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Exploring Resilience Capacity Building Strategies of Flood-vulnerable Communities in the Lower Orashi Region of Niger Delta, Nigeria

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Abstract: The study explored resilience capacity building strategies adopted by flood-vulnerable communities in the Lower Orashi Region of the Niger Delta in Nigeria and provides a comprehensive examination of the various strategies employed by these communities to mitigate and manage the impact of recurrent flooding in the region. The study adopted a quantitative research approach, utilising a descriptive research design for the collection of data. The study employed stratified and simple random sampling techniques to select communities and residents who were interviewed in the study area. A total of 400 respondents were determined from 22 communities that were sampled in the study area using the Taro Yamane formula at a 5% precision level. The study found that the strategies adopted by residents in the study area to build resilience capacity were to relocate to government-designated Internally Displaced Persons (IDP) camps, move to a relative's home during flood events and their reliance on government aid and familial support networks which were mostly considered fair and ineffective, though some residents rated the strategies as effective. To improve on resilience capacity of adopted by the residents, the study suggested the following recommendations including carrying out flood study and analysis of the Orashi region and prepare maritime spatial area plan and establishment of Flood Management Committee; collaboration between the all stakeholders including governments, multi-nationals, communities and NGOs to strengthened the development of sustainable resilience capacity strategies to cope with flood risks and hazards; build flood structural control devices such as levees, dykes, tide gates, flood barriers that will serve as seawalls and embankments to protect the flood-vulnerable communities; design and build IDP camps that meets international acceptable standard to house flood victims during flooding period; and government and communities should collaborate to boost non-structural flood measures such as early-warning signals and not developing close to the coastlines of the communities that are below sea mean level through flood education to reduce the impacts of flood-vulnerability to communities and infrastructures to increase their resilience capacity.

Keywords: *Resilience capacity strategies, flood-vulnerability, lower Orashi region, Niger Delta*

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INTRODUCTION

The Orashi region in Nigeria is known for its vulnerability to floods, which pose significant risks to the communities residing in this area. As floods become more frequent and intense due to climate change, there is a pressing need to

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understand and enhance the resilience capacity of these flood-vulnerable communities (Zabihi, Gheibi, Akrami, & Hajiaghaei-Keshteli, 2023). This research delves into the strategies adopted by these communities to build resilience against floods, aiming to identify effective approaches for managing and mitigating flood disasters in the Orashi region. Floods, characterised by the overflow of water into previously dry areas, are ubiquitous and destructive natural disasters (Ifiok Mfon & Etim, 2022). They are caused by natural forces, such as rainfall, drought, windstorms, and cyclones, as well as human activities, including vegetation removal and settlement expansion ((Badou & Afouda, 2017); (Soetanto & Mullins, 2010)). The Orashi region, particularly susceptible to floods, relies heavily on floodplains for livelihood activities, subsequently exposing its inhabitants to the risks associated with flood disasters.

The consequences of floods extend beyond immediate property damage, affecting infrastructure, crops, animals, and the overall economic and social well-being of the affected communities (Soetanto & Mullins, 2010); (Brown, 2019). Thus, it is crucial to build the resilience capacity of these communities to effectively manage and mitigate flood disasters. This research explores the strategies employed by flood-vulnerable communities in the Orashi region to enhance their resilience. The relationship between floods and public health is a pertinent concern. Enhancing community resilience responses has been recognized as a key approach to reducing health risks associated with floods, with economic and cultural factors playing a significant role (Masten, 2001); (Ochege, Wekpe, & Obafemi, 2016). A combination of hard and soft methods for flood management, including restoring natural river and floodplain functions, involving local communities in river basin management, and capacity-building strategies, prove effective in the long-term management of floods in flood-prone areas (Shaw, Takeuchi, & Rouhban, 2009); (Cirella & Iyalomhe, 2018).

