ensuring that the flood risk management plan is effective and sustainable. The stakeholders in the multiple communities include individuals, household leaders, community chiefs, community leaders, the local authority, the state government and

external NGOs. The hierarchy of authority and leadership governing the communities is shown in Figure 5.2 of the result chapter (Chapter 5). According to Herath, Wijesekera, and Rajapakse (2021), stakeholder consensus-building is relevant for effective flood risk management. Also, integrating the views of all the various stakeholders and the standard agreement and joint decision-making would facilitate sharing responsibilities between stakeholders. The relevance of collaboration and communal effort in ensuring community resilience to flood must be considered, which is one of the main arguments of this thesis, and the involvement of the various stakeholders is vital for this. The different flood risk management stakeholders of the Niger Delta communities and their importance/role in the framework are outlined below. Most of the information was gathered from this study as there is limited literature on the roles and responsibilities of the various stakeholders mentioned below.

6.5.1 National and State Emergency Management Agency (NEMA/SEMA)

The National and State Emergency Management Agency, or NEMA and SEMA, is the Federal and state government authority responsible for community flooding. NEMA was discussed in detail in Chapter 3 (section 3.1.1). However, SEMA is accountable for representing the Nigerian government at the state level. They also have their environmental department and can independently respond to flood events without the federal government's intervention. For this framework to be effective and sustainable, NEMA and SEMA should be responsible for providing financial support (which is one of the significant challenges of the communities) to assist in projects that will improve the resilience of the communities. They also have to involve all the stakeholders while acting to achieve mutual collaboration and liaise with other states and the federal government on the dam control in the country.

6.5.2 Local Authority Roles in the Flood Risk Management Process

The local authority in the Niger Delta communities is known as the Local Government. Several villages are grouped under a specific Local Government Area (LGA). Several of these LGAs make up a state. A chairman and several ward counsellors govern the LGAs. They are the closest in authority to the people and are regarded as grassroots government. The LGAs are very relevant to the flood risk management process as they are believed to have more capacity in governance and resources as the state government financially empowers them. They are also involved in feeding back to the state and central government with information and issues confronting the communities and relating the problems and plights of the communities to them. This framework proposes that the local authority provide flood risk awareness and flood warnings to the communities, as they can work together with the state meteorological offices (there are no meteorological offices at the local authority level).

6.5.3 Community Leaders Roles in the Flood Risk Management Process

The community leaders, also known as village chiefs, are the - lower tier in the hierarchy of authority in the ND region. They are very well respected and influential. Their presence in the community is political, and they bridge the gap between the LGA leaders and the community members (as several villages belong to one LGA). The community leaders relay the plights of their community members to the local authority. The roles and responsibilities of the community leader in the framework will, therefore, be to coordinate the local flood preparation, mitigation, and recovery actions, create flood action groups, provide flood coping and adaptive information to the community members, and liaise with other communities on collaborative actions, sharing of information and create a community flood decision plan. The community leaders already function together as they have their cabinet, known as the Council of Chiefs, which represents every compound in the community.

6.5.4 Household/Compound Leaders Roles in the Flood Risk Management Process

The compound leaders relay what has been agreed by the council of chiefs to the households within their compound. The compound leaders, also known as the compound chiefs, are the next level of authority, and they usually oversee several households that are externally related. Therefore, they must translate the agreed flood preparation, mitigation and recovery actions to their households and ensure they are actively involved.

6.5.5 Individual Roles in the Flood Risk Management Process

After all the preparation and mitigation actions have been proposed, individuals make the final decision about flood response through those actions that relate to them. They also decide on how they respond to flood events, especially in the case of a severe flood event, and it is relevant that individual households create a flood plan using the response action plan and review it after every flood event, whether regular or severe. Below (figure 6.1) is a response action guide for households to use to create their flood plan. This response action guide was created based on the findings from this study. The response action guide, however, provides households with questions that, when answered, will enable them to plan and decide how to respond to the flood event, considering their circumstances and available resources.

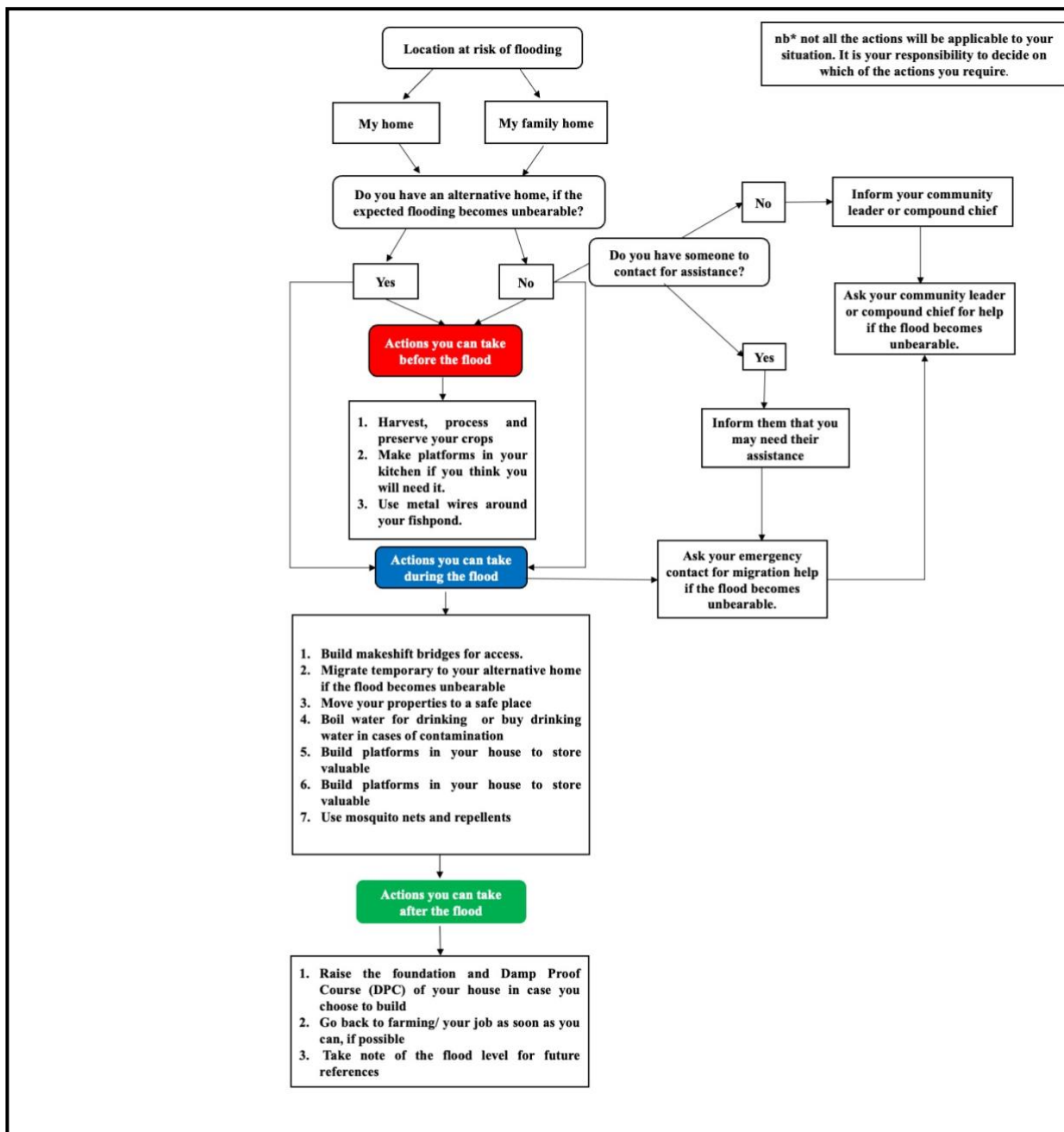


Figure 6.1 Household Response Action Guide.

6.6 Stages of Framework Implementation

6.6.1 Stage 1: Initiation and Awareness

It is also essential that the residents of the communities accept that they are meant to be involved in making the decisions and participating in the activities required to implement the framework. According to Bryan (2017) the article, an initiation activity could affect the community members coming together in a participatory style that will support their going through the operational framework with a shared understanding of the issues. The operational framework will make them aware of what is required of them and also promote recognition that they can be part of the solutions by empowering them with adequate information and support in understanding how best they can respond. This will involve developing individual and collective flood plans based on the situation. The community leader can initiate the activity through community group meetings, town hall meetings or workshops. In the results chapter (Chapter 5), some respondents mentioned that they had a similar town hall meeting and workshop on the education of cholera and typhoid, which they found very useful and successful, and they believed that this could also be done by educating members of the communities on flooding. Also, the community leader and the various compound leaders can come together to create community flood action groups. These flood action groups can develop an awareness of flood risk within the community, organise volunteers to clear the drains regularly to keep them clear from debris, join the community leaders or assist local households in creating and reviewing a community plan and promoting adaptive actions. They can also prepare and respond to flood events and be aware of social vulnerabilities in their community (The Flood Hub, 2021).

