

Understanding and Addressing Economic and Non-economic Loss and Damage from Climate Related Disasters in Southwestern Coastal Bangladesh



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We would like to express our sincere gratitude to all those who contributed to the successful completion of the study titled ***"Understanding and Addressing Economic and Non-Economic Loss and Damage from Climate Related Disasters in Southwestern Coastal Bangladesh."***

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Finally, we recognize the contributions of individuals and organizations working tirelessly to promote inclusive, resilient, and sustainable agricultural practices across Bangladesh. We hope this study contributes meaningfully to ongoing efforts toward climate justice, inclusive development, and sustainable agriculture in the face of increasing climate risks.

Executive Summary

This study identifies and assesses the economic and non-economic loss and damages (L&D) experienced by coastal communities in Bangladesh due to climate-induced disasters. The findings reveal profound impacts on livelihoods, health, infrastructure, and social cohesion, emphasizing the urgent need for comprehensive and inclusive recovery strategies. The most common economic losses reported were infrastructure damage (86.92%), income loss (84.11%), and property damage (66.36%), with only 2.49% of respondents reporting no economic losses. Non-economic losses were equally severe, with 84.42% of respondents reporting communication and infrastructure disruptions, 82.55% facing challenges in accessing water, sanitation, and hygiene (WASH), and 62.62% experiencing disruptions in medical services. Physical health issues affected 69.78% of respondents, while 50.47% reported mental health challenges, including anxiety and depression. Educational disruptions impacted 39.25% of respondents, and 14.02% noted the erosion of indigenous knowledge, further undermining community resilience.

In the short term, economic strain, displacement, and disrupted daily activities were immediate consequences, with waterborne diseases and poor sanitation exacerbating health challenges. Long-term impacts included permanent displacement, chronic health issues, slow economic recovery, and food insecurity, with mental health challenges such as anxiety and depression persisting across communities. Barriers to addressing L&D included ineffective government policies (69.47%), limited disaster relief funding (61.37%), and bureaucratic delays (41.43%) for economic recovery, while limited focus on mental health services (70.4%) and weak community support systems (23.36%) hindered non-economic recovery. Proposed solutions emphasized disaster-specific financial relief programs (84.42%), community savings

initiatives (47.98%), and integrating mental health programs (57.63%) into recovery frameworks.

Existing strategies were largely deemed ineffective, with personal strategies viewed as somewhat effective for economic (43.93%) and non-economic (51.09%) recovery, while community-based and formal strategies were seen as ineffective by 78.5% and 85.36% of respondents, respectively. Policy and programmatic gaps highlighted the lack of localized adaptations in existing frameworks, such as the Standing Orders on Disaster (SOD) and Climate Change Policy, and the absence of systemic approaches to address non-economic losses like mental health and cultural preservation. The proposed ACCESS L&D Framework integrates economic and non-economic dimensions into disaster recovery, emphasizing sector-specific interventions in WASH, health, education, agriculture, and infrastructure, while prioritizing vulnerable populations and promoting community-based resilience.

Recommendations include establishing community-managed seed banks and subsidized crop insurance for agriculture, integrating mental health and psychosocial support services (MHPSS) into health sector responses, and prioritizing disaster-resilient designs for schools and healthcare facilities in infrastructure planning. Governance improvements should focus on expanding damage assessment tools to include non-economic losses and establishing a multi-sectoral disaster task force to enhance coordination. Engaging the private sector through tax incentives and CSR initiatives, as well as securing international funding for localized climate-resilient projects, such as urban greening and water retention systems, are also critical. By adopting these holistic, inclusive, and coordinated approaches, Bangladesh can build resilience and support long-term recovery for disaster-affected communities.

Contents

EXECUTIVE SUMMARY	3
1. INTRODUCTION	8
1.1 Context and Background	8
1.2 Study Objectives	8
1.2.1 Main Objective	8
1.2.2 Specific objectives	8
1.3 Research Questions	9
2. LITERATURE REVIEW	10
2.1 Loss and Damage: Key Concepts ¹⁹	10
3. CONCEPTUAL FRAMEWORK	12
3.1 Identification and Assessment of Economic and Non-Economic Losses and Damages	13
3.1.1 Categorizing the Economic and Non-Economic Losses and Damages	13
3.1.2 Assessment of Barriers and Potential Solutions	13
3.2 Examination of Local Response Methods and Strategies and Its Effectiveness	13
3.2.1 Identification of Various Methods and Strategies in Reducing Losses and Damages	13
3.2.2 Assess the Effectiveness of Local Response Methods and Strategies	13
3.3 Policy and Intervention Guidance	13
3.3.1 Policy briefs	13
3.3.2 Recommendations for Policymakers	14
3.4 Framework Development and Recommendation	14
3.4.1 Comprehensive Framework Development	14
3.5 Research Matrix	14
4. METHODOLOGY	15
4.1 Preliminary Field Visit and Discussion with Project Team	15
4.2 Desk Review	15
4.3 Sampling Techniques	15
4.4 Sample Distribution	15
4.5 Ethical approval and consent of the participants	16
4.6 Data Collection Procedure	16
4.6.1 Quantitative Data Collection	16
4.6.1.1 Semi-structured Questionnaire for the Household Survey	16
4.6.1.2 Mobile App-based Survey	17
4.6.2 Qualitative Data Collection Tools	17
4.6.2.1 Key Informant Interviews (KII)	17
4.6.2.2 Focus Group Discussions (FGDs)	17
4.7 Data Management	17
4.8 Challenges and Limitations	17
5. RESEARCH AREA	19
6. RESULTS AND DISCUSSION	21
6.1 Socio-demographic Information	21
6.2 Socio-economic Information	23
6.3 Climate and Disaster Related Information	24
6.4 Identification and Assessment of Various Types of L&D	25
6.4.1 Economic Loss & Damage (ELD)	25
6.4.2 Non-economic Loss & Damages (NELD)	26
6.4.3 Severity of Various NELD	26
6.4.4 Impact of Various Types of NELD on Life and Livelihoods	27
6.4.4.1 Education	27
6.4.4.2 Communication	27
6.4.4.3 Mental and Emotional Well-being	28
6.4.4.4 Indigenous and Local Knowledge	28
6.4.4.5 Culture and Practices	28
6.4.4.6 Social Fabric	28
6.4.4.7 Access to WASH Services	28

6.4.4.8 Ecosystem Services and Biodiversity	29
6.4.4.9 Medical Services	29
6.4.4.10 Physical Health	29
6.4.4.11 Territory	30
6.4.4.12 Human Mobility	30
6.4.5 Barriers to Addressing the Various Types of Loss and Damage (L&D)	32
6.4.5.1 Barriers to Address Economic Loss and Damage (ELD)	32
6.4.5.2 Barriers to Address Non-Economic Loss and Damage (NELD)	32
6.5 Methods and Strategies to Address ELD and NELD	34
6.5.1 Methods and Strategies to Address ELD	34
6.5.1.1 Formal and Informal Support Strategies	34
6.5.1.2 Community-based Coping Mechanisms	34
6.5.1.3 Personal Financial Strategies	34
6.5.2 Methods and Strategies to Address NELD	35
6.5.2.1 Physical Health	35
6.5.2.2 Ecosystem Services and Biodiversity	35
6.5.2.3 Mental and Emotional Well-being	35
6.5.2.4 Medical Services	36
6.5.2.5 Human Mobility	36
6.5.2.6 Access to WASH Services	36
6.5.2.7 Territory	36
6.5.2.8 Social Fabric	36
6.5.2.9 Culture and Practices	36
6.5.2.10 Indigenous and Local Knowledge	36
6.5.2.11 Education	37
6.6 Policy and Programmatic Gaps in Addressing L&D	39
6.6.1 Current Policy Frameworks for Addressing Loss and Damage	39
6.6.2 Significant Gaps in Response Mechanisms	39
6.6.3 Overlooked Aspects of Loss and Damage	40
6.6.4 Recommendations for Sector-specific Interventions	40
6.7 L&D Framework	41
6.7.1 WASH (Water, Sanitation, and Hygiene)	41
6.7.2 Health & Well-being (Physical and Mental Health Issues)	42
6.7.3 Disruption in Communications	42
6.7.4 Education	43
6.7.5 Loss of Agricultural Productivity	43
6.7.6 Loss of Territory	43
6.7.7 Environmental Impacts	44
6.7.8 Human Mobility (displacement and migration)	44
7. FUTURE RESEARCH DIRECTION	45
8. RECOMMENDATIONS	47
9. CONCLUSION	48
2. ANNEXURES	51

List of tables

Table no.	Title	Page no.
Table 1	Study participant selection and sample size distribution.	16
Table 2	Socio-demographic characteristics of the respondents	21
Table 3	Socio-economic information of the respondents	39