Resilience, as a concept, refers to the ability of social systems to withstand and recover from external shocks induced by environmental, economic, or political crises (Holloway, 2015); (Koike, 2019). Building resilience involves learning, reorganising, innovating, and transforming to adapt to changing circumstances and adversity (Rutter, 1987). Resilience-building strategies are crucial for disaster risk reduction, focusing on enhancing the ability of targeted groups, institutions, communities, and individuals to anticipate, respond to, and recover from adverse events (Paul, 2011). Within flood-prone communities in the global south, there is a growing recognition of indigenous behaviours that contribute to enhancing resilience to floods and other disasters (Olasunkanmi & Ojo, 2020). These communities have developed a series of activities over time, which have become ingrained habits aimed at building resilience. However, despite this collective resilience, individual variations exist, suggesting the presence of specific qualities that contribute to the resilience capacity of individuals within these communities (Ramota Ruth Obagah, 2017).

To address the issue of flooding in the Orashi region, this research incorporates remote sensing and geographical information systems (GIS) to enhance the understanding and management of flood-related challenges (Adriana Keating & Magnuszewski, 2017). These tools enable the integration, manipulation, and analysis of data within a GIS environment, providing valuable insights into flood dynamics and informing effective strategies. The vulnerability of the Orashi region to floods necessitates a comprehensive exploration of the resilience capacity strategies adopted by flood-vulnerable communities. By identifying and understanding these strategies, this research aims to contribute to the body of knowledge on community resilience in flood-prone areas and inform future interventions and policies for sustainable flood management in the Orashi region. Understanding the factors contributing to resilience capacity will be essential in building effective strategies and enhancing the resilience capacity of flood-vulnerable communities in the face of increasing flood risks in the study area.

Objectives of the Study

- Identify the resilience strategies employed by flood-vulnerable communities in the Orashi Region.
- Assess the effectiveness of resilience strategies adopted by residents of the study area.
- Identify opportunities and challenges in implementing and sustaining resilience strategies.
- Identify measures to enhance the resilience capacity strategies for the sustainability of residents coping with flooding activities in the study area.

Scope of the Study

Geographically, the study covered 2 local government areas that are located in the lower part of the Orashi region namely Abua/Odual and Ahoada West LGAs in Rivers State, Nigeria (see Figure 1). The content scope includes identifying the resilience strategies employed by flood-vulnerable communities in the Orashi Region; assessing the effectiveness of resilience strategies adopted by residents of the study area; identifying opportunities and challenges in

implementing and sustaining resilience capacity strategies; and identifying measures to enhance the resilience capacity strategies for sustainability of residents coping with flooding activities in the study area.

The Study Area

The Orashi region, situated within Nigeria's Niger Delta, extends across an expansive area of approximately 70,000 km2, making it one of the largest wetlands globally. This region is characterized by a coastal plain intersected with rivers and tributaries, rendering it highly susceptible to flooding. Remarkably diverse in terms of ecosystems, the Orashi region encompasses various habitats such as lowland rainforests, freshwater swamp forests, mangroves, and coastal barrier islands. The lower Orashi region comprises four distinct local government areas, namely Abua/Odual, Ahoada East, Ahoada West and Ogba/Egbema/Ndoni. It is home to six different ethnic nationalities, each with its unique social, cultural, economic, and political orientations. The region's population primarily engages in agriculture and subsistence fishing to sustain their livelihoods. However, the susceptibility to flooding in the area is influenced by anthropogenic activities like agriculture and oil and gas exploration. The focus of this study centres on understanding the resilience strategies employed by flood-vulnerable communities in the Orashi region. The aim is to investigate and gain insights into the specific strategies implemented by these communities to effectively respond to flood risks. To narrow down the research scope, the study will concentrate on two local government areas: Abua/Odual and Ahoada West, both situated within the lower Orashi region.