6.6.2 Stage 2: Evaluating existing coping and adaptive strategies

It is relevant to identify and evaluate the existing coping and adaptive strategies in the communities and assess if the current coping and adaptive strategies that the residents of the

communities employ mitigate or reduce the effect of the flood events from the communities' experience. During the data collection process of this study, most respondents reported that their coping and adaptive strategies were adequate for regular floods, which was evident, as some of the respondents described the regular flood events as usual. However, they expressed that they suffered some losses or were significantly affected by the severe flood events. In this light, the framework will include their existing coping and adaptive strategies in response to regular and severe floods (both individual and collective coping and adaptive strategies). It will also include strategy from expert knowledge, literature, and learning within and between communities to help enhance the transition from mainly coping to adaptation to severe flood events.

6.6.3 Stage 3: Response Action Guide

This section of the chapter integrates the roles of the different stakeholders in the Niger Delta communities with the stages of the flood risk management process. The section will also provide a practical action plan on how the ND communities can respond to regular and severe flood events. The community response action guide includes the existing coping and adaptive strategies of the communities that are obtained from the findings, as well as strategies from the literature that are appropriate to the settings of the communities in the Niger Delta region of Nigeria. This is similar to the household response action guide (figure 6.1) but applies to the community collective flood response.

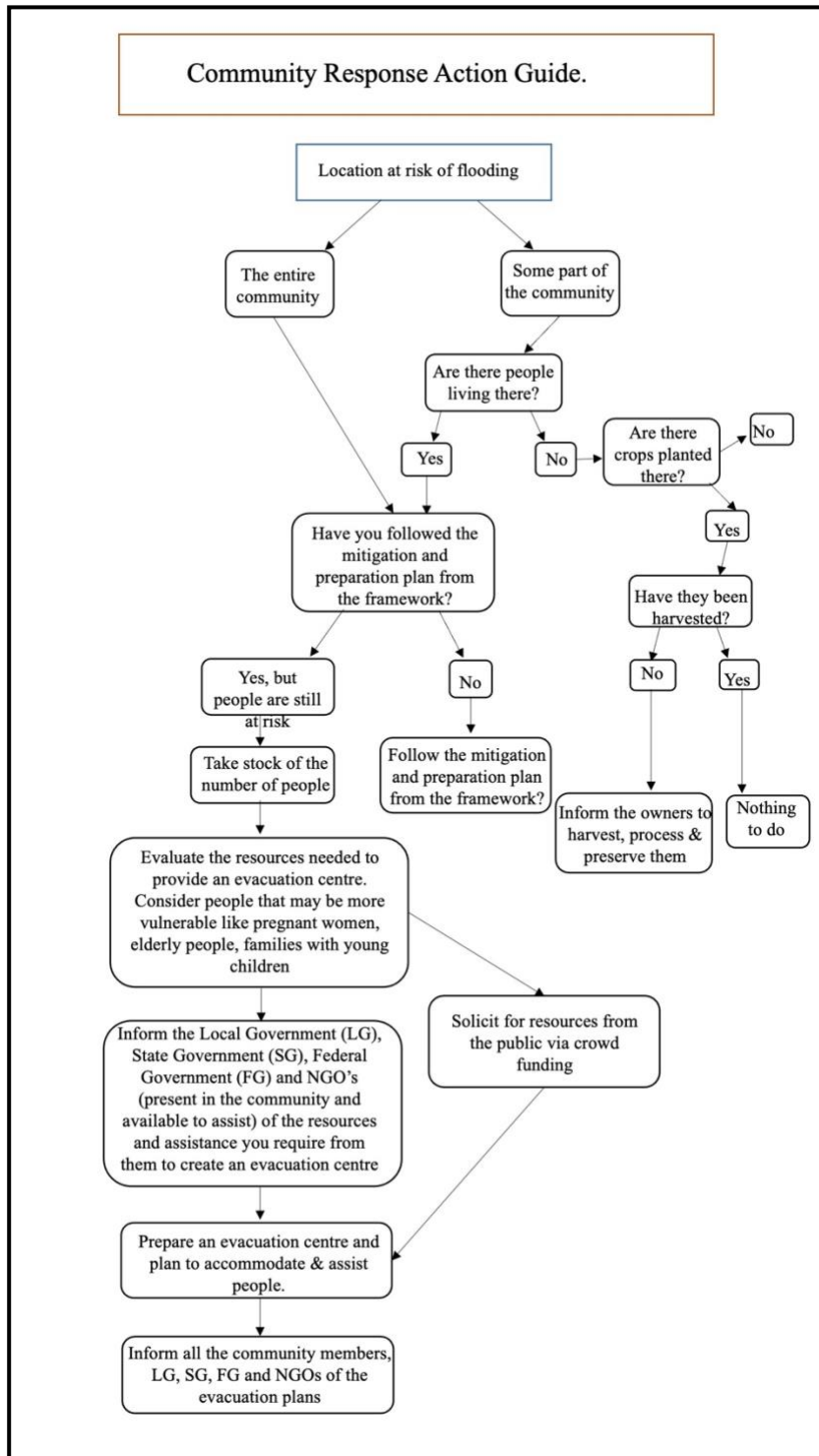


Figure 6.2: Community Response Action Guide

(Created by Researcher)

6.7 Flood Risk Management Framework Process

The framework is targeted towards flood preparedness and mitigation and is focused on providing information that could influence the behavioural change of the communities to move from reactive to proactive. Therefore, the mitigation and preparation actions are the same as sometimes, it is not known if the flood will be severe until it occurs, and severe floods occur occasionally and may become more frequent. Below is the framework diagram (figure 6.3) before the framework validation process, showing the proposed responsibilities of the various stakeholders at the different stages of response required.

Figure 6.3: Framework for Community-Based Flood Risk Management

		Actors	COMMUNITY MEMBERS	COMMUNITY/COMPOUND LEADERS	LGA LEADERS	NEMA/SEMA
		Actions				
Mitigation	Shore Protection		Community flood action group work in collaboration with the community leaders in maintaining the shore protections.	Community leaders to coordinate the maintenance of the shores.		Build shore protection barriers.
	Dam Control					Effectively control the dams which causes the rivers to overflow.
	Permanent Relocation	Individuals and household can relocate permanently to higher lands within the community.	Assist individuals or household who intend to move to a higher lands by providing them with the lands to build.			Assist with resources for permanent relocation such as funds for building.
Regular Flood Preparation Actions	Create Community Flood Action Group	Community Flood Action group made up of community members works in collaboration with community leaders to ensure rules regarding flooding are adhere too and community decision making guide is executed.	Both leaders creates the group consisting of at least one person from each compound.			
	Flood Community Forum	Community flood action group ensures community knowledge sharing by including flood discussions during regular community meetings.	Community leaders to coordinate the forum to share knowledge from individuals to collective and promote flood awareness.			
	Flood Community Forum	Community flood action group ensures community knowledge sharing by including flood discussions during regular community meetings.	Community leaders to coordinate the forum to share knowledge from individuals to collective and promote flood awareness.			
	Food Preservation	Compound leaders coordinate knowledge sharing of food preservation methods and coordinate collective food preservation point			Works in collaboration with NEMA/SEMA	
	Fishpond Protection					
	Building of designated relief camp	Collaborates with NEMA/SEMA in building the relief camp(s)	Collaborates with NEMA/SEMA in building the relief camp(s)			Build relief camp(s) in the case of a severe flood

	Actors	COMMUNITY MEMBERS	COMMUNITY/COMPOUND LEADERS	LGA LEADERS	NEMA/SEMA
	Actions				
Severe Flood Preparation	Flood Warning	Go through the decision-making guide to prepare an adequate response to flood.	Both leaders relate the flood warnings to the community.		Start issuing flood warnings weekly at least 3 months before the flood months if possible
Regular Flood Response	If the mitigation and preparation actions are taken, then the regular flood event is very well bearable, and no response is required as people can live as normal.				
Severe Flood Response	Save lives	Migrate temporarily if possible.			Provide resources for temporary migration.
	Protect Shelters and Properties	<ul style="list-style-type: none"> • Create barriers with sandbags. • Elevate beds using bricks • Move belongings and properties to a safe place. • Construct a makeshift footbridge. 	Compound leaders to coordinate the construction of a makeshift footbridge.		
Regular Flood Recovery	Conserve food and water	<ul style="list-style-type: none"> • Boil water to purify it for drinking • Buy package water for drinking. 	Works in collaboration with NEMA/SEMA		Assist by providing food and water.
	If the mitigation and preparation actions were taken, then there is minimal recovery needed. However, flood plans and decision-making guides should be reviewed by all the stakeholders				
Severe Flood Recovery	Financial recovery	<ul style="list-style-type: none"> • Fall back to salaries, jobs and savings if possible. • Ask for assistance from family and friends. 			Provide financial assistance to people who have lost everything
	Rebuild Shelters and Properties	Rebuild or repair houses and properties if applicable	Ensure sharing of local knowledge on how to build houses that are flood resilient.		Provide resources for people who need to rebuild or repair their houses and properties.
	Planting	Start planting as soon as possible.	Works in collaboration with NEMA/SEMA.		Assist by providing seedlings for planting.
	Review Flood Plan	Review mitigation and preparation actions to ascertain what needs to be strengthened.			
Evaluation of Event/Framework Review	Experience and Knowledge Sharing	Evaluate their experience on how they have responded to the flood event.	Facilitate discussions with the community members to share their knowledge and experiences concerning their preparation and response to the flood event.	Meet with the community leaders to review their preparation and response.	Evaluate their preparation and response but also meet with the community leaders to learn on how they could improve on their support