List of Figures

Figure no.	Title	Page no.
Figure 1	Flow chart of the variables considered and their assessment methods (ELD, Economic loss & damage; NELD, Non-economic loss and damage).	12
Figure 2	Study area location.	20
Figure 3	Different types of ELD identified in the studied area.	25
Figure 4	Different types of NELD identified in the studied area.	26
Figure 5	Severity of various NELD experienced in the studied area due to climate-induced events.	27
Figure 6	Short and long-term impacts of L&D on life and livelihoods.	31
Figure 7	Barriers faced in addressing ELD & NELD by respondents.	33
Figure 8	Various types of strategies for addressing ELD	35
Figure 9	Various types of strategies for addressing NELD adopted by respondents.	38

Abbreviations

CSR	Corporate Social Responsibility
ELD	Economic Losses & Damages
FAO	Food and Agriculture Organization
FGDs	Focus Group Discussions
GDP	Gross Domestic Product
GOs	Governmental Bodies
IPCC	Intergovernmental Panel on Climate Change
KIIs	Key Informant Interviews
MHPSS	Mental Health and Psychosocial Support Services
NELD	Non-Economic Losses and Damages
NGOs	Non-Governmental Organizations
PTSD	Post-Traumatic Stress Disorder
SOD	Standing Orders on Disaster
SOP	Standard Operating Procedure
UDMC	Union Disaster Management Committee
UNDP	United Nations Development Programme
UNDRR	United Nations Office for Disaster Risk Reduction
UNFCCC	United Nations Framework Convention on Climate Change
WASH	Water, Sanitation, and Hygiene
WHO	World Health Organization

1.

Introduction

1.1 Context and Background

Bangladesh has ranked 7th most vulnerable of the most climate-vulnerable countries in the world, according to the IPCC 2021 report (IPCCAD, 2022). Over the past three decades, the country has suffered nearly \$16 billion in GDP losses due to approximately 200 climate-related disasters, leading to extensive property damage, disrupted livelihoods, infrastructure collapse, agricultural loss, and significant mortality (Malakar and Mishra, 2017). The southwest coastal region of Bangladesh is particularly vulnerable to climate-induced impacts due to tropical cyclones, storm surges, and floods and the recent growing concern of soil and water salinity (Shaibur et al., 2021). Projections indicate that about 13.3 million people may become climate refugees, forced from their homes due to extreme weather events by 2050 (McDonnell, 2019).

While the economic losses & damages (ELD) associated with climate-related disasters have gained increased attention, the non-economic losses and damages (NELD) (e.g., human life, physical health, mental and emotional well-being, territory, culture and practices, indigenous and local knowledge, ecosystem services and biodiversity, social fabric, education, mobility, sexual harassment) remain critically underexplored. Slow-onset events such as salinization, sea-level rise, increasing temperatures, depletion of groundwater etc. also lead to NELDs (UNFCCC, 2013). NELDs can have long-lasting effects on

mental health, education, ecosystems, cultural heritage, and community cohesion (Islam et al., 2022). Although the Bangladeshi government has improved post-disaster recovery efforts focused on tangible damages, such as rebuilding infrastructure and agricultural land, the profound impacts of NELD, including deterioration in mental health among the affected, disruption to education, damage to ecosystems, and loss of community networks, loss of cultural heritage, displacement, and human mobility, loss of Indigenous knowledge, have not been adequately addressed in current risk reduction strategies (DMB, 2010). While studies have examined the ELD resulting from disasters (UNB, 2021), the consideration of NELD has been significantly neglected. There is a significant knowledge gap in how NELDs are experienced and addressed, especially in the southwest coastal region.

This study aims to address this gap by conducting a comprehensive analysis of ELD and NELD resulting from climate-related disasters in the southwestern coastal region of Bangladesh. It will evaluate local responses to these impacts, exploring how communities cope with disruptions to their social and cultural fabric, and assessing the effectiveness of existing management practices. The research will also offer recommendations for improving the management of non-economic losses and enhancing policy responses to better support affected communities.

1.2 Study Objectives

1.2.1 Main Objective

To conduct a comprehensive study on economic and non-economic losses and damages from climate-related disasters in southwestern coastal Bangladesh, focusing on identifying impacts, assessing local responses, and developing a framework for mitigation and policy implementation.

1.2.2 Specific objectives

- Identify economic and non-economic loss and damage experienced by climate-related disasters and factors hindering effective responses.
- Examine the methods and strategies employed by individuals and communities to manage economic and non-

economic impacts.

- Evaluate the effectiveness and adequacy of local response mechanisms for economic and noneconomic loss and damage, highlighting any gaps or challenges.
- Generate context-specific data to guide the development of targeted policies and interventions.
- Develop a framework for mitigating economic and non-economic losses and damages, with recommendations for policy implementation from national to local levels.

1.3 Research Questions

- What are the economic and non-economic losses and damages experienced by communities due to climate-related disasters in southwestern coastal Bangladesh?
- How effective and adequate are the local response mechanisms in addressing economic and non-economic losses and damages?
- What framework and policy recommendations can be developed to mitigate economic and non-economic losses and damages from climate-related disasters in southwestern coastal Bangladesh?

2.

Literature Review

2.1 Loss and Damage: Key Concepts¹⁹

Loss and damage relate to the destructive impacts of climate change that cannot be avoided through mitigation (avoiding and reducing greenhouse gas emissions) or adaptation (adjusting to current and future climate change impacts).

Loss and damage are often defined as those adverse impacts that are incurred when 'limits to adaptation' are reached. These include 'soft' limits – when adaptation options exist but communities do not have the resources or capacity needed to pursue them – and 'hard' limits – when there are no reasonable prospects for avoiding intolerable risks.

Loss – such as loss of life, biodiversity, cultural heritage and Indigenous Peoples' knowledge – cannot be recovered, while damage can be either restored or repaired – for example, damage to physical infrastructure such as houses, schools, hospitals, roads and bridges or disruption to social support networks.

Loss and damage can result from sudden onset events and weather extremes, such as cyclones, flash flooding or heatwaves, and from slow-onset events, such as sea level rise, desertification, glacial retreat, land degradation, ocean acidification and salinization.

Economic loss and damage are those affecting resources, goods and services that are commonly traded in markets and/ or have a market or economic value to the community, such as damage to critical infrastructure and property or supply chain disruptions. They can be on a transnational, national or local scale and include impacts on individual farmers, entire communities or transboundary resources and value chains.

Non-economic loss and damage can be the most

devastating and may include the incalculable toll of losing family members, the disappearance of cultures and ways of living, or the trauma of being displaced or compelled to migrate from ancestral homes. While harder to quantify and monetize, noneconomic loss and damage hold significant value to people and have severe and detrimental effects on physical and mental health and overall well-being.

2.2. Impacts on livelihood and human life

Bangladesh is highly disaster-prone, regularly impacted by cyclones, including those in 1970, 1991, 2007, and 2009. A spatial risk assessment study found that while cyclone-related fatalities have dramatically decreased—from 0.3 million in 1970 to a few thousand in recent events—vulnerable populations along the southwestern coast remain at high risk, particularly in coastal islands and major inland rivers. The study showed that risk is highest in areas along the land–sea boundary, and while cyclone shelters help protect many communities, patterns of infrastructure quality and road networks create complex capacity variations [1]. For example, the super cyclone Sidr in 2007 caused 3,406 fatalities and affected 2.3 million households, with total losses estimated at approximately US\$450 million [2]. Similarly, Cyclone Aila induced widespread economic impacts in coastal sub-districts. Abdullah et al. (2016) found that higher-income groups were more vulnerable to cyclone hazards and less resilient, and post-cyclone income levels tended to equalize across income groups in severely affected areas [3].

2.3. Health impacts and community well-being

Climate-related disasters in southwestern coastal Bangladesh have profound impacts on community health, affecting both physical wellbeing and mental health, and contributing to broader non-economic losses. Salinity intrusion into freshwater sources has led to significant health issues in the region. A study by Bhowmik (2024) documented non-economic impacts, including gradual erosion of social cohesion, increased prevalence of mental health issues, long-term physical health consequences, heightened insecurity, and depletion of fertile topsoil [4]. A study by Rafa et al. (2021) reported that salinity intrusion and damage to water and sanitation facilities following cyclones led to outbreaks of infectious diseases, including diarrhea and skin infections, among coastal communities in Bangladesh. Similarly, Paul et al. (2011) reported that post-cyclone illness was a significant indirect impact, identifying diarrheal diseases, respiratory infections, typhoid, skin diseases, fever, and corneal infections among affected populations [5]. Paul (2022) also reported that soft-tissue injuries, fractures, and dislocations were common during cyclones, primarily caused by falling trees and windborne debris [6]. A study by Kabir et al. (2019) reported that environmental stressors caused by sea-level rise in coastal Bangladesh were linked to heightened psychological health problems, including distress, depression, anxiety, and stress. The study further indicated that participants' perceived loss of resources may play a mediating role in the relationship between sea-level rise and mental health outcomes [7]. A study reported that communities in Satkhira and Khulna districts of southwestern Bangladesh experienced higher levels of psychological distress, depression, anxiety, and stress during the post-monsoon period, particularly in areas highly vulnerable to sea-level rise. The study further noted that increased environmental stressors and perceived resource losses in these communities contributed significantly to the observed deterioration in mental health [8].