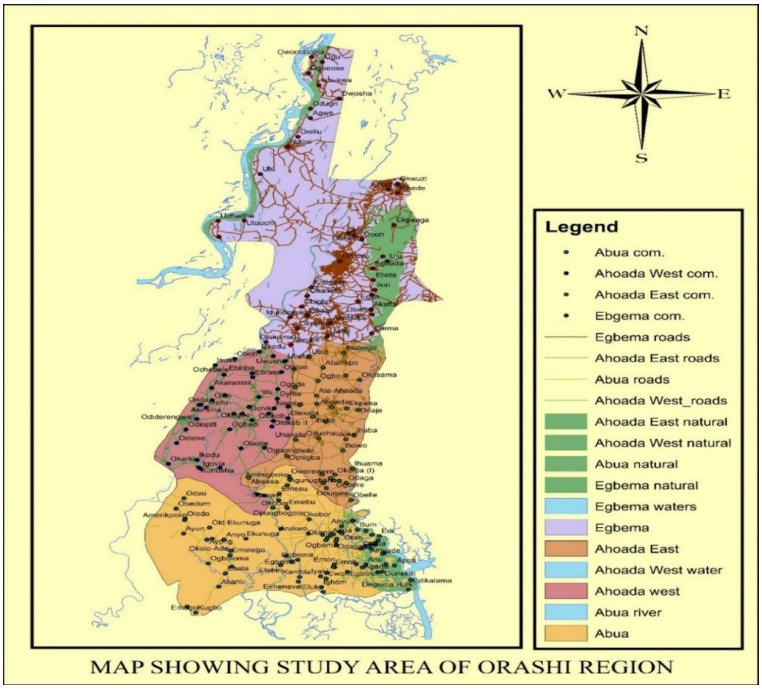

Figure 1 *Map showing Abua/Odual and Ahoada West LGAs and their Communities in the Study Area*
Source: GIS Lab, Department of Urban and Regional Planning, Rivers State University, Port Harcourt, 2023

LITERATURE REVIEW

The literature extensively delves into the complex interplay of factors influencing the resilience capacity of flood-vulnerable communities in the Orashi Region, anchored in the Theory of Overland Flow. This theory, formulated by Robert Horton in 1933, provides a foundational understanding of surface runoff, known as overland flow. This phenomenon occurs when precipitation, stormwater, meltwater, or other water sources cannot infiltrate the soil swiftly enough. The occurrence of overland flow is exacerbated when the soil is saturated, and rainfall exceeds the absorption capacity, especially in urban environments with impermeable surfaces like pavement and roofs (Eze & Abua, 2002).

The introduction of the resilience concept broadens the discussion beyond the physical aspects of flooding to the psychological and social dimensions of community response. Resilience, derived from the Latin term "resilire," signifying elasticity, is explored through various definitions provided by scholars such as (Masten, 2001); (Rutter,

1987); and (Janas, 2002). The flexibility of the term is evident as it is used interchangeably with positive coping, adaptation, and persistence (Greene, 2002). The application of resilience expands beyond ecological contexts and has become a prominent theme in disciplines such as psychology, sociology, environmental planning, economic geography, and disaster studies (Davoudi & Shaw, 2012).

The resilience concept is dissected to focus on the community or system's ability to persevere, absorb, and recover from hazardous events. Adaptability is identified as a core feature of resilience, emphasizing adjustments in natural or human methods in response to adverse stimuli (Frankenberger & Alexander, 2013). The literature underscores the importance of positive outcomes resulting from adaptation after experiencing difficulties. The three crucial characteristics associated with resilience, as highlighted by Carpenter and Brock (2008) and Paul and Routray (2011), include adaptive capacity, self-organization, and redundancy. This nuanced understanding of resilience sets the stage for examining how flood-vulnerable communities in the Orashi Region can develop and utilize resilience strategies.