Figure 6.4: Framework for Community-Based Flood Risk Management Simplified for Validation Process

	Actors			
	Community Members	Community/Compound Leaders	LGA Leaders	NEMA/SEMA
Actions Before the Flood				
Shore Protection	Community flood action group work in collaboration with the community leaders in ensure the shores are protected.	Community leaders to coordinate the maintenance of the shores.		Build shore protection barriers.
Dam Control				Effectively control the dams which causes the rivers to overflow.
Permanent Relocation	Individuals and household can relocate permanently to higher lands within the community.	Assist individuals or households who intend to move to higher lands by providing them with the lands to build.		Assist with resources for permanent relocation such as funds for building
Create and operate Flood Community forum	Hold regular community meetings involving all community members to share knowledge and discuss what to do before, during and after a flood event.	Both leaders coordinate the forum to share knowledge amongst individuals to promote collective flood awareness.		
Food Preservation	Individual community members should preserve their foods with local methods.	Compound leaders to coordinate knowledge sharing of food preservation methods and coordinate collective food preservation point.		
Fishpond Protection	Individuals who own fishponds should put wires on the top of them for protection.			
Building of designated relief camp	Community flood action group ensures everyone is looked after, especially the more vulnerable (elderly people, families with little children etc).	Community leaders to organise and oversee the practicality and functionality of the relief camp and resources available to the community members.	Collaborates with NEMA/SEMA in building the relief camp(s).	Build relief camp(s) in the case of a severe flood.
Flood Warning	Go through the household response action plan to prepare an adequate response to the flood.	Both leaders relate the flood warnings to the community.	Collaborates with NEMA/SEMA in communicating the flood warnings.	Start issuing flood warnings weekly at least 3 months before the flood months if possible.
Actions During the Flood				
Save lives	Individuals can migrate temporarily if possible. They can also use petrol around houses to repel snakes and reptiles.	Compound leaders to provide support to individuals choosing to migrate.		Provide resources for temporary migration.
Protect Shelters and Properties	Individuals can elevate their beds using bricks, move their belongings and properties to a safe place and tie their beds to pillars to secure them.	Compound leaders to coordinate the construction of makeshift footbridge and creating foot barriers using sandbags.		
Conserve food and water	Individuals to boil water to purify it and buy packaged water for drinking.	Work in collaboration with SEMA/NEMA to coordinate the distribution of food and water.		Assist by providing food and water.
Actions After the Flood				
Financial recovery	People can fall back to salaries, jobs, and savings if possible They can also ask for assistance from family and friends.	Community leaders to organise fund raising appeal with the help of the flood action group to assist people who are desperately in need.		Provide financial assistance to people who have lost everything.
Rebuild Shelters and Properties	Individuals can rebuild or repair their houses and properties if applicable.	Ensure sharing of local knowledge on how to build houses that are flood resilient.		Provide resources for people who need to build or repair their house.
Planting	Start planting as soon as possible	Work in collaboration with SEMA/NEMA.	Assist by providing seedlings for planting.	Start planting as soon as possible.
Review Flood Plan	Review mitigation and preparation actions to ascertain what needs to be strengthened			
Experience and Knowledge Sharing	Evaluate their experience on how they have responded to the flood event.	Facilitate discussions with the community members to share their knowledge and experiences regarding their preparation and response to the flood event.	Meet with the community leaders to review their preparation and response.	Evaluate the preparation and response actions by meeting with the community leaders to learn how they could improve their support.

6.8 Framework Validation

The framework validation was conducted to ascertain the relevance and viability of the framework, aside from the validation process being one of the sub-aims of the study. As described in the methodology chapter (section 4.11), the framework validation was done over the phone as a telephone interview with seven (7) people (who were part of the initial participants) consisting of two community leaders, two compound leaders and three community members. Before the telephone interview, the framework diagram (figure 6.3) was sent to the participants via email so they could go through it before the scheduled interview. The first respondent, a community member, complained that the diagram was challenging to understand. The diagram was, therefore, redesigned and simplified (shown in Figure 6.4) while maintaining the same content and value as expected.

All the participants were optimistic about the framework, as they mentioned that they were familiar with most of the actions the framework was proposing. However, a summary of the participant's response to the framework validation questions is as follows:

- What do you think of the framework?

In response to the question about the framework, the respondents said that the framework will encourage an organised approach to flood situations. They also commended the framework, saying it is a good and intellectual work that is innovative by the researcher, and the collaborative approach of involving everyone from the people in the community to their leaders and the government makes it a good one.

- How do you think the framework can improve the flood resilience in the community?

Regarding the perceived impact of the framework, most respondents thought that it, being an organised and structured way of responding, would make the communities proactive, improve their resilience, and influence how they can positively respond to a flood situation. The

respondents also said the framework could empower the communities to stay independent of the government.

- What is your opinion on the practicality of the framework?

When asked how practical they thought the framework was, most respondents perceived it to be helpful because some of the actions suggested by the framework already exist in the community. However, one respondent mentioned that the framework might not be efficient because of the government's involvement, as they could be more responsive. Another respondent also commented that the practicality of the framework may be determined by the entire community's understanding of it.

- How can this framework be implemented?

The participants emphasised the need to educate and encourage people as a requirement for the framework to be practical and effective, leading to the question of implementing the framework. Most respondents believed educating the community is the first step to implementing the framework. One respondent went further to say this can be actualised by the cooperation of the local government authority and the clan chiefs (who are in charge of all the community leaders) because the local government is the local-level organised government agency. They listen to the government, and the people listen to them. They are the middle ground between the government and the communities and are in the best position to propagate the implementation of the framework.

On the other hand, the Clan chief is the traditional ruler in charge of all the community leaders. The community leaders are loyal to the clan chief and getting them involved in the framework will ensure it is effectively implemented. The respondent was therefore suggesting that to implement the framework, the hierarchy of leadership in the community has to be followed because the people are very loyal to this hierarchy (the hierarchy of leadership is shown in figure 5.2). Therefore, if the leaders understand and are on board with the idea of the

framework, then the people will follow because they are yearning for such knowledge and the proactive approach suggested by the framework.

- Do you have anything else to say?

Respondents believed that the mental shift for the community members is significant because, in Nigeria, many people are waiting for the government, even for things they can do for themselves. One respondent said that looking at the entire framework, they think it is well thought-out and down-to-earth, as everybody is involved. However, it is relevant for everybody to ensure that the framework is implemented because when a flood event occurs, it does not affect just one individual but everyone in the community. Another respondent shared that educating the leadership is critical because the framework is very good for the community and encourages a communal way of doing things. The respondent also mentioned that in the past, communities collaborated, and the culture of communal living is beginning to fade out. The framework is a means of re-introducing a communal approach to doing beautiful things. Respondent 3 said ... *“This framework is bringing structured and documented ways we can respond to the flood with what we are already doing.”*

6.9 Summary

The chapter has integrated the research findings into developing and presenting an operational framework, which meets the research aim of evaluating how the flood coping and adaptive strategies of the communities in the NDR of Nigeria can contribute to an effective Community-Based Flood Risk Management Framework for improved community resilience. A framework was also developed to promote community and collective response to the ND communities' regular and severe flood events. The chapter further discussed the various roles of the stakeholders in the communities, which is relevant in ensuring effective community resilience to flood risk in the NDR. Also, the framework's validation shows that it received a positive response from the community members, saying it is innovative, intellectual and viable.

However, the framework delivery requires integration of the leadership hierarchy in the Niger Delta communities.

Chapter 7 Discussion and Conclusions

7.1 Discussion

This chapter reviews the achievement of the research aims and sub-aims and discusses how they contributed to the study's primary findings with pre-existing knowledge. This discussion builds on and summarises prior discussions in the results chapters (chapter 5) of the thesis. The findings discussed in this chapter were discovered during the data collection. The discussion of the study's findings is also included in the framework chapter, as the research findings were employed in developing the framework. The chapter also includes a discussion on the implications of the Niger Delta Communities as a resilient community.

7.1.0 Review of Research Aims and Sub Aims

The study aimed to critically design a Community-Based Flood Risk Management Framework that can improve the community resilience of the Niger Delta communities and evaluate how their flood coping and adaptive strategies can contribute effectively to this process. The study aim was achieved by creating and validating a flood risk management framework for the Niger Delta communities. The framework is aimed at providing adequate and relevant information needed to support the decisions on preparing for and responding to the regular and occasional severe flood events that communities experience. The aim and sub-aims of the study were set up at the start of the research to complete the research. The following section discusses the sub-aims of the study concerning the results of the thesis and the contribution of knowledge it adds to the literature.