2.4. Ecosystem services and biodiversity loss

Ecosystem services play a critical role in supporting livelihoods and reducing vulnerability in coastal Bangladesh. A study by Bhowmik (2024) estimated that economic losses from climate-related events, particularly in provisioning ecosystem services like rice and fish, ranged from US\$28 to US\$419 per household in island areas [4]. Haq et al. (2012) found that trees with shallow roots and large crowns were more susceptible to damage during climate events compared to those with deeper taproots and well-shaped canopies, highlighting the vulnerability of certain ecological structures [9]. Similarly, the degradation of mangroves, wetlands, and other coastal ecosystems not only reduces protective buffers against storm surges but also affects food security, aquaculture, and cultural services [10].

2.5. Social and cultural impacts

Migration and displacement also cause cultural and social losses. A study by Naz et al. (2024) reported that coastal households in Khulna and Satkhira often rely on seasonal or temporary migration as an adaptive response to gradual climate impacts such as rising temperatures and salinity. The study further found that permanent migration is usually driven by severe climate events, including cyclones and riverbank erosion, where adaptation options are limited. Social networks played a significant role in shaping migration decisions, although some individuals chose to remain in rural areas due to emotional attachment to ancestral land and the high costs of urban living [11]. Further, a study on Cyclone Aila (2009) in Satkhira and Khulna show that disaster severity influenced migration, with non-migrants staying due to economic ties, social bonds, and emotional attachment, while migrants sought safety, healthcare, and education. Migrant households exhibited higher adaptive capacities in food security, housing, agriculture, and livelihoods compared to non-migrants with limited coping options [12].

3.

Conceptual Framework

This study adopts the conceptual framework presented in Figure 1, which illustrates the interconnections among the core concepts guiding the research. The framework supports a systematic investigation into both economic and non-economic losses and damages (ELD & NELD) resulting from climate-induced hazards. It organizes the study into four key steps: (1) identification and assessment of ELD & NELD, (2) examination of local response methods and strategies, (3) formulation of policy and intervention guidelines, and (4) development of an integrated framework with practical policy implementation recommendations.

To operationalize this framework, a mixed-methods approach was employed, incorporating desk reviews, household surveys, key informant interviews (KIIs), and focus group discussions (FGDs). The study considered a broad array of variables categorized into domains such as economic and non-economic factors, environmental influences, institutional barriers and potential solutions, locally adopted adaptation strategies, community response effectiveness, and policy considerations. Together, these elements provide a comprehensive understanding of the dynamics of loss and damage and offer evidence-based pathways for building resilience and informing policy.

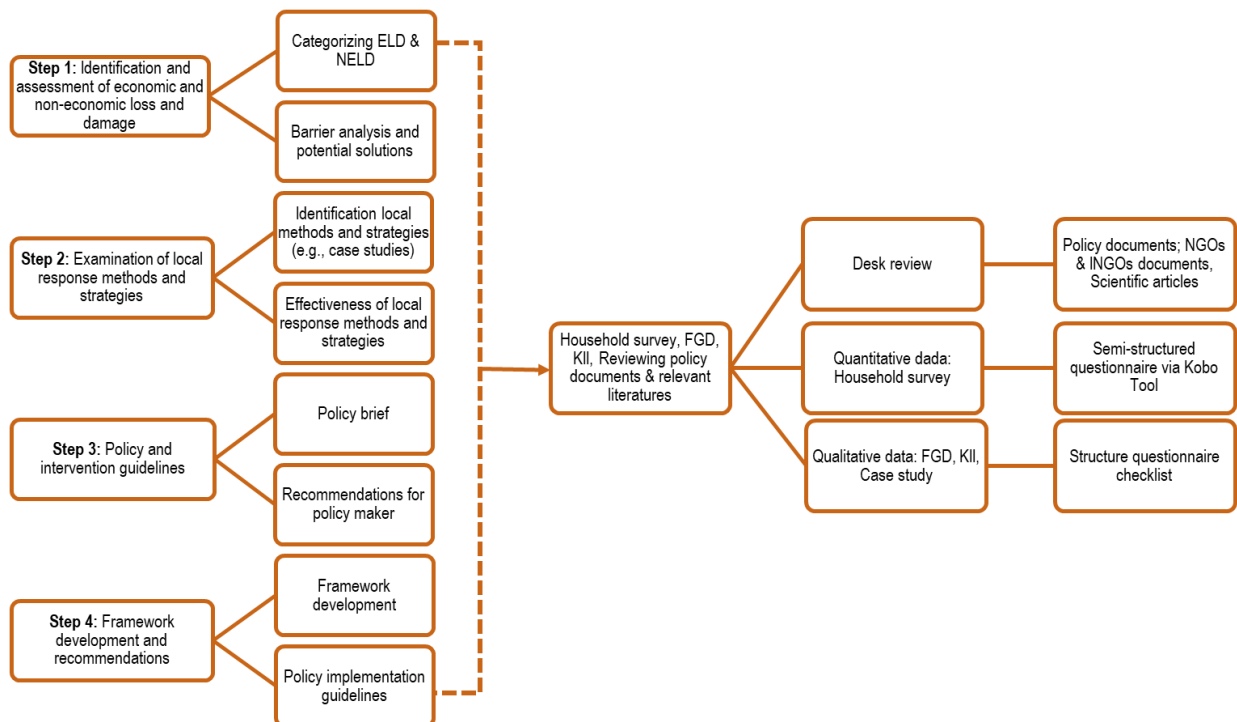


Figure 1. Flow chart of the variables considered and their assessment methods (ELD, Economic loss & damage; NELD, Non-economic loss and damage).

3.1 Identification and Assessment of Economic and Non-Economic Losses and Damages

3.1.1 Categorizing the Economic and Non-Economic Losses and Damages

The first step in our assessment involved identifying and categorizing the key variables associated with economic and non-economic loss and damages due to disasters. Economic factors encompassed the quantifiable losses experienced by individuals and communities during natural disasters. This included factors such as income loss, property damage, infrastructure damage, job loss, investment loss, and recovery costs, all of which directly impacted the livelihoods of affected communities. Non-economic loss and damage (NELD) were less quantifiable but equally important in understanding the holistic impact of disasters. For this assessment, we considered non-economic factors, including human life, physical health, mental and emotional well-being, human mobility, loss of territory, culture and heritage, indigenous and local knowledge, place attachment and sense of place, and social cohesion, which were equally critical but often overlooked in traditional assessments. Furthermore, environmental factors like loss of biodiversity, ecosystem

degradation, and resource depletion were evaluated to understand the longer-term implications of NELD, as these factors could undermine the foundational resources communities relied on for recovery and sustainability.

3.1.2 Assessment of Barriers and Potential Solutions

The Barrier Analysis and Solution section examined the factors impeding effective responses to economic and non-economic loss and damage (NELD) in the study areas. This assessment focused on identifying institutional, economic, environmental, and social barriers. Institutional barriers centered on issues such as policy effectiveness, funding availability, and the capacity of local governance frameworks. To address these barriers, solutions were proposed based on stakeholder and community consultations. These included recommendations for improving policy frameworks, enhancing disaster preparedness, building financial mechanisms for rapid response, and strengthening community networks.

3.2 Examination of Local Response Methods and Strategies and Its Effectiveness

3.2.1 Identification of Various Methods and Strategies in Reducing Losses and Damages

In this step, to deepen our understanding of the impacts of climate-related disasters, we used both quantitative and qualitative interview in selected study communities in southwest coastal Bangladesh that have been affected by various disasters, including cyclones, storm surges, and salinity intrusion. Each case study will focus on several critical aspects. **First**, we explored community characteristics, gathering demographic and socio-economic data to assess the level of community cohesion before and after these disaster events. **Second**, we examined coping mechanisms, documenting the strategies employed by individuals and communities to manage damages and losses. This will include an exploration of traditional practices, community-based interventions, and support from external sources such as government agencies and

local non-government organizations. **Lastly**, we evaluated the outcomes of these coping strategies, assessing their effectiveness in mitigating both economic and non-economic losses.

3.2.2 Assess the Effectiveness of Local Response Methods and Strategies

In this step, we evaluated the effectiveness of local response methods employed in study communities to mitigate economic and non-economic losses resulting from disasters. This evaluation focused on key variables, including response time, resource availability, and community engagement. We analyzed how quickly communities and local authorities react during emergencies and the effectiveness of their recovery efforts. Furthermore, we assessed the accessibility of financial and material resources critical for recovery, as well as the level of community involvement in disaster management planning and execution.

3.3 Policy and Intervention Guidance

3.3.1 Policy briefs

In developing policy briefs, we conducted a contextual analysis of existing policies, identifying gaps and engaging stakeholders through expert consultations to gather insights on policy effectiveness. The synthesis of findings

from interviews, surveys, and expert consultation informed concise policy briefs that provide targeted recommendations for enhancing resilience and mitigating losses.