Resilience capacity, as a key theme, is defined as the ability of individuals, households, communities, and institutions to prepare for, respond to, and recover from shocks and stresses. The three groupings of absorptive, adaptive, and transformative resilience capacities form a framework that enables protected or improved well-being outcomes (Christophe & Suzanne, 2015). The capacity-building process, as outlined by the United Nations International Strategy for Disaster Reduction (UNISDR), involves systematically developing strengths, attributes, and resources within communities, societies, or organisations over time to achieve social and economic goals (Simonov & Egidarev, 2018).

The comprehensive approach to capacity development covers five dimensions of disaster risk management, including natural, man-made, and complex hazards. The strategy extends beyond government sectors to include social, economic, health, educational, infrastructure, productive, environmental, cultural, and regulatory sectors. This holistic perspective emphasises the involvement of all stakeholders, necessitating collaboration between government and non-government organizations, scientific and technical institutions, private and corporate sectors, media, and community-based organisations.

The dimensions of capacity development are further delineated into education, research, training, and awareness. The role of education is highlighted as foundational, incorporating disaster management into school curricula and higher education courses across various disciplines. Research is positioned as a multidisciplinary endeavour, addressing policy and management issues in the realm of disaster risk management. Training is identified as a core function of capacity development, encompassing sensitization programmes, functional and technical skills development, and awareness generation initiatives.

Flood vulnerability, a critical aspect of the literature, is explored through studies examining vulnerability patterns and factors influencing the negative impact of flood hazards. Socio-economic factors, control over assets, and power dynamics play a pivotal role in determining vulnerability. Coping strategies identified by (Paul & Routray, 2011), are linked to indicators such as age, gender, social class, early warning dissemination, locational exposure, external assistance, and social protection. Indigenous disaster prevention and mitigation strategies are acknowledged for their role in minimising vulnerability, with poverty emerging as a key indicator. In essence, the literature provides a comprehensive and interconnected understanding of the resilience capacity of flood-vulnerable communities in the Orashi Region. It navigates through theoretical frameworks, conceptualisations of resilience, practical strategies for building resilience capacity, and the nuanced dimensions of flood vulnerability, shedding light on the multifaceted nature of the challenges and potential solutions in this context.

METHODOLOGY

To obtain information and data for the study, the study adopted a quantitative research approach using descriptive research design to explore the resilience capacity strategies of flood-vulnerable communities in the lower Orashi region of the Niger Delta, Nigeria. The study employed stratified and simple random sampling techniques for data collection. The study area covered 2 LGAs namely, Abua/Odual and Ahoada West LGAs and other communities were stratified into 2 strata (flood-vulnerable and non-flood-vulnerable communities). The study identified 125 communities in the study area of which 109 of these communities were flood-vulnerable communities using Vulnerability Ranking Index (VRI) showing their height level above sea level using 13 metres below sea level to determine the flood-vulnerable communities. A total of 22 communities representing 20% of the identified flood-vulnerable communities were selected for sampling as listed from the 1991 census report with their population (see Table 1). An average household size of 5 persons was derived Matemba and Mwandosya (2023) which was used to determine the number of households in the

selected flood-vulnerable communities for sampling. A total of 400 sample size was achieved using the Taro Yamane formula at a 5% precision level and were proportionately distributed across the 22 communities selected for sampling. A simple random technique was employed to select respondents who were interviewed. Also, remote sensing and physical observations were used to explore the resilience capacity strategies of flood-vulnerable communities of the study area. However, for collation and analysis, 388 questionnaires were retrieved and valid for analysis.