7.1.1 Sub Aim one: Relevance of Community-Based Flood Risk Management

Sub-aim one aims to critically evaluate the relevance of community-based disaster risk management in mitigating flood disasters and building resilience. Community-based disaster risk management requires communities to be actively involved in identifying the risk and threat of the flood events they experience and evaluating and planning adequate responses and

strategies. The evaluative and planning responses and strategy can involve the collaboration of the communities with other stakeholders (in the case of the Niger Delta communities, this collaboration can occur with the local, state, and federal governments of Nigeria). The communities being actively involved in the process is relevant as from the literature review of this study, it is established that the local communities in the Niger Delta are the first line of response during a flood event. Therefore, involving them in all stages of the flood risk management process will not only make it effective but could positively influence the sustainability of the process, which could help improve their flood resilience. However, the community experience of floods is an experiential knowledge resource that can be useful in designing or developing a flood risk management strategy. According to Raška and Brázdil (2015), incorporating community experience is relevant in community-based flood management, and it plays a vital role in building the flood resilience of the communities. These flood experiences also develop the indigenous knowledge of the communities. For communities like the Niger Delta communities where a formal flood risk management policy or strategy does not exist, the community members rely on their coping and adaptive strategies (developed from their indigenous knowledge) as a means of resource to respond to the prevailing flood disaster they experience. Indigenous knowledge is accumulated from past flood experiences (experiential learning), some of which have been passed down from generation to generation (also known as intergenerational learning). Pierce and Hemstock (2022) argued that Indigenous knowledge could be passed down orally through several generations, and this can be in the form of stories, rites, memories, encounters, and abilities, such as actual farming practices being demonstrated. The local experiential knowledge is passed down to generations in the communities, which plays a significant role in how the community members prepare and respond to flood events. As most of the indigenous knowledge in the Niger Delta communities has been developed through experiential learning

and passed on from generation to generation, the application of the knowledge gained from experiential learning has also become effective in how the communities are adapting to flood events. An example is the way of building houses in the communities. Local experiential knowledge is not static and changes as the community learns how to adapt better or respond effectively to flood events. A study by Emdad et al. (2022) on flooding in Bangladesh concluded that experiential learning from the locals became the foundation of understanding how to respond to flood risk. The study also found that the experiential learning of the communities' past experiences formed the basis of knowledge for deciding the variety of coping and adaptation measures they can adopt to improve their resilience. This knowledge is also shared in a social learning context, and it was established in chapter 6 (section 6.4.3) of this study that social learning exists in the Niger Delta communities as community members narrated how they share their experiences and lessons learnt informally amongst themselves in their regular conversations. Social learning therefore constitutes social capital in the Niger Delta communities, and it can help enhance the communities' resilience to floods. These are also considered in the framework developed from this study, as the framework suggests regular meetings and forums within and between the Niger Delta communities to share knowledge and experiences. The suggestion is formed based on the understanding of social capital, which proposes that people achieve more when they operate and act together (Blackshaw and Long, 2010). However, considering the communities' shared experiences, collective actions and activities are relevant in developing a community-based flood risk management strategy to improve the community's resilience to flood effectively. Therefore, community-based flood risk management is pertinent to improve community resilience to flood disasters.

7.1.2 Sub Aim Two: Coping and Adaptive Strategies in the Niger Delta Communities

This sub-aim is aimed at critically identifying the existing coping and adaptive strategies of the Niger Delta communities and the development of an in-depth understanding of these strategies. Coping and adaptive strategies are how flood-prone communities prepare and respond to the prevalent flood events that they experience, which includes the Niger Delta communities. Therefore, the understanding of how, what, when and why the communities employ these coping and adaptive strategies is relevant for the developing of a flood risk management process or policy for stakeholders or for anyone looking to build and enhance community resilience (Tabe-Ojong, Boakye and Muliro, 2020). Understanding the coping and adaptive strategies existing in the Niger Delta communities helped in the development of the framework. According to what was identified in the literature review chapter (chapter 2) of this study, coping strategies are short-term responses to flood events, and these strategies are classified as coping strategies for regular and severe floods in the result chapter (section 5.3). The communities were seen to employ more coping strategies during the severe flood than during the regular flood, and this could be attributed to the fact that they do not prepare adequately for the severe flood events, which could be because of its frequency, making their response mostly spontaneous/ reactive or inefficient due to inadequate preparation. The coping strategies developed from the indigenous knowledge of the communities are usually employed from the onset of the severe flood events rather than before. The strategies are mainly aimed at reducing or avoiding the effect of the severe flood events on their daily life (whilst the flood

event is still occurring) until they get external help and intervention, usually from the state and federal government or individuals outside the communities. The coping strategies are also aimed at protecting lives, minimising food supply disruption, securing valuables, and ensuring people's safety. According to Peters-Guarin, McCall and Westen (2012), coping strategies allow people to feel like they can manage the situation using their resources until the flood situation exceeds their capacity. Then they begin to seek other means of response (which most times is evacuation) when they have reached that point. Employing coping strategies also makes people less reliant on external intervention, which does not imply that their strategy could be more efficient. However, it gives them a sense of everyday life during severe flood events. In the case of the Niger Delta communities, during severe flood events, people tend to remain in their homes employing their coping strategies until they exhaust their resources before they either move out of the community or move into the relief camps that the government usually provides. Also, over time, some of the coping strategies of the communities have been developed to allow the communities to plan and proactively respond to anticipated future flood events, which gives rise to adaptive strategies. These adaptive strategies are sometimes unique and organic or learnt from other communities, just like the coping strategies. The adaptive strategies in the Niger Delta communities are long-term, proactive strategies that are usually employed towards regular flood events. The frequency of the regular seasonal flood events has meant that there is an established way of living, so the communities are well prepared by employing their adaptive strategies as a way of recovery from the end of the past regular flood events, which makes their experience of the regular flood bearable (according to their narration). The adaptive strategies in the communities are categorised as structural, non-structural behavioural practices and agricultural practices in this study as they are primarily geared

towards increasing the structural standards, improving their methods of food preservation, securing their agricultural practice and preservation of the community's surroundings.

The understanding of the coping and adaptive strategies of the Niger Delta communities in this study led to the researcher's suggestion that it is relevant for the communities to transition their coping responses to adaptive responses, especially towards severe flood events. The study also proposes that the communities move from a reactive approach, which is responding to the immediate flood concern, to a proactive approach, which involves putting thoughts into the anticipation of the severe flood event to make deliberate and timely decisions. Proactive approaches will enable the communities to reduce their vulnerability by having a set of actions and interventions before the flood event is anticipated (Trovato & Giuffrida, 2018). The communities also transitioning from a reactive to a proactive approach to response to flooding (especially for severe floods) could improve their resilience as it will enable them to effectively anticipate, prepare, respond, and recover from flood events. However, the concern is that most communities that are susceptible to flood disasters, including the ND communities, do not consider preparedness as a relevant stage in flood response, which could be because they do not have the knowledge and financial resources (De Majo, 2022; Islam et al., 2018). Preparedness is the first step to being proactive as it prepares the communities to anticipate extreme events. In the case of the Niger Delta communities, as mentioned earlier, they are proactive to the regular flood events as the regular flood events are yearly, and so anticipating them is very well possible. However, severe flood events do not occur yearly, but the trend from the past shows that they appear on average every ten years. With climate change, there is a danger of increasing incidence and altering patterns. However, one of the observed challenges is that when it comes to dealing with flooding, both the residents of the Niger Delta communities and the government are generally more reactive than proactive. The community members know that being proactive has many advantages and may be more effective, but they

believe they need more adequate resources to be proactive. Being overly reliant on the government also makes it difficult for them to take responsibility for their actions and accept the wealth of indigenous knowledge they possess as a resource that can be used to continue to transition their coping strategies into adaptive strategies. Their reliance on the government further influences their response and decision to take adequate responsibility for their actions. In summary, in identifying and understanding the coping and adaptive strategies of the ND communities, it is evident that adaptation has occurred more for regular flood events, and coping occurs more during severe flood events. However, it can also be concluded that the communities are more proactive to the regular flood events but are reactive to the severe flood event. The knowledge gained from this understanding was, however, considered during the development of the framework as the framework suggests actions from preparation to recovery for both regular and severe flood events. Also, just like the two flood-prone communities, namely Mansión del Sapo and Maternillo in Puerto Rico discussed in the literature review (session 2.1.5), the Niger Delta communities have learned to cope and adapt to flood disasters because they are left with little or no option.

7.1.3 Sub Aim Three: Household and Community Flood Response

Action Guide

This sub aim is aimed at developing household and community flood response action guides for how the communities in the Niger Delta respond to both regular and severe flood events. The flood response action guide is relevant in ensuring that the actions employed by a stakeholder can adequately address the flood situation they are experiencing. The household and community response action guide developed in this study was created from the practices of the ND communities reported in the findings and literature suggesting ways of responding to flood events. A flood response action guide can help community members formulate their responses and preferences in responding to the flood situation (Hansson et al., 2013). The

decision-making guide, which includes the communities' familiar actions, is relevant in formulating their response and deciding to make it before, during, and after the regular and severe flood events they experience. However, the decision-making guide must stand together and sit within the community-based flood risk management framework developed in this study. The details of what is included in the guides are discussed in Chapter 6 (session 6.6.3).

7.1.4 Sub Aim Four: Framework Development

This sub aim is aimed at developing a practical framework for effective Community-Based Flood Risk Management (CBFRM) in the Niger Delta region based on international best practices and the Niger Delta community strategies. The aim of the framework, as discussed in (chapter 6) is to provide an understanding of how a systematic communal process of response to the prevalent flood events in the Niger Delta communities can be achieved. Community is communal, and collective response is critical in ensuring continuity in community-based flood risk management, as otherwise, responses would continue as an individualistic approach.