3.3.2 Recommendations for Policymakers

Our recommendations for policymakers were grounded in expert consultations aimed at co-developing actionable

steps for implementation. These recommendations considered implementation challenges and resource allocation to ensure that policies are both feasible and effective.

3.4 Framework Development and Recommendation

3.4.1 Comprehensive Framework Development

We developed a detailed framework for mitigating economic and non-economic loss and damage, integrating findings from previous deliverables into a

coherent strategy. This framework included implementation guidelines for policymakers at national and local levels, ensuring alignment with existing policies and strategies.

3.5 Research Matrix

Indicators/key issues/area of inquiries	Data sources	Data collection method/tools	Data analysis method	Framework (if applicable)
Specific objective 1:				
Categorizing the economic and non-economic loss and damages due to disaster	Primary data from household survey	Questionnaire	Quantitative analysis	Not available
Assessment of barriers and potential solutions	Primary data from household survey and FGD	Questionnaire and questionnaire checklist for FGD	Quantitative and qualitative analysis	Not available
Specific objective 2 and 3:				
Identification of various methods and strategies in reducing loss and damages	Primary data from household survey and case study	Questionnaire	Quantitative and qualitative analysis	Not available
Assessment of local response methods	Primary data from household survey and FGD	Questionnaire and questionnaire checklist for FGD	Quantitative and qualitative analysis	Not available
Specific objective 4:				
Policy briefs	Primary data from household survey, KII and FGD	Questionnaire and questionnaire checklist for both KII and FGD	Quantitative and qualitative analysis	Not available
Recommendations for policymakers	Literature review and Primary data from FGD & KII	Secondary data source & Questionnaire checklist for FGD & KII	Qualitative analysis	Not available
Specific objective 5:				
Comprehensive framework development	Primary data from household survey, KII and FGD	Questionnaire (Kobo Toolbox) and questionnaire checklist for both KII and FGD	Quantitative and qualitative analysis	Not available
Policy implementation guidelines	Primary data from household survey, KII and FGD	Questionnaire (Kobo Toolbox) and questionnaire checklist for both KII and FGD	Quantitative and qualitative analysis	Not available

4.

Methodology

4.1 Preliminary Field Visit and Discussion with Project Team

A preliminary field visit was conducted to establish groundwork for the research activities. During this visit, engagements were held with local stakeholders, including women and elderly people, community leaders, disaster management committee, and other relevant representatives in consultation with HELVETAS officials.

4.2 Desk Review

The desk review served as the foundation for the study by analyzing existing literature and secondary data on economic and non-economic losses and damages from climate-related disasters. We reviewed the peer-reviewed articles, research reports, case studies, government and non-government organizations report relevant to the impacts of climate-related disasters. We also thoroughly reviewed the national and local policies, guidelines, and frameworks related to disaster management to have an insight about the current policy landscape to address and manage economic and non-economic loss and damage.

4.3 Sampling Techniques

A comprehensive approach was employed to ensure that respondents for the survey represent various stakeholders and demographic groups within the study areas. Target respondents included farmers, fishermen, local business owners, household members, and key representatives from governmental organizations (GOs), non-governmental organizations (NGOs), and Union Parishad personnel, such as members of the Union Disaster Management Committee (UDMC). In collaboration with HELVETAS, the selection process identified eligible participants. Stratified random sampling techniques was applied to ensure that a wide range of perspectives are captured across age groups, genders, socioeconomic statuses, and geographic locations. Table 1 presents detailed information regarding the study

participants. Prior to data collection, participants were briefed in orientation sessions about the purpose of the study, their role, and the confidentiality of their responses. Informed consent was obtained to address any concerns.

4.4 Sample Distribution

Both qualitative and quantitative data were collected for this study. For quantitative data, a household survey was conducted to gather information on economic and non-economic loss and damage and to assess the effectiveness of local response strategies. A semi-structured questionnaire was administered across six unions (50 individuals per union) in three districts, targeting those who had experienced disaster-related losses, with a particular focus on affected individuals, including women (Table 1). Finally, we have collected data from 321 respondents (45 & 90 households from Goroikhali, Bagali Unions of Khulna; 45 & 50 households from Baraikhali & Rayenda Unions of Bagerhat; 30 & 59 households from Dhandia & Pratapnagar Unions of Satkhira (please see Table 1 for more details of the study area)). Ten percent households of the selected Unions were surveyed for the study. For qualitative data, three Focus Group Discussions (FGDs) per union were conducted with diverse community members, especially those severely impacted by disasters. Additionally, 24 Key Informant Interviews (KIIs) were conducted, with four interviews from each union, involving individuals with specialized knowledge or experience in disaster management. This group included representatives from local governments, the Union Disaster Management Committee (UDMC), and non-governmental organizations. One village from each of the selected unions was chosen for data collection. The selection was based on convenience for communication and data collection. These qualitative methods complemented the household survey, providing a comprehensive understanding of community responses and the effectiveness of existing strategies for mitigating loss and damage.

Table 1. Study participant selection and sample size distribution.

Data collection tool	Total	Khulna (2 Union)	Bagerhat (2 Unions)	Satkhira (2 Unions)
Semi-structured Questionnaire-Household survey				
Affected household head	300	50*2	50*2	50*2
Affected Women				
FGD				
Male	18	1*2	1*2	1*2
Female		1*2	1*2	1*2
Mixed group		1*2	1*2	1*2
KII				
Individuals possessing specialized knowledge or experience in disaster management (Union Disaster Management Committee (UDMC) and non-governmental organizations).				
- Union Parishad Chairman, secretary & Members - Religious leader and teachers - Members of Union Disaster Management Committees	24	4*2	4*2	4*2
- Local volunteers involved in disaster preparedness and response - NGO field officers or coordinators - Agricultural extension officers - Livestock officers - DPHE/ Health workers - ACCESS Project officials				

4.5 Ethical approval and consent of the participants

An ethical approval was obtained from the relevant research ethical review committee in consultation with HELVETAS. Eligible respondents were approached to participate in the study, with enumerators explaining the survey's purpose in Bengali and addressing any

questions. Participants then were asked for their consent. If anyone declines, the next household on the predetermined list was approached for inclusion in the study.

4.6 Data Collection Procedure

For both quantitative and qualitative data collection, the following tools were applied:

- Semi-structured questionnaire for the household survey.
- Checklist for focus group discussions (FGDs).
- Checklist for Key Informant Interviews (KIIs).

4.6.1 Quantitative Data Collection

4.6.1.1 Semi-structured Questionnaire for the Household Survey

A semi-structured questionnaire was developed as the primary tool for collecting quantitative data from affected individuals, including women, who had experienced economic and non-economic losses due to disasters. The questionnaire was drafted based on an extensive literature

review to align with the study objectives, encompassing sociodemographic characteristics, types of damages, coping strategies, and hindrances to effective response. Prior to the main survey, a draft questionnaire underwent pre-testing in the field to ensure clarity and

appropriateness. This pre-testing facilitated revisions to enhance reliability. After training enumerators, the finalized

questionnaire was administered through face-to-face interviews in Bengali to ensure effective communication.

4.6.1.2 Mobile App-based Survey

A face-to-face survey using an open-source mobile app-based approach, such as KoboToolbox, was employed to streamline the data collection and analysis process. The survey instruments were developed in alignment with the study objectives and questions. Data collection instruments were finalized in consultation with the concerned officials of HELVETAS. All the survey instruments were initially developed in English and subsequently translated into

Bangla by the research team to ensure clarity and ease of response for participants. Once finalized, an expert from the research team configured the tools for use on Android-based devices, enabling both online and offline data collection. To ensure reliability and consistency, a field test of the tools and contents was conducted in a comparable area not included in the sample, allowing for integrity checking and refinement as needed.

4.6.2 Qualitative Data Collection Tools

4.6.2.1 Key Informant Interviews (KII)

For the KIIs, individuals with relevant expertise or experience in managing disaster-related economic and non-economic loss and damage were carefully selected in consultation with HELVETAS officials. This group included representatives from various organizations, such as governmental bodies (GOs), non-governmental organizations (NGOs), and Union Parishad personnel, including members of local government institutions and the Union Disaster Management Committee (UDMC). A total of 24 KIIs were conducted to gather diverse insights. The interviews utilized a structured questionnaire checklist designed to explore participants' perspectives, insights, and recommendations, ensuring that a comprehensive understanding of their experiences and expertise was captured in compliance with the study objectives.

4.6.2.2 Focus Group Discussions (FGDs)

FGDs were conducted with individuals who had been affected by natural disasters and had experienced both economic and non-economic losses. The aim of these discussions was to gain deeper understanding of their perceptions, experiences, and coping practices related to disasters and response. A total of 18 FGDs were conducted to facilitate rich dialogue among participants. A structured questionnaire checklist was prepared to guide the discussions, enabling participants to share their knowledge, concerns, and strategies for coping with disasters such as cyclones and floods. Each FGD was facilitated by trained moderators who used a predefined topic guide to ensure consistency and relevance across discussions, fostering an inclusive environment where all voices were heard.