Table 1 *Determination of sample size for the study*

S/No.	Sampled LGAs	Sampled Communities	1991 Population	2023 Population (at 3.2% Growth Rate)	Number of Households (5 Persons per HH)	No. of HH Selected for Sampling
1	Abua/Odual	Emesu	829	2,271	454	10
		Omonema	1,133	3,104	621	13
		Agada	1,315	3,603	721	15
		Odaga	2,718	7,447	1,489	32
		Okolomade	1,675	4,589	918	19
		Gambia	433	1,186	237	5
		Ogonokom	3,305	9,056	1,811	38
		Opugizogolo	220	603	121	3
		Egorbiri	359	984	197	4
		Emumema	444	1,217	243	5
		Anyu	1,584	4,340	868	18
		Digriga	1,927	5,280	1,056	22
		Akani	2,373	6,502	1,300	28
		Serebia	1,361	3,729	746	16
2	Ahoada West	Odieke	371	1,017	203	4
		Ochika	813	2,228	446	9
		Ogbedi	1,589	4,354	871	18
		Ubeta	3,689	10,108	2,022	43
		Oshiobele	341	934	187	4
		Emezi II	762	2,088	418	9
		Okarki	5,332	14,610	2,922	62
		Oyigba	1,796	4,921	984	21
	Total		34,369	94,171	15,695	400

Source: NPC, 1991; NBS, 2016; Researchers Computation & Compilation, 2023

RESULTS AND FINDINGS

Resilience capacity building strategies of flood-vulnerable communities

Table 2 revealed the resilience strategies capacity of flood-vulnerable communities of the study area. The responses in the data, as presented in Table 2, indicates that in Abua/Odual LGA the modal resilience capacity building strategies adopted by most residents in the event of flood menace include relocating to any government designated IDP (internally displaced persons) camp and home of relative accounted for 29.4% and 16.5%, respectively while in Ahoada West LGA the most adopted resilience strategies were relocating to home of relative and government-designated IDP camp represented by 17.5% and 15.5%, respectively. These modal resilience strategies adopted by residents of the study area accounted for 78.9% of the responses. Also, relocating to government designated IDP camps as the most adopted strategy accounting for 44.9% of the responses. Another resilience capacity building strategy adopted by some of the residents was to places of worship (churches) accounted for 11.1% of the responses. This strategy is used more in Ahoada West LGA accounts for 5.9% while Abua/Odual LGA accounts for 5.2% of the distribution. Some other

residents opted for others which include relocating to educational and healthcare facilities, civic centres, and community halls and elevation of their buildings using pier technology represented by 8% in the distribution. However, this strategy is used more in Abua/Odual LGA accounts for 5.2% of the responses while 2.8% of the residents of Ahoada West indicated using this strategy. The least adopted resilience strategy as indicated by the residents was do not move to anywhere accounting for 2.1% of the responses which was indicated more by residents of Abua/Odual LGA in the data distribution.

Presenting an immediate and promising short-term solution to flooding and vulnerability, the relocation to government designated IDP camps or a relative's home during flood events has proven significantly effective in abating immediate physical harm to the community members. These strategies undeniably underscore their reliance on government aid and family support networks, reinforcing the vital roles these institutions play in crisis management considering political and social capitals as platforms to cope with flood-related activities by the communities. From the study findings, the exploration of resilience capacities building strategies for flood vulnerability in the lower Orashi region provides valuable insights into the communitys resilience strategies and measures to adapt to flood risks and hazards. These findings could guide the development of more refined flood management strategies and robust disaster risk reduction frameworks available.

Table 2 *Resilience strategies of flood-vulnerable communities*

S/No.	Resilience Strategies of Flood-vulnerable Communities	Abua/Odual		Ahoada West		Aggregate	
		N	%	N	%	N	%
1	To government designated IDP camp	114	29.4	60	15.5	174	44.9
2	To the home of a relative	64	16.5	68	17.5	132	34
3	Do not move anywhere	5	1.3	3	0.8	8	2.1
4	To place of worship	20	5.2	23	5.9	43	11.1
5	Others (specify)	20	5.2	11	2.8	31	8
	Total	223	57.6	165	42.5	388	100

Source: Researchers Field Survey, 2023

Effectiveness of the resilience capacity building strategies adopted by residents