One of the key findings in this study is that the community members of the Niger Delta communities are individualistic in their flood response. The result chapter (section 5.6) presented the exploration of the communal activities in the communities, and it can be concluded that the Niger Delta communities lack organised communal action. What is, however, present in the communities is people assisting others when necessary; as one respondent, OD4, said, **“If the flood situation is very destructive, then we collaborate to help each other”**. Communal response can be identified as unstructured, structured, and formalised. Unstructured responses do not require organisation and occur when an individual or household (from the community or outside the community) offers to help someone affected by a flood spontaneously (Coates, 2015). This help can include moving properties or furniture, providing temporary shelter, or delivering food and drink. Structured responses are organised situations where community members have agreed to come together and respond to flood

events at the various phases of flood risk management. Structured responses are often expected to enhance community flood resilience. An example of a structured response will be community members setting up flood action groups as suggested by the framework. The formalised response is a long-term structure that responds to the flood event. This structure involves the community members and all the stakeholders responsible for flood risk management. Unstructured response is currently the predominant response of the Niger Delta communities, as people tend to help one another when needed. Also, community members reach out for help from people who are part of their community but may not be affected at the time, probably because they are not residents in the community at the time of the flood events. Unstructured response benefits the community as it can form the foundation for improving community networks. However, the community will be more resilient if they come together and create a structured and formalised response to flooding (Coates, 2015). Therefore, one of the aims of the framework developed in Chapter 6 is to encourage the communities in the Niger Delta region to move from an individualistic response to a communal response. Hence, there is a need for community-based flood risk management. The results obtained from the data collection process and expert knowledge from the literature were used in developing the framework. The framework suggests practical roles and responsibilities of the stakeholders who are responsible for the flood risk management of the Niger Delta communities. The community members are familiar with some of these roles and responsibilities as the framework considers the existing community hierarchy of roles. This framework was also developed to be practical and not theoretical because the Niger Delta communities are currently hands-on with their response to the flood events they experience. However, these existing responses are not communal and formal, which means they are limited in their response. A communal response is more effective than an individual one, especially during severe floods. The framework also encourages a multi-level approach and collaboration; for example, the

framework has suggested that the government agencies should be responsible for the execution of some projects like building shore protection barriers and building relocation houses for the communities, and this is because the communities do not have enough resources to create them. However, the framework proposes that the communities are responsible for looking after and maintaining them. The framework will not only encourage a multi-level approach and collaboration. However, it will enable the transition of the communities' approach from coping to adapting to the severe flood events, reactive to proactive and also individualist response to communal response within and between communities in the Niger Delta region.

7.1.5 Sub Aim Five: To validate the FRM framework developed

The framework validation is discussed in the framework chapter (Chapter 6) of the thesis. The validation was conducted by interviewing seven stakeholders in the communities. These stakeholders comprised two community leaders, two compound leaders and three community members. The stakeholders who validated the framework described it as community-based, realistic, practical, and functional, all of which are favourable responses, as those were some of the researcher's goals when developing the framework. The respondents described the framework as re-introducing the communal approach (which one of the respondents mentioned has been lost over time). The respondents described the framework as bringing a structure and documented ways the community members can prepare and respond to the flood with the things they are already doing. The familiarity and acceptance of the respondents with the suggestions made by the framework is evidence that the framework meets its aim, as one of the objectives of developing the framework is to encourage communal response to flood events in the ND communities by including the existing coping and adaptive strategies. The framework, however, has the potential to be implemented, and other researchers could evaluate its value to the government and the communities in the future.

7.1.6 The Niger Delta communities as a resilient community

It is relevant to understand the positions of the Niger Delta communities as resilient communities as this gives an understanding of the situation of the communities regarding how their resilience to flood can be improved. According to the literature review chapter (2.4.1), a resilient community can be characterised as a group of people that have a sense of belonging to the community, have adequate resources to respond to flood events, have guidelines, strategies and plans as well as a working relationship amongst themselves and also collaborate with external partners. As Dwirahmadi et al. (2019) described, a resilient community is a less vulnerable community that feels empowered and ready to address any flood event. According to Wong and Abdullah (2022), there may be adequate resilience at the individual level in a community, but more is needed to translate to the community being resilient. The concept of community resilience involves the ability of a community to collectively learn, adapt and transform the flood situation to go beyond just bouncing back to ensuring that there is stability after the flood events and that there is anticipation to learn and develop existing processes to ensure that the communities' resilience is continuously improved. However, from the findings of this study, it can be said that the Niger Delta communities are not resilient, and this is the knowledge gap this study is aimed at filling. According to Dwirahmadi et al. (2019), the barriers to a resilient community could include but are not limited to these factors:

- Inadequate financial resources
- Need for more adequate use of technology.
- Poor community practices (for example, dumping rubbish in rivers).
- There is a need for adequate coordination amongst related institutions and stakeholders.
- Need for more adequate leadership.
- Undefined roles and responsibilities amongst stakeholders.
- There is a need to understand who is doing what, where, and how.

- There needs to be more social sensitivity in the community.
- Inadequate involvement/participation in the community.
- Community members receive disaster substantial disaster relief every year.
- Every year, residents of the community rely significantly on government support.

The majority of these factors are present in the Niger Delta communities. In the findings, community members have mentioned that they need more adequate financial resources to address some of the responses and solutions they perceive can help improve their resilience to floods, especially severe flood events. The Niger Delta communities also have limited access to technology in addressing the flood events. Even though the question about technology was not asked, most of the coping and adaptive strategies mentioned by the community members included things that use minimal technology to actualise. Poor community practices are experienced in the Niger Delta communities, as during the data collection process, some respondents mentioned that their drainage getting blocked due to dumping of rubbish in the drainages was one of the reasons the flood impact is more. They also shared that the non-cooperation and willingness of community members to collectively clean the drainages periodically is a challenge, leading to inadequate coordination within the community. However, this is not only experienced within the community but between communities in the Niger Delta and also between the communities are the government agencies (NEMA/SEMA) responsible for tackling the flood events. The government agencies are not involved in the pre-flood planning stage with the community members and act in isolation only to react or respond when the flood event is severe.

The various flood-impacted communities in the Niger Delta also need to adequately collaborate on responding to flood events by sharing their experiences, activities, plans, and knowledge gained. The framework developed, therefore, encourages actions that will ensure collaboration amongst all the stakeholders in the communities, both within the community and between

community collaboration and sharing are essential. Concerning the lack of leadership, the communities in the ND have a strong leadership presence. However, the leaders are limited in encouraging community resilience to flood as they are not equipped with adequate knowledge and resources, which is why, during the framework validation, one of the participants said that educating the community leaders on the relevance of the framework is the first step to ensuring that the framework is practical. There are undefined roles and responsibilities in the Niger Delta communities, and this factor was observed during the data collection process as the respondents attributed some roles to the government, some of which they can carry out. Since there is a minimum collaboration among the stakeholders at different levels in the hierarchy articulated in Chapter 5 (figure 5.2), they need to be made aware of which role is perceived to be each other's responsibility, and this is one of the factors that further leads to the communities being overly reliant on the government. Therefore, there needs to be a greater understanding of what, who, how, and why some flood response actions should be employed. The framework aims to bridge this gap by clearly stating how each stakeholder should respond to the flood events at the various stages and what is expected. During the data collection process, the community members expressed a willingness to participate in communal activity to improve their resilience. However, this was not observed in actions, as the attitudes across the communities are more individualistic than communal. Also, during the framework validation process, the participants expressed that community members have been eager for a structured and formal process that will enable them to respond collectively to flood events. Addressing the abovementioned factors is a step towards ensuring a community is resilient to flood disasters. The framework developed in this study addresses all of the aspects relating to inhibitors of being a resilient community that have been identified as present in the Niger Delta communities, and it can be linked to the overall aim of this study which is developing a

community-based flood risk management framework which is aimed at improving the resilience of the communities.

7.2 Conclusions

This section concludes the thesis by summarising the key findings, contribution to knowledge, recommendations for future research, and replication of this study. It also reflects on the researcher's relevant experiences during the research process and lessons learned.

7.2.1 Summary of Findings

The following are the key findings of the study.

- The Niger Delta Communities experience yearly regular floods and occasional severe floods. They consider the regular floods bearable due to their lived experience and have some festive celebrations during the flood seasons.
- The severe floods, on the other hand, are devastating. The community members are more individualist than communal in responding to all the scales of flood events they experience. However, they are open to improving their communal response with adequate resources.
- The communities are proactive about the regular floods, adopting a more adaptive approach, and reactive about the occasional severe floods, employing more coping strategies.
- The communities' coping and adaptive strategies, born out of the Indigenous knowledge and experiential learning of the community members, are centred around their buildings, farmlands, and food preservation, closely linked to their livelihood and significant occupation.
- They are reliant on the government, especially during the severe floods. The government employs mostly reactive intervention during severe floods.
- The communities possess indigenous knowledge/ experiential knowledge, which is the foundation of their coping and adaptive strategies. This is evident in how they build and preserve their crops in response to the flood events.