4.7 Data Management

The consultant and research associate checked the entered data daily during the survey period to ensure its accuracy and reliability. After the completion of fieldwork, the consultant initiated the processing and cleaning of the data. This process involved meticulously reviewing and organizing both qualitative and quantitative data sets to prepare them for analysis. For qualitative data, the collected information was transcribed and scripted in Bengali before being translated into English to facilitate

broader understanding and dissemination. Selected enumerators were responsible for handling the scripting and translation tasks efficiently. All photos and recordings were stored in Google Drive. Once the qualitative information/dialogues were scripted and translated, they were shared with experts for in-depth analysis and interpretation, contributing to a comprehensive understanding of the findings.

4.8 Challenges and Limitations

Potential risks in this study included difficulties in accessing certain households, enumerator bias, and language/cultural barriers. Additionally, data privacy risks could arise if proper security measures were not in place to protect sensitive information. To address these risks, a pre-visit assessment was conducted to identify logistical challenges, and contingency plans were developed in consultation with HELVETAS. Enumerators received thorough training on data collection and cultural sensitivity to enhance neutrality and effective communication with respondents. Strict supervision ensured adherence to

protocols. Finally, robust data security protocols, such as encryption and password protection in consultation with HELVETAS, were implemented to protect sensitive information from breaches.

The consultant and research associate checked the entered data daily during the survey period to ensure its accuracy and reliability. After the completion of fieldwork, the consultant initiated the processing and cleaning of the data. This process involved meticulously reviewing and organizing both qualitative and quantitative data sets to prepare them for analysis. For the qualitative data, the

information collected was transcribed and scripted in Bengali before being translated into English to facilitate broader understanding and dissemination. Selected members from the enumerators were responsible for handling the scripting and translation tasks efficiently. All

photos and recordings were stored in Google Drive. Once the qualitative information/dialogues were scripted and translated, they were shared with experts for in-depth analysis and interpretation, contributing to a comprehensive understanding of the findings.

5.

Research Area

The southwestern coastal region of Bangladesh is among the most climate-vulnerable regions globally due to its unique geographical and socio-ecological characteristics. Bordered by the Bay of Bengal and home to the Sundarbans—the world's largest contiguous mangrove forest—this region faces an increasing frequency and intensity of climate-induced hazards, including tropical cyclones, storm surges, tidal flooding, riverbank erosion, and progressive salinity intrusion. Studies indicate that major cyclones make landfall approximately every three years (Dasgupta et al., 2014), and 30–37% of Bangladesh is inundated annually (Brouwer et al., 2007; Huq & Ayers, 2008). Sea-level rise, coupled with reduced freshwater inflows and anthropogenic activities, has accelerated saline water intrusion, posing a serious threat to agricultural productivity, drinking water availability, ecosystem health, and overall human well-being (Amin & Shammin, 2022; Tajrin & Hossain, 2017).

The study focuses on six upazilas located in this vulnerable belt: Morrelganj and Sharankhola in Bagerhat District; Paikgachha and Koyra in Khulna District; and Tala and Assasuni in Satkhira District. These areas are situated at the interface of freshwater and saline tidal systems and are often exposed to high-intensity cyclonic events and coastal surges, particularly during the monsoon and post-monsoon seasons.

Morrelganj, positioned in southern Bagerhat, is crisscrossed by tidal rivers and bordered to the south by the Sundarbans. The upazila faces persistent challenges of saline water intrusion and seasonal flooding, particularly during high tides and cyclonic events, which affect both agricultural production and freshwater resources. The degradation of polders and embankments further exacerbates the community's vulnerability to waterlogging and crop failure.

Sharankhola, located adjacent to the Bay of Bengal and Sundarbans Reserve Forest, is one of the most cyclone-prone upazilas in Bangladesh. Cyclones such as Sidr (2007) and Amphan (2020) have left long-lasting impacts on local infrastructure, agriculture, and public health. Soil salinization has reduced crop diversity, and drinking water

insecurity remains a critical concern due to the salinization of surface and shallow groundwater sources.

Paikgachha, in Khulna District, is a low-lying upazila characterized by extensive aquaculture development. It suffers from recurrent tidal flooding, saline water intrusion, and declining freshwater availability. These climatic stressors have shifted traditional livelihoods toward shrimp farming, although this transition has introduced new socio-ecological trade-offs, including land degradation and reduced access for marginalized farmers.

Koyra, also in Khulna, is the second-largest upazila in the country by area and had a population of approximately 220,102 as of 2022. It is highly susceptible to storm surges, embankment breaches, and prolonged saline waterlogging, particularly during cyclone seasons. The degradation of natural buffers and inadequate infrastructure leave many communities exposed to repeated displacement and loss of livelihood assets.

Tala, in Satkhira District, traditionally benefited from fertile soils and extensive rice and vegetable cultivation. However, the intensification of salinity and seasonal waterlogging has adversely impacted agricultural productivity. As of 2022, the upazila's population stood at approximately 326,111, with increasing numbers of residents shifting to aquaculture or seasonal migration as adaptive strategies.

Assasuni, one of the most severely impacted upazilas in southwestern Bangladesh, experiences frequent cyclones, saline inundation, and riverbank erosion. Land-use patterns have undergone significant change due to the expansion of brackish water shrimp farming, often at the cost of food security and land tenure security for smallholder farmers. The upazila remains a hotspot for climate-induced displacement and exhibits high vulnerability across social, economic, and ecological dimensions.

Collectively, these six upazilas reflect the multifaceted impacts of climate change on coastal Bangladesh. The

compounding effects of environmental stressors and socio-economic marginalization have eroded traditional coping mechanisms, prompting the need for context-specific, community-based adaptation and resilience-building measures. Interventions such as climate-resilient

agriculture, improved water resource management, ecosystem restoration, and the integration of local knowledge into planning processes are essential to sustaining livelihoods and enhancing adaptive capacity in this fragile deltaic landscape.

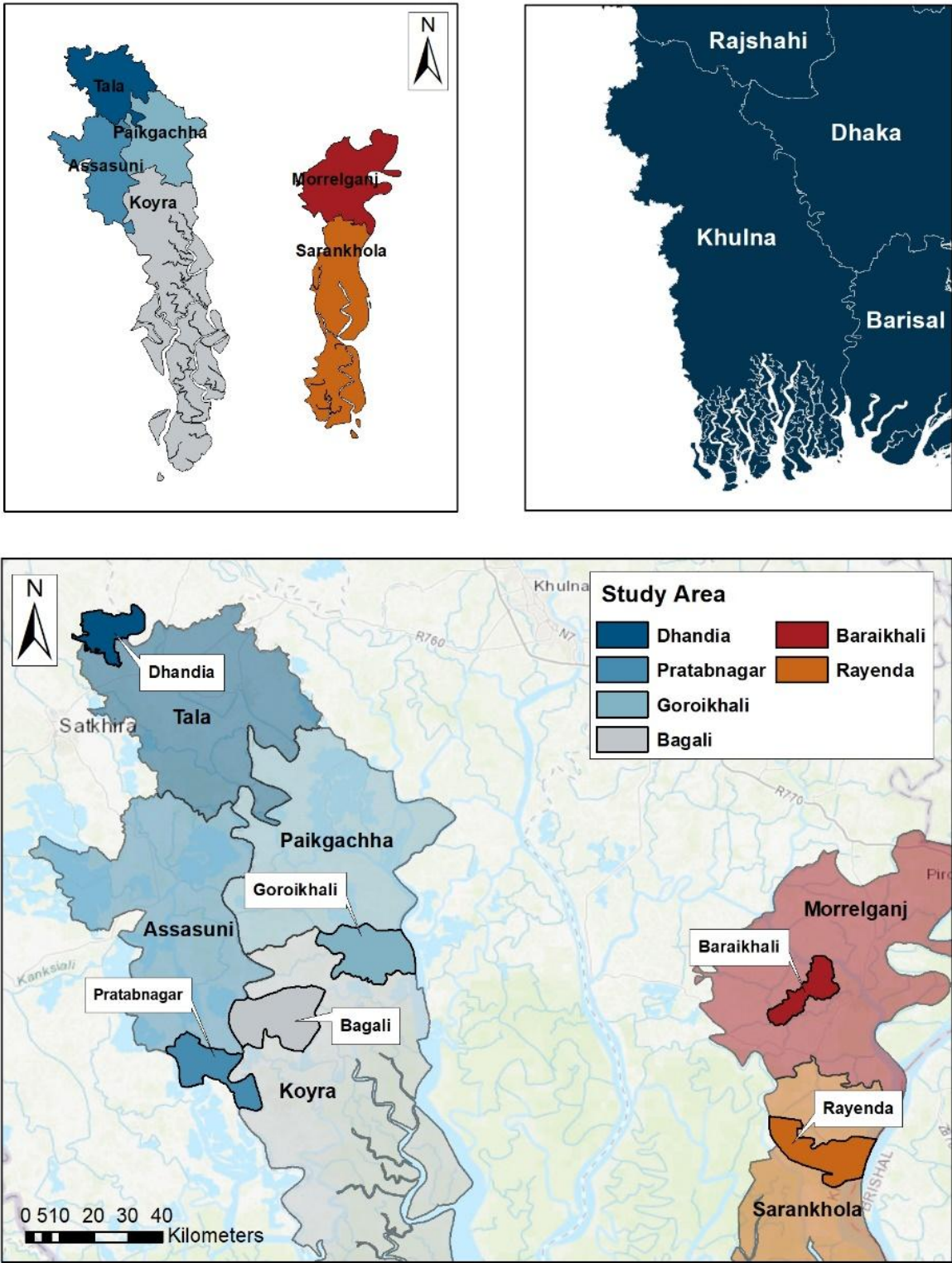


Figure 2. Research location.