Findings from the study as evident in Table 3 indicate the effectiveness of the resilience strategies adopted by residents of the flood-vulnerable communities in the study area. The data indicated that residents rated the effectiveness of the resilience strategies as mostly fair accounting for 62.6% of the responses. Residents of Abua/Odual LGA were the people who mostly indicated the strategies as fair accounting for 39.9% of the responses while 22.7% of the residents of Ahoada West also indicated the option. Other residents rated the effectiveness of the resilience strategies adopted in the incidence of flood in the communities as ineffective accounting for 22.7% of the responses. This figure is shared by the 2 LGAs with Ahoada West LGA accounting for 12.3%, while Abua/Odual LGA has10.3% of the responses. The lowest rating by the residents was effectively represented by 14.7% of the responses which there was a slim difference between both LGAs in the study area in terms of responses. However, none of the residents in their responses indicated very effective and very ineffective as displayed in the data presented.

The implementation of local resilience capacity strategies in the Orashi region by communities has shown a range of successful outcomes and useful insights from residents ratings of the effectiveness of available strategies. From the preference of community members to relocate to safer areas, to the reliance on non-government organisations and government agencies, various adaptive measures have been taken to manage flooding risks and hazards. The effectiveness of these strategies and their outcomes that have been evaluated by the residents need to be improved upon and foster more sustainable strategies to safeguard communities during flooding periods.

Opportunities and Challenges in Implementing and Sustaining Resilience Capacity Building Strategies

Table 4 of the study data revealed the opportunities to implement and sustain resilience strategies to enhance the resilience capacity of residents of the study area. From the findings, the modal opportunity suggested by the residents was the preparation of a floodplain development plan for the area accounted for 30.8% of the responses and 16.8% of the responses came from the residents of Abua/Odual LGA. Similarly, Ahoada West LGA residents accounted for

Table 3 *Effectiveness of Resilience Strategies Adopted by Residents*

S/No.	Effectiveness of Resilience Strategies	Abua/Odual		Ahoada West		Aggregate	
		N	%	N	%	N	%
1	Very effective	0	0	0	0	0	0
2	Effective	28	7.2	29	7.5	57	14.7
3	Fair	155	39.9	88	22.7	243	62.6
4	Ineffective	40	10.3	48	12.3	88	22.7
5	Very ineffective	0	0	0	0	0	0
	Total	223	57.4	165	42.5	388	100

Source: Researchers Field Survey, 2023

13.9% of the responses. Other opportunities indicated by the residents were the construction of flood control structural devices, the establishment of a flood management agency and education of the residents on flood activities accounted for 24.5, 19.3% and 13.9%, respectively. Amid these opportunities, residents from Abua/Odual LGA have the modal options from responses. The least opportunity suggested by the residents was regularly studying flood activities in the area accounted for 11.6% of the responses, though there was slim variance from the responses of the residents of the Abua/Odual and Ahoada West LGAs represented by 5.9% and 5.7%, respectively in the distribution. The flood control structural devices mentioned by residents were the building of levees, dykes, flood barriers and clearing of waterways and construction and channelling of drainages in the study area. Some of the education on flood activities includes avoiding developments within water channels, consideration of warning signals, and relocation from flood risk areas. These strategies helped to stimulate community bonds and foster community relationships with government agencies, multinationals and NGOs as stakeholders that usually help during flood periods to the communities and residents as resources are mobilised towards helping flood vulnerable areas.

There are some inherent challenges indicated by some residents that obstruct the implementation and sustainability of resilience capacity building strategies to cope with and combat flooding activities in the study area. The study reveals in Table 5 that the modal challenge is the area is low-lying nature of the terrain accounting for 36.1% of the responses. Although, 22.2% of the residents of Abua/Odual LGA indicated this challenge while 13.9% of the responses were from the residents of Ahoada West. The other challenges as indicated by the residents were poor drainage facilities, excessive rainfall and blockage of waterways accounted for 30.9%, 27.8% and 3.1%, respectively. The least response got from the residents challenges indicates that people do not respond to warnings to relocate from their abodes from flood early warning. These challenges oftentimes hinder the implementation of flood risk identification and management procedures and militate against flood resilience capacity building in flood prone communities within the study area. However, challenges such as low-lying areas and excessive rain are natural phenomena with frequent occurrence. Opportunities such as regular study of flood activities, preparing a floodplain plan, establishment of specialised agency, construction of flood control devices and education of the communities will provide a more sustainable and effective approach to cope and build resilience capacity to deal with flood activities in the region.