- The majority of the states in the country experience yearly flood events. However, the Niger Delta region is argued to be most susceptible to the prevalent flood events in the country.
- A flood risk management framework that recognises the ND communities' local coping and adaptive strategies and distinguishes between regular and severe flooding is needed.
- There is a need for an operation flood risk management framework for the Niger Delta communities that could be continually updated. This framework had to be responsive to the community's needs and co-created by the communities, using their suggestions.
- The validation concludes that the framework has the potential to aid the response and participation of stakeholders from communities on community-based flood risk management. The framework's structure is easy to comprehend, and there are few or no challenges perceived in its implementation as it is straightforward in its presentation. However, the framework must be tested before reaching this conclusion. The opinions expressed by the respondents indicated that the advantages of utilising the framework are sufficient to improve the flood resilience of the communities when the framework is adequately implemented.

7.3 Thesis Contribution to Knowledge

The contribution of knowledge will reflect the contribution to theory, literature, and practice as the study investigates the relevance of community-based flood risk management through the experiences of community members.

7.3.1 Contribution to Theory

This study further contributes to theory as it reflects the relevance of community-based flood risk management by presenting an insight into the flood experiences of the communities in the Niger Delta region of Nigeria. Most of the research on flood risk management in Nigeria has only explored the situation and experiences of the people and recommended solutions that the government can implement. Most researchers have not addressed the aspect of the community members being the driving force for the response to the regular and severe flood events in the

Niger Delta region of Nigeria. According to Sharma (2021), involving community members in the flood risk management process at the community level enhances the capacities of the community. This study, therefore, recognises the resources and capacities available in the communities that could be improved to enable them to respond to flood events without over-relying on the government. This study has, however, deliberately and empirically focused on community-based flood risk management as a means to improve the resilience of the Niger Delta communities of Nigeria to flooding. The study mainly focused on the coping and adaptive strategies of the communities (which are deeply rooted in their indigenous and experiential knowledge) as a resource and capability that can contribute to effective community-based flood risk management. The study further contributes to the theory of the relevance of a collaborative approach to the response to flood events in achieving effective flood risk management.

7.3.2 Contribution to Literature

Previous flood risk management research has been conducted in Nigeria. However, there has been minimal research on community-based flood risk management in the Niger Delta region of Nigeria. The study contributes authentic and rich knowledge as the data collected for the study was mainly through primary sources of data collection (as described in the methodology chapter in section 4.5). Most research on flood risk management needs to approach the topic through the lens of the community members, just as this study has done. The mixed methods approach allowed for a rapid evaluation of coping and adaptive strategies to develop a framework and also highlighted the need to consider different severities within a local context. Therefore, the findings from this study contribute to the literature on flood risk management from a community perspective. The study has also contributed to the literature on the development and implication of a flood risk management framework globally, but especially within the Nigeria context, as one of the challenges the researcher initially faced was finding

relevant and adequate literature regarding coping and adaptive strategies in the Niger Delta region.

7.3.3 Contribution to Practice

The framework is a new resource and a distinct innovation by the researcher, and it further contributes to the resources and knowledge available to the communities regarding flood response by considering how and who should be responsible for flood risk management. As a result, it is anticipated that the flood risk management framework, which is founded on the empirical research enquiry, findings, and validation of the study, may contribute to an improvement in the flood resilience of the Niger Delta communities. The flood risk management framework can be a resource not only by the Niger Delta communities but by other states in Nigeria, as well as other less economically developed countries in exposed deltaic settings with cultures comparable to Nigeria's and the Niger Delta communities. The operational community-based flood risk management framework developed in chapter 6 of the study provides a practical solution to the flood risk. The study has also contributed to knowledge concerning the development and implication of a flood risk management framework and the literature on this topic, especially within Nigeria. As one of the challenges the researcher initially faced was finding relevant and adequate literature regarding coping and adaptive strategies in the Niger Delta region.

7.4 Recommendations

In light of the findings and the contribution to knowledge this study presents, the following recommendations are directed to stakeholders of the Niger Delta communities and how they can achieve resilience by effectively applying the flood risk management framework.

7.4.1 Recommendation for the Government (NEMA/SEMA/Local Governments)

The study found that, while there might be various reasons why it is difficult for the Niger Delta communities to improve their resilience to the prevailing flood events they experience,

the fundamental issue is the ineffectiveness of the government being proactive in the situation. The ineffectiveness of the government has a broader impact on the response to flood management, in which a wide range of stakeholders, particularly community members, need to be adequately supported. Thus, having an integrated and coordinated plan and decision-making process for responding to severe and regular flood events is required to improve the flood risk management of the region. Community-based flood risk management is a relevant strategy for ensuring that stakeholders know their responsibilities and, in effect, that the community's resilience is improved. Community-based flood risk management involves collaboration amongst the stakeholders, which may only be possible with a formal system and process that can explain every stakeholder's role and responsibility. Therefore, what the flood risk management framework developed from this study is set out to do. It is relevant that all government agency recognises their roles and responsibilities and have action plans as well as policies that will enable them to act promptly and adequately to contribute to the flood risk resilience of the Niger Delta communities, and this can be replicated in other states of the country. While conducting this study, it was apparent that the local government authorities (the closest government to the people) are critical players in the communication between the communities and the state/federal government. They need more resources and capacity to support the local communities, as they must rely on the federal and state governments for extra funding after a flood event. The local government should have a department dealing with flood events and a yearly budget for flood responses as these events are very well anticipated, making planning easier.

7.4.2 Recommendation for the Communities (Community Leaders/Compound Leaders/Community Members)

Over-reliance on the government is a significant issue in Nigeria which is also one of the critical challenges of the Niger Delta communities. The people need more confidence in their capacity,

although they still require assistance and support from the government to improve their resilience to flooding. They must recognise that their experiential, indigenous, and generational knowledge is a resource they can capitalise on. They translate resources to mean just finances. This study has helped to demystify this by developing the flood risk management framework, which shows the community members' roles and responsibilities that they can engage in to improve their resilience to flooding. The community must collaborate at all levels to understand when, what, how, who and where to respond, enabling them to identify and structure best practices relevant to their situation and experience.

7.5 Reflection on the Research Process

The secondary data regarding coping and adaptive strategies concerning flooding in the Niger Delta communities were limited, which meant that the researcher went to the field with limited knowledge of the topic. This study was primary research, meaning the researcher had to collect the data. The researcher was residing in the United Kingdom, while the study was about the Niger Delta region of Nigeria. One of the significant limitations of this study was the accessibility of the community members in the villages visited and the frequent travel required to conduct the data collection process. However, the researcher visited the villages just once for data collection. During the data collection, the researcher formed relationships with some of the participants, and one of them assisted in the validation process as the researcher did not go into the field of validation data collection. The participant assisted by printing out and administering the interview question sheet, consent form and framework sheet to other participants before the interview, which was conducted over the phone by the researcher.

Also, from the framework, the local government have little responsibility because, during the data collection process, the communities presented the local government as needing to be more helpful. They are supposed to be the bridge between the government and the people, but they do not have the power and also do not generate their resources. However, during the framework

validation process, it was evident that the Local Government authorities are relevant and the key plays of communication between the communities and the state and federal government, which was an exciting finding for the researcher as it was assumed that the local government did not have much influence on the flood management process in the region. However, if an interview had been conducted with the local government leadership, this would have improved the information gathered. The researcher was a member of the Niger Delta community before moving to the UK, which meant that there was a good sense of knowledge as regards the study area and the flood experiences of the community members. However, some of the experiences shared by the community members were new and interesting to the researcher. Hearing a very different perspective from the researcher's experience was inspiring.

Also, some of the findings (like the celebration of the fishing festival) were intriguing as they gave an understanding of the basis of some of the practices of the communities that the researcher knew about. There was also some resistance from the community members during the data collection as they complained about the neglect from the government and thought the researcher was from the government. Some of them asked for tips to get involved with the interviews; it would have been an option to think of ways to reward the participants. However, after the first community visit, during the visit of the subsequent communities, a researcher approached the community leader first, who certified that they were an independent researcher and sent a representative with her to affirm with the participants. Also, during the interview, some participants were more comfortable speaking in their local dialect (which the researcher speaks and understands well). However, the transcribing of such interviews took more time than anticipated. For some narration, they found the right words in English to match precisely what the participants were trying to communicate: too much work.

Another limitation of the study was that the researcher's safety determined the choice of the community visited. This meant that the researcher could not see a community more than once

and could only visit communities deemed safe by the contacts made before the data collection process.

7.5 Further Research

The study has looked at how to improve the flood resilience of the Niger Delta communities and has also developed a flood risk management framework to achieve this goal. However, several limitations remained, primarily related to the methods and data collected. This section highlights some additional research ideas that would benefit future studies.