6.

Results and Discussion

6.1 Socio-demographic Information

A total of 321 respondents participated in the survey. The age distribution showed the highest concentration in the 40–49 age group (29.60%), followed by 30–39 (24.92%), 50–59 (21.5%), 60 and above (15.89%), and 18–29 (8.1%). Males represented 55.45% of the respondents, while females accounted for 44.55%; no respondents identified as other genders.

Regarding education, 17.13% had no formal education, and the majority had primary (45.17%) or secondary (31.15%) education. Only a small fraction attained higher secondary (2.8%), bachelor's (2.8%), or postgraduate and above (0.93%) qualifications.

Agriculture and daily labor were the most common primary occupations, comprising 20.87% and 24.3% respectively. Other significant occupations included fishing (15.26%), homemaking (12.15%), self-employment or small businesses (9.97%), and a small number in government (0.93%) and private (0.62%) sectors. Notably, some traditional livelihood categories like honey and wood collection had no reported responses. For secondary income sources, livestock rearing (32.4%) was dominant,

followed by fishing (9.35%), agriculture (4.36%), and day labor (4.05%).

The average household size was 5.21 members (SD = 1.87). An overwhelming majority (98.13%) had lived in the area for more than 10 years, indicating strong place attachment and community ties.

Regarding sanitation, pit latrines were most common (39.56%), followed by slab latrines with water (25.23%) and concrete latrines (19.63%). A concerning 14.33% used makeshift latrines (polythene seal, no slab), and one respondent reported open defecation.

Drinking water sources were diverse, with 44.24% relying on surface water and 33.96% on rainwater. Fewer households used deep tube wells (6.54%), shallow tube wells (2.49%), or supply water (4.36%). Use of advanced filtration (e.g., Reverse Osmosis) was rare (1.87%).

In terms of electricity, the majority (89.1%) had access to the national grid, while 9.03% used both grid and solar sources. Very few households relied solely on solar panels (0.93%) or had no electricity (0.93%).

Table 2. Socio-demographic characteristics of the respondents (n = 321).

Variables		n	%
What is your current age?	18–29	26	8.1
	30–39	80	24.92
	40–49	95	29.60
	50–59	69	21.5
	60 and above	51	15.89
What is your gender?	Male	178	55.45
	Female	143	44.55
	Other	0	0
No formal education		55	17.13

Variables		n	%
What is the highest level of education you have completed?	Primary	145	45.17
	Secondary	100	31.15
	Higher secondary	9	2.8
	Bachelor's degree	9	2.8
	Postgraduate or higher	3	0.93
What is your main occupation?	Agriculture/farming	67	20.87
	Fishing	49	15.26
	Honey collector	-	-
	Wood collector	-	-
	Boat driver	8	2.49
	Government/Administration	3	0.93
	Private sector	2	0.62
	Self-employed/Business owner	32	9.97
	Daily labor	78	24.3
	Homemaker	39	12.15
	Unemployed	10	3.12
	Other	33	10.28
What is your secondary income source?	Livestock	104	32.40
	Fishing	30	9.35
	Day Labor	13	4.05
	Agriculture	14	4.36
	Sewing/Artisan	3	0.93
	Business	3	0.93
	Aquaculture	4	1.25
	Teaching	2	0.62
	Other	8	2.49
Number of people in household		Mean = 5.21	SD = 1.87
How long have you lived in this area?	Less than 5 years	1	0.31%
	5–10 years	5	1.56%
	More than 10 years	315	98.13%
What type of sanitation facility does your household have?	Concrete latrine	63	19.63
	Slab with water	81	25.23
	Pit latrine	127	39.56
	Polythene seal, no slab	46	14.33
	Open defecation	1	0.31
	Others	3	0.93
What is your primary source of drinking water?	Deep tube well	21	6.54%
	Shallow tube well	8	2.49%
	Supply water	14	4.36%
	Reverse Osmosis	6	1.87%
	Surface water	142	44.24%
	Rainwater	109	33.96%
	Others	21	6.54%
What is your primary source of electricity?	Grid lines	286	89.1
	Solar panel	3	0.93
	Both	29	9.03
	No electricity	3	0.93

6.2 Socio-economic Information

More than half of the respondents (53.27%) reported no dependence on natural resources such as wood, fish, or honey for their income. However, 27.41% were partially dependent, and 19.31% were completely dependent, highlighting the relevance of nature-based livelihoods for a significant portion of the community.

In terms of housing, the majority (67.6%) resided in kacha (non-durable) houses, while 22.12% lived in semi-pacca and only 10.28% in pacca (brick/concrete) structures, indicating prevalent housing vulnerability.

Monthly household income remained concentrated in the lower brackets, with 54.21% earning 5,001–10,000 BDT, 30.22% between 10,001–20,000 BDT, and only 0.93% earning above 40,000 BDT, consistent with prior data.

A striking 87.85% of respondents reported that their income had fluctuated due to climate-related disasters, indicating a high level of climate sensitivity in local livelihoods.

Despite this, only 33.33% received any formal financial support (such as loans or insurance) to aid recovery. The majority (66.67%) did not receive any such assistance, indicating significant gaps in financial resilience mechanisms.

Household debt was reported by 58.57% of respondents, indicating a widespread reliance on borrowing as a coping strategy. The primary reasons for incurring debt varied, with the most common being starting a business (5.62%), house renovation (3.44%), and meeting basic survival needs (3.12%). Other notable causes included boat construction (1.87%), fishing activities (1.24%), and expenses related to family crises, medical treatment, agriculture, and livestock purchase each accounting for approximately 1.24% to 1.25%. Additionally, 6.87% cited various other purposes. These findings underscore the economic vulnerability of households in climate-affected areas, highlighting the urgent need for improved financial inclusion, targeted livelihood support, and climate-resilient safety nets.

Table 3. Socio-economic information of the respondents (n = 321).

Variables		n	%
How dependent is your family on natural resources (wood, fish, honey) for income?	Completely dependent	62	19.31
	Partially dependent	88	27.41
	Not dependent	171	53.27
What type of structure is your primary residence?	Pacca (brick/concrete)	33	10.28
	Semi-pacca	71	22.12
	Kacha	217	67.6
What is your monthly household income range?	Below 5,000 BDT	28	8.72
	5,001–10,000 BDT	174	54.21
	10,001–20,000 BDT	97	30.22
	20,001–40,000 BDT	19	5.92
	Above 40,000 BDT	3	0.93
Has your income fluctuated due to climate-related disasters?	Yes	282	87.85
	No	39	12.15
Did you receive any formal financial support (e.g., loans, insurance) to help recover from disasters?	Yes	107	33.33
	No	214	66.67
Are you in debt? If yes, what is the primary reason for incurring debt?	Yes	188	58.57
	No	133	41.43
Reasons for incurring debt	For starting business	18	5.62
	House renovation	11	3.44
	Survival	10	3.12
	Boat construction	6	1.87
	Fishing activities (e.g., buying fishing net, cultivation)	4	1.24
	Family crisis	4	1.25

Variables	n	%
Treatment	4	1.24
For agricultural purposes	4	1.25
For buying livestock	2	0.62
Various other purposes	22	6.87

6.3 Climate and Disaster Related Information

An overwhelming majority of respondents reported experiencing multiple forms of climate-related disasters over the past decade, with 99.69% affected by cyclones, 93.77% by flooding, 63.86% by salinity intrusion, 55.45% by river erosion, 35.20% by heatwaves, and 33.96% by storm surges. Notably, 86.92% experienced such events multiple times a year, indicating the chronic nature of climate stress in the region.

Despite this, only 57.01% of households reported taking disaster preparedness measures. Common strategies included gathering emergency supplies (47.04%) and strengthening house structures (45.79%), while fewer households reported savings for emergencies (8.10%), regularly following weather forecasts (27.10%), or participating in community disaster training (3.12%).

Encouragingly, 92.21% of respondents were informed of impending disasters through early warning systems, and 67.6% found these warnings either "strongly effective" or "very effective." However, access to emergency services post-disaster was a significant concern—47.98% of households reported these services were not accessible, and 31.15% said they had limited access.