Table 4 *Resilience strategies of flood-vulnerable communities*

S/No.	Opportunities to Implement and Sustain Resilience Strategies	Abua/Odual		Ahoada West		Aggregate	
		N	%	N	%	N	%
1	Regular studying flood activities in the area	23	5.9	22	5.7	45	11.6
2	Construction of flood control structural devices	57	14.7	38	9.8	95	24.5
3	Education of the residents on flood activities	41	10	13	3.3	54	13.9
4	Preparation of floodplain development plan	65	16.8	54	13.9	119	30.8
5	Establishment of flood management agency activities	37	9.6	38	9.8	75	19.3
	Total	223	57.6	165	42.5	388	100

Source: Researchers Field Survey, 2023

Table 5 *Resilience strategies of flood-vulnerable communities*

S/No.	Challenges to Implement and Sustain Resilience Strategies	Abua/Odual		Ahoada West		Aggregate	
		N	%	N	%	N	%
1	No drainage facility	4	1	8	2.1	12	3.1
2	Blockage of waterways	0	0	8	2.1	8	2.1
3	The area is low-lying	86	22.2	54	13.9	140	36.1
4	Excessive rainfall	108	27.8	0	0	108	27.8
5	Other (specify)	25	6.4	95	24.5	120	30.9
	Total	223	57.4	165	42.6	388	100

Source: Researchers Field Survey, 2023

CONCLUSION

Conclusively, the study on exploring the resilience capacity building strategies of flood-vulnerable communities in the Lower Orashi region has unveiled a plethora of strategies that these communities adopt to minimize the impact of floods and improve their ability to cope with and recover from such disasters in the region. The reliance on government assistance for relocation to IDP camps and the role of community and family support systems, move to places of worship and other facilities in the community such as educational and healthcare facilities, community halls and civic centres during flood situations emerged as key aspects of building resilience capacity strategies of the communities during flood periods. The study also highlighted how effective these strategies are to the communities but require more improved and sustainable strategies to cope with flood activities and increase communities resilience capacity. The study has further highlighted opportunities that should be utilised by communities, government, and other stakeholders to improve the resilience capacity including preparing floodplain development plan, construction of flood control structures, provision of flood management agency, regularly studying of the region on flooding activities and public enlightenment of the communities. Also, challenges that may distort the implementation and sustenance of resilience capacity building strategies such as the terrain of the region, excessive rainfall and communities not adhering to the advice of the government not to build with in flood prone areas in the region. However, from these findings, there is a need to improve the resilience capacity strategies of communities that are flood-vulnerable in the region to improve sustainability in their approaches and cope with flooding activities in the region. Therefore, the study has suggested sustainable, effective, and workable approaches to enhance the resilience capacity building strategies of communities in the study area.

RECOMMENDATIONS

i. The government should carry out a flood study and analysis of the Lower Orashi region and prepare a maritime spatial area plan. The government should establish a Flood Management Committee that will take cognizance of the opportunities and challenges to improve communities resilience capacity strategies adopted in the study area. There should be collaboration among stakeholders including governments, multinationals, communities and NGOs to strengthen the development of sustainable resilience capacity strategies to cope with flood risks and hazards in the study area. The government and its development agencies should collaborate with other investors to build flood prevention structures such as levees, dykes, tide gates, and flood barriers that will serve as seawalls and embankments to protect flood-vulnerable communities in the study area.

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