- Future studies can investigate how the Niger Delta communities implemented the framework and evaluate the effect it has in improving the flood resilience of the communities.
- Investigating why community members are more individualistic than communal in their response to flooding will be helpful. This study should have considered this before the data collection. Community members mentioned times when they have been communal in their response to various things and projects, which shows they can be communal. Still, they need more structure and leadership guidance to apply this within flood risk management.
- It could also be relevant for future studies to explore the barriers to improved/effective adaptation in the Niger Delta communities, especially concerning severe flood events. These severe flood events are forecasted in real-time, and it is puzzling that communities still need to prepare to respond to them even though they are less frequent.
- Future studies can also explore the effectiveness of coping and adaptive strategies in communities. These strategies have existed in the communities and have been developed over time. It may be relevant to measure or study the continued effectiveness of these strategies concerning the current trend of climate change and the growing population.
- Future studies can also explore the relationship between oil spillage and flooding. During the data collection process, it was mentioned that there is a relationship between flooding and oil spillage, as some community members explained how the flood brings

contaminated water into their farmlands, which has health implications for the food crops grown. Therefore, the relationship between flooding and oil spillage would be an essential study.

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Appendix

Appendix 1: Questionnaire

Please tick the box where appropriate. On a scale of 1(never) to 5 (always), how often do you do this before, during and after a flood disaster?

No	Questions	1	2	3	4	5
1	Plant plantains around your house					
2	Dig drainage system around your house to direct the flood water away					
3	Plant catkin reeds to control flood					
4	Take shelter on higher ground during the flood					
5	Use special plants to collect drinking water during rainy season to avoid drinking flood water and getting sick					
6	Preserve food in barns					
7	Use sandbags as barriers for water not to flow into your house					
8	Construct footbridge					
9	Plant water hyacinths as barriers					
10	Construct floating houses					
11	Raise the platform of your kitchen to keep food, drinking water and fuel safe					
12	Raise the platform of your storerooms to keep valuables safe during the flood					
13	Reduce the number of meals you eat					
14	Rely on inexpensive food					
15	Sell your assets (e.g., furniture and household belongings) before they get damaged by the flood					
16	Look for an alternative source of income					
17	Sell your livestock					
18	Plant coach grass to guard against erosion					
19	Migrate temporarily					
20	Raise home before the flood					
21	Elevate bed using bricks					
22	Tie bed to wooden pillars to protect them from being swept away by the flood					
23	Move assets (e.g., furniture and household belongings) to a safe place					
24	Preserve food by drying					
25	Use separable materials for building in order to transfer the whole house in bits during a severe flood					
26	Follow traditional crop calendar for planting					
27	Use bamboo and fishing nets to protect fisheries during flood					
28	Use water hyacinth to raise pond embankments					
29	Use potassium alum to purify water for drinking					
30	Use water purifying tablets to purify water for drinking					
31	Boil water for drinking					

32	Use traditional herbs to treat cold, fever, diarrhea, and dysentery					
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Appendix 2 Interview and Focus Group Guide Questions

- Can you give me a brief introduction to where you live and how long you have stayed there?
- Are you a tenant or a landlord?
- Tenant: Did you consider the tendency of this place to be flooded before renting this property?
- Landlord: Did you consider flooding while building your house? If so, what measures did you take or consider?
- When was the first time you ever experienced flooding?
- How many flood experiences have you had?
- Which was the worst?
- Is this your first-time experiencing flooding?
- If this is not your first experience, why are you still living in the community with the frequent floods?
- Tell me what you did before the flood.
- What do you do to survive during the flood?
- What enabled your coping to be effective?
- What was the significant barrier you faced with dealing with the flood disaster?
- What sort of things helped you the most recover after the event?
- Who do you think was most affected by the event? And why?
- How do you think different people/groups coped with the event? And why?
- Who do you think coped least during the event? And why?
- Is there anything the community can do collectively?
- Do you go and assist anyone during the flood?
- In your view, has the community improved, worsened, or remained the same due to the event? What sorts of things have made things better or worse?
- Do you think communal measures will be more effective than individual measures?
- Is there anything you want to contribute that I have yet to ask you?

Appendix 3 Information Sheet for primary data collection

Coping and Adaptative Strategies for Building Community Based Flood Resilience (A case study of the Niger Delta Region of Nigeria).

INTRODUCTION

I am Ngo Orubite, a PhD Researcher from the University of Huddersfield; my Doctoral Thesis is geared towards “*Coping and Adaptative Strategies for Building Community Based Flood Resilience (A case study of the Niger Delta Region of Nigeria)*”.

The primary aim of this research is to design a Community-Based Flood Risk Management Framework that can improve the community resilience of the Niger Delta communities and

critically evaluate how existing flood coping and adaptive strategies can contribute effectively to this framework which is informed by the research.

My research is at the data collection stage, which is gathering information from people on the flood experiences they have been confronted with or involved with over time. This would further assist me in continuing with my investigation.

This process will be in the form of a focus group or semi-structured interview (whichever is applicable). I will pose some questions to you, and you are expected to answer and discuss them. This can also lead to further areas for discussion (even if I have not asked for them), but it has to be information relevant to my research.

Please be informed of the following: -

- **Length of Interview** - This interview should take 30 – 45 minutes, depending on how discussions progress.
- **Data Capture—The interview is being recorded to ensure the accuracy of the information obtained.** Please let me know if you have any issues (s) with this.
- **Confidentiality** - Anything you say will be held in the strictest confidence. Your name will not be used in the transcript, but should I need to record your name, a pseudonym will be used instead.
- **Informed Consent** - You can sign a Consent form and acknowledge your agreement to participate in this exercise.
- **Participation** - You are under no obligation to participate, and should you wish to withdraw before we begin, you are free to do so.
- **Questions** - Do you have any questions you would like to ask before we begin?



Appendix 4 Research Ethics – Consent Form

TITLE OF PROJECT: -

Coping and Adaptive Strategies for Building Community Based Flood Resilience (A case study of the Niger Delta Region of Nigeria)”.