In terms of post-disaster support, 63.86% of households reported receiving no assistance. Among those who did, 25.86% received support from local NGOs and 22.12% received government relief, with minimal community-level support reported (0.31%). These findings highlight critical gaps in disaster response systems and the need for more inclusive, accessible, and community-driven preparedness and recovery mechanisms.

Table 3. Climate and disaster related information (n = 321).

Variables		n	%
What types of climate related disasters have you experienced in the last 10 years?	Cyclones	320	99.69
	Flooding	301	93.77
	Storm surges	109	33.96
	Salinity intrusion	205	63.86
	Heatwaves	113	35.20
	River erosion	178	55.45
	Other	10	3.12
How frequently do you experience such disasters in the last 10 years?	Once a year	37	11.53
	Multiple times a year	279	86.92
	Once every few years	5	1.56
	Rarely	-	-
	Never	-	-
Did your household take any disaster preparedness measures?	Yes	183	57.01
	No	138	42.92
Types of disaster preparedness measures adopted	Strengthened house structure	147	45.79
	Gathered emergency supplies	151	47.04
	Planting disaster-resistant crops	5	1.56
	Participated in community disaster training	10	3.12
	Regularly following weather forecasts and climate predictions	87	27.10
	Savings for emergencies	26	8.10
	Other (please specify)	12	3.74

Variables		n	%
Were you informed of the disaster through early warning systems?	Yes	296	92.21
	No	25	7.79
How effective was the warning?	Very effective	98	30.53
	Strongly effective	119	37.07
	Moderate effective	65	20.25
	Slightly effective	13	4.05
	Not effective	1	0.31
How accessible were emergency services to your household after the disaster you faced in the last 10 years?	Very Accessible	3	0.93
	Highly Accessible	15	4.67
	Moderately Accessible	49	15.26
	Little Accessible	100	31.15
	Not Accessible	154	47.98
What type of support or assistance did you receive after the disaster you faced in the last 10 years?	Government relief	71	22.12
	Local organizations/NGOs support	83	25.86
	Community support (e.g., rehabilitation and reconstruction, loan)	1	0.31
	No assistance received	205	63.86
	Other (please specify)	8	2.49

6.4 Identification and Assessment of Various Types of L&D

This section identified and assessed the climate-induced economic and non-economic loss and damages, experienced by coastal communities.

6.4.1 Economic Loss & Damage (ELD)

The survey findings revealed that households in the study area have endured a wide range of losses and damages due to recurring climate-related disasters. The most commonly reported impacts were infrastructure damage (86.92%) and income loss (84.11%), followed closely by property damage (66.36%). Additionally, 32.40% of respondents cited increased market prices of goods, reflecting inflationary pressures and disrupted supply chains post-disaster.

Other significant losses included loss of production (12.46%) and costs associated with recovery (11.53%), suggesting both immediate and long-term economic burdens. Smaller proportions reported job loss (3.74%), loss of livestock (1.62%), and investment loss (0.31%), while 2.49% of respondents reported experiencing no loss.

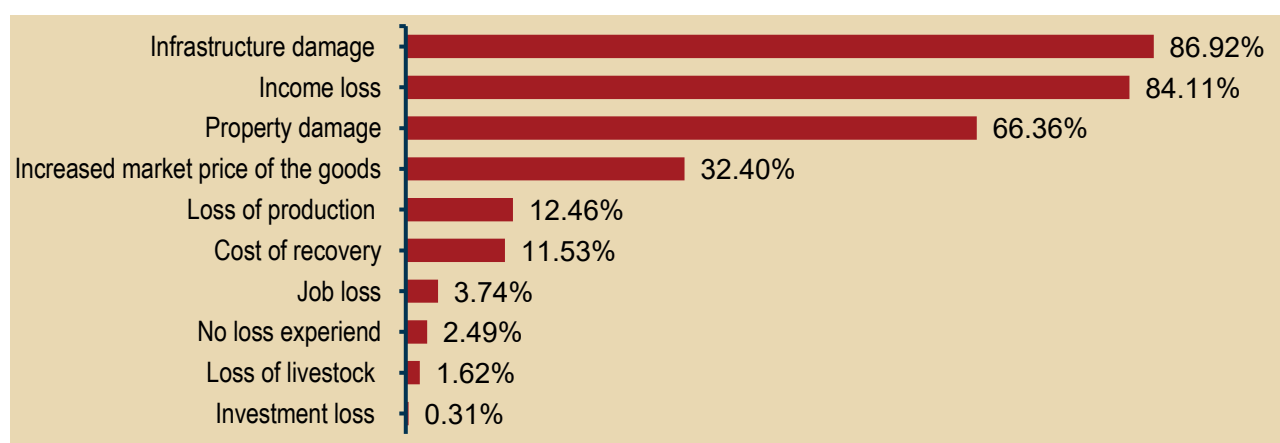


Figure 3. Different types of ELD identified in the studied area.

6.4.2 Non-economic Loss & Damages (NELD)

The survey results indicate a wide range of non-economic loss and damage (NELD) experienced by the affected communities due to climate-related disasters. The most commonly reported impacts include disruption in communication services (84.40%), limited access to WASH (water, sanitation, and hygiene) services (82.60%), and negative effects on physical health (69.80%). A significant number of respondents also cited challenges in accessing medical services (62.60%) and impacts on their mental and emotional well-being (50.50%). Other key areas affected include education (39.20%), loss of territory and ecosystem

services/biodiversity (both 32.10%), and changes to culture and traditional practices (16.50%).

Human mobility (15.60%), the erosion of indigenous and local knowledge (14.00%), and the weakening of social fabric (5.30%) were also notable concerns. Although less frequently reported, losses related to human life (2.80%) and respondents who did not experience any loss (3.40%) were also documented.

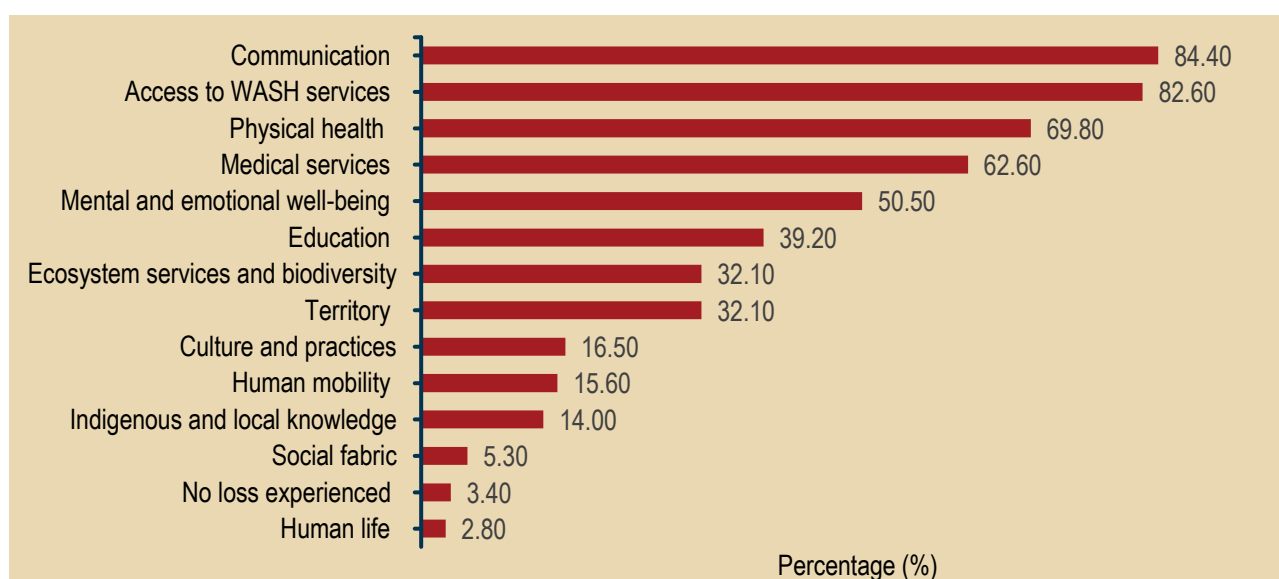


Figure 4. Different types of NELD identified in the studied area.

6.4.3 Severity of Various NELD

The severity analysis of various Non-Economic Loss and Damage (NELD) components experienced in the studied area due to climate-induced events reveals a diverse range of impacts, with certain aspects showing a high concentration of severe and major effects.

Communication services emerged as the most severely affected domain, with 46.1% reporting severe impact and 31.8% major, indicating that nearly four out of five households experienced significant communication breakdowns during or after disasters. This was closely followed by access to WASH services, with 42% reporting severe and 34.3% major impact, reflecting widespread disruption of water and sanitation facilities.

Medical services (22.7% severe, 24.9% major) and physical health (14.6% severe, 24% major) were also notably affected, underscoring vulnerabilities in health systems and increased health-related challenges during climate crises. Mental and emotional well-being showed considerable impact as well, with 17.9% experiencing

severe and 14.6% major distress, and a further 22.1% moderate, highlighting the invisible but critical psychological toll of such events.