NAME: Ngo Orubite

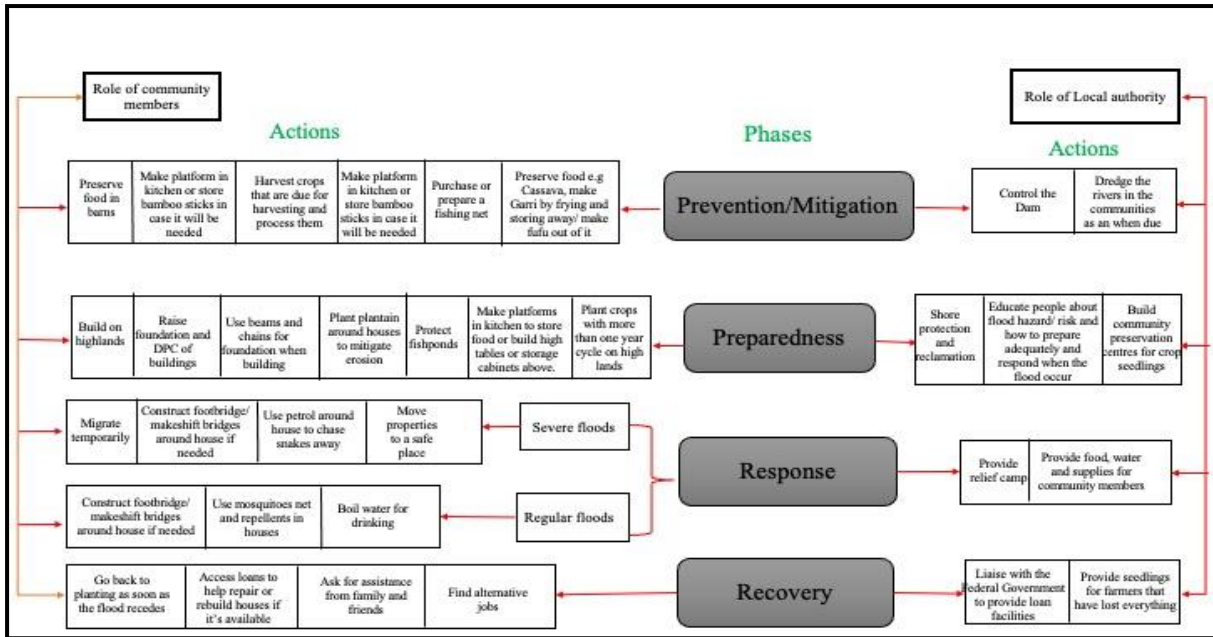


Figure 8. 1: First framework diagram developed

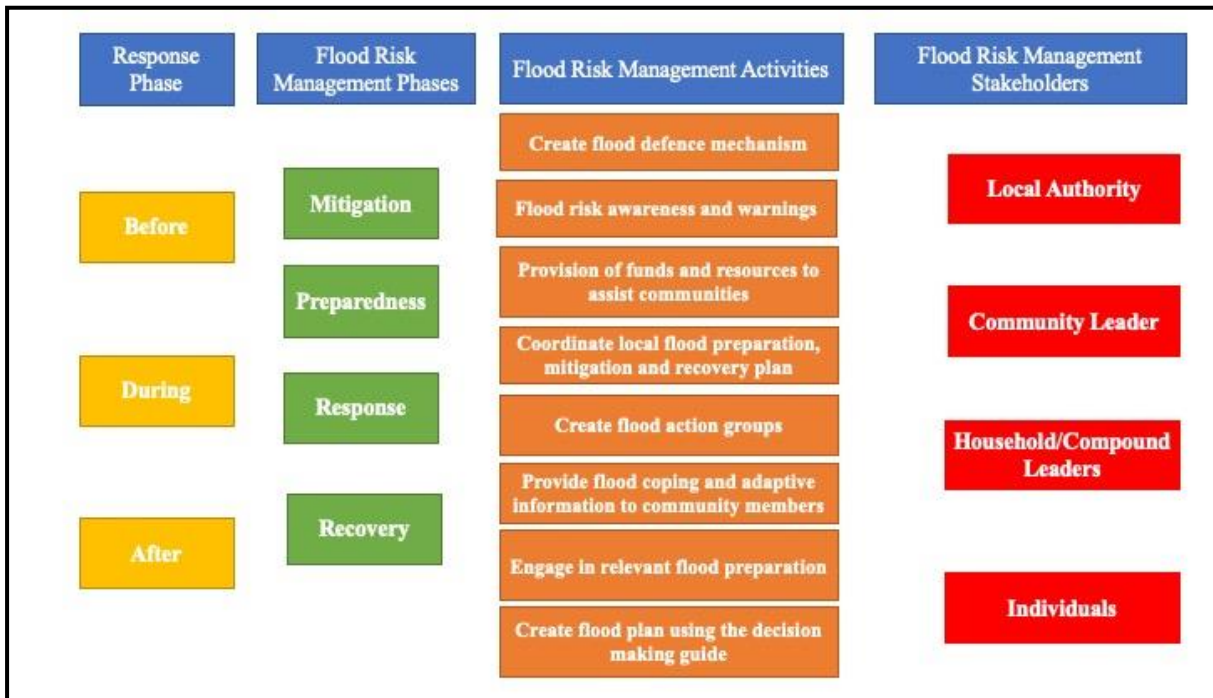


Figure 8. 2: Second framework diagram developed

Figure 6. 2: Flood Risk Management Operational Framework for ND Communities

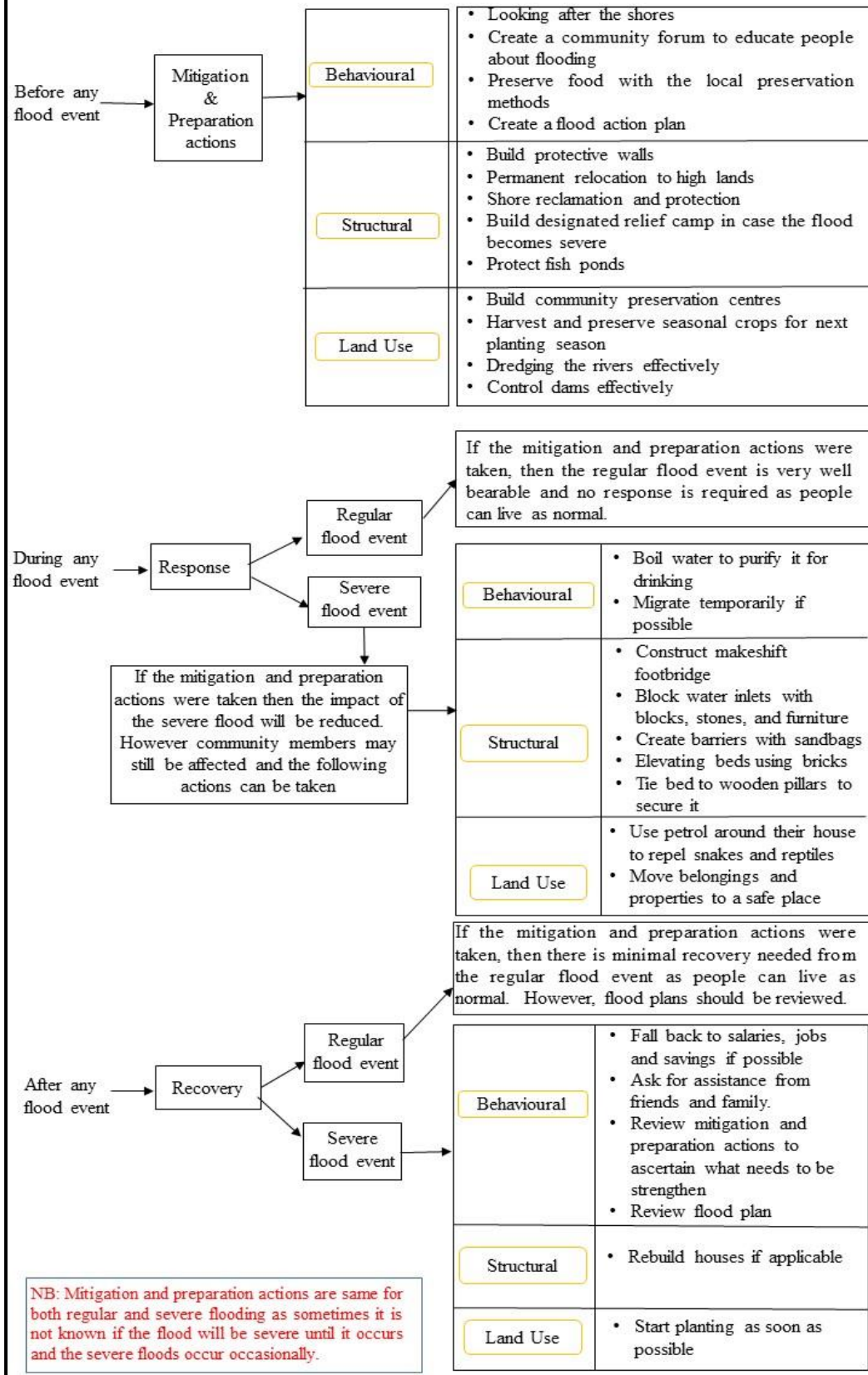


Figure 8. 3: Third framework diagram developed

Appendix 6: Validation Data Collection Informed Consent Form

Name of Researcher: Ngo Orubite (Doctoral Student)

Email: Ngo2.Orubite@live.uwe.ac.uk

Mobile Number: +447599342127

Title of Project: Validation of Flood Risk Management Framework for the Niger Delta Communities of Nigeria

The main aim of this research is to seek your opinion on the development of a Community-Based Flood Risk Management framework in the Niger Delta Region of Nigeria that is expected to improve the flood resilience of the communities if implemented.

To validate this framework, you will be required to answer some interview questions. Your participation in the interview is valuable, and the exercise will take about an hour. However, participating in this research is voluntary; you can opt-out anytime.

Why you have been chosen to participate:

You have been invited to take part in this research because of your connection with either of the following:

- You are a member of one of the Niger Delta Communities
- You are a community leader in one of the Niger Delta Communities
- You are a lawmaker in one of the Niger Delta Communities
- You are a staff of the Nigeria Emergency Management Agency, South-South Region.

Harms and benefits

There are no disadvantages to participating in the interview. It is an opportunity for you to be involved in the development of the Flood Risk Management framework that will improve the flood resilience of the Niger Delta communities. The only risk in the exercise is that your perception may differ from that of other community leaders and participants. Still, you are protected because the details of participants are kept anonymous.

Privacy, anonymity and confidentiality

All the data collected in this research will be securely stored and destroyed after submitting the thesis. All information supplied will be kept from third-party use. Nobody can identify you or any information you have provided from the thesis or further publications. All responses generated from the interview will be anonymous when the findings are presented. The data collection method adopted for the research is designed to provide complete anonymity of participants because no personal information, data- such as name, phone number, date of birth, *etc.* are included in the interview schedule. Furthermore, the reporting format will not link data collected to individual responses.

Future use of information

The research findings will be included in the researcher's final thesis.

Right not to participate and withdraw.

It is up to you to decide whether or not to take part. If you choose to participate, you will be given an information sheet to keep and asked to sign this consent form. If you decide to participate, you can withdraw anytime and without a reason. Deciding to withdraw at any time or not participate will not affect your progress.

Participant declaration

I have read and understood the attached information sheet giving project details.

I have had the opportunity to ask the Researcher any questions about the project and my involvement and understand my role.

My decision to consent is entirely voluntary, and I understand that I can withdraw without giving a reason.

I understand that the data gathered in the project may be used to create a report, publication, or presentation.

I understand that my name will not be used in any report, publication or presentation and that every effort will be made to protect my confidentiality.

Respondent/Participant name (In capital letters)

Respondent/Participant' signature.....

Date dd/mm/yyyy.....

Appendix 7 Framework Modification

What the framework is about

This framework is about the actions that people should take before, during, and after yearly flooding. Annual flooding has been categorised into two categories: regular and severe. The regular one is a flood that just comes and goes without much effect, while the severe one destroys many things and causes lots of discomfort. Please review the different actions and actors and validate the framework by answering these questions.

Interview Questions

1. What do you think of the framework?

2. How do you think the framework can improve the flood resilience in your community?
3. What is your opinion on the practicality of the framework?
4. How do you think this framework can be implemented best?

When I collected my data, the actions were based on what people had told me before, during, and after a regular and severe flood. The actors are the groups responsible for responding to floods in the community.

Framework Word Glossary

Flood action groups: The group would include adult males and females. They are responsible for collectively representing both their compound and the community regarding flood mitigation/preparation, response, and recovery.

Flood Forum: A forum set aside to discuss flooding in the community. This includes the knowledge they share on how to respond before, during, and after a flood event, reflect on past flood events, and share and evaluate people's experiences, responses, and recovery.

Response Action Guide: This guide informs community members what strategies they can employ during a flood event.