Education suffered severe impacts for 14% of respondents and major for 16.5%, while territory loss (e.g., land and property) was reported as severe by 11.3% and major by 16.2%, reflecting displacement and degradation of living spaces. Loss of ecosystem services and biodiversity was also prominent, with a combined 20.6% experiencing severe to major impacts.

Less immediate but still notable were impacts on culture and practices (2.8% severe, 5.2% major), indigenous and local knowledge (15% reported moderate to major), and human mobility (6.5% severe, 5.6% major), indicating a slower erosion of traditional lifestyles and forced movement due to environmental degradation.

In contrast, human life loss was the least reported in terms of severity, with only 0.2% experiencing severe loss and

97.2% indicating no loss, suggesting that while the indirect impacts were widespread and severe, direct mortality remained relatively low.

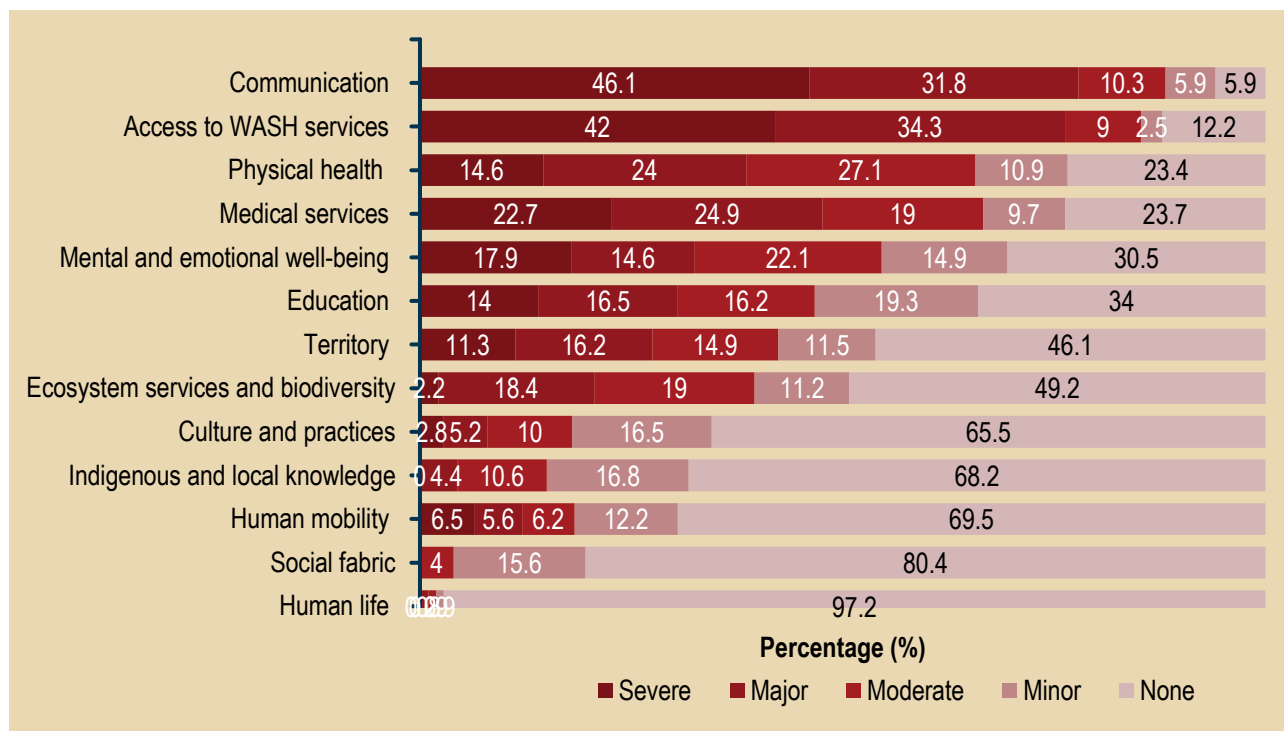


Figure 5. Severity of various NELD experienced in the studied area due to climate-induced events.

6.4.4 Impact of Various Types of NELD on Life and Livelihoods

The analysis of long-term impacts of Non-Economic Loss and Damage (NELD) in the studied area reveals significant and multi-dimensional consequences across various sectors of life, especially in the wake of recurring climate-induced disasters.

6.4.4.1 Education

The long-term impacts on education are significant, with over half of the affected communities (56.4%) experiencing school closures. This disruption not only halts children's academic progress but also affects their social development and future opportunities. Additionally, 19.9% report a lack of teachers and staff, which further undermines the quality of education and continuity of learning. Damaged school buildings (19.1%) create unsafe learning environments, causing prolonged interruptions in schooling. Moreover, 5.9% of households face the inability to afford school supplies, which exacerbates educational inequities, particularly among vulnerable families.

Together, these challenges contribute to significant long-term educational setbacks, increasing the risk of higher dropout rates and limiting the development of human capital in affected communities. Qualitative insights from focus group discussions highlight how disasters severely disrupt education—children are often unable to attend school due to damaged infrastructure or are compelled to engage in child labor to support their families.

Teachers, too, face obstacles in resuming classes amid displacement and inadequate facilities. Participants stressed that prolonged interruptions, coupled with the loss of homes and schools, are likely to have enduring negative effects on children's futures and the broader community's development.

6.4.4.2 Communication

Long-term communication challenges manifest primarily through the isolation of remote communities, with 40.5% experiencing extended periods of social and informational disconnection. This isolation reduces community cohesion and access to essential services. More critically, 56.9% face delayed access to medical care and emergency support, which not only jeopardizes health outcomes but also increases vulnerability during crises. Such communication barriers hinder timely dissemination of information, reduce community resilience, and limit participation in decision-making processes, further marginalizing affected populations over time.

According to qualitative findings from FGDs and KIs conducted with local communities who have experienced climate-induced disasters over the past decade, participants frequently highlighted the destruction of essential infrastructure such as roads, embankments, and

6.4.4.3 Mental and Emotional Well-being

The long-term impacts on mental and emotional well-being are both profound and widespread. A significant majority 70.7% report increased fears, stress, and anxiety, which often persist for years following the initial events. Over half of the population (52.6%) experience sleep disturbances that negatively affect overall health and daily functioning. Depression affects 36.5% of individuals, while 26.5% report a loss of hope or motivation, highlighting a deep psychosocial burden. Additionally, 24.3% exhibit symptoms of Post-Traumatic Stress Disorder (PTSD), reflecting severe and lasting trauma.

These mental health challenges undermine community resilience, disrupt social functioning, and may perpetuate cycles of poverty and vulnerability if not adequately addressed. Qualitative findings reveal that participants frequently spoke of heightened stress, anxiety, and sleeplessness triggered by financial hardship, displacement, and uncertainty about the future. Many shared that the loss of livelihoods and family members due to disasters intensified their emotional distress, often leaving them feeling hopeless about recovery.

The psychological toll was especially severe during rapid-onset disasters, where families faced sudden and significant losses of homes and sources of income. Meanwhile, slow-onset events such as salinity intrusion and drought compounded these challenges by prolonging environmental stress and steadily eroding the overall well-being of communities over time.

6.4.4.4 Indigenous and Local Knowledge

The long-term erosion of indigenous and local knowledge systems represents a critical impact on affected communities. Traditional agricultural knowledge has declined for 45.7% of respondents, posing serious threats to sustainable land management and food security. Additionally, 34.5% report a breakdown in the transfer of knowledge between generations, which weakens cultural continuity and undermines community identity. Most notably, an overwhelming 87.3% indicate growing reliance on external support, reflecting a significant loss of self-sufficiency and adaptive capacity. This increasing dependence risks further diminishing traditional practices that have historically allowed communities to survive and thrive amid environmental challenges.

Qualitative insights emphasize that valuable traditional knowledge—especially related to disaster resilience, sustainable farming, and water management—is rapidly

sanitation systems, which hindered access to medical services and delayed critical interventions. For example, participants shared stories of individuals, particularly pregnant women, who died due to the inability to reach healthcare facilities during emergencies.

being lost. Participants explained that as communities adopt externally introduced technologies and methods, important cultural and ecological knowledge is often marginalized or forgotten. This erosion of indigenous knowledge diminishes communities' ability to effectively recover from disasters and adapt to future environmental stresses, jeopardizing both their resilience and long-term sustainability.

6.4.4.5 Culture and Practices

Cultural heritage faces long-term decline, with 39.2% noting reduced celebration of festivals, a key element of social cohesion and identity. Loss of traditional gardening and rituals affects 26.5%, diminishing the cultural landscape and local biodiversity management. Access to religious spaces is also restricted for 22.1%, which disrupts spiritual life and community bonding. These impacts weaken cultural resilience and the ability of communities to sustain their unique traditions and social structures over time.

6.4.4.6 Social Fabric

The social fabric of communities experiences erosion, though to a lesser extent in numerical terms. Reduced cooperation affects 8.4% of respondents, while loss of trust impacts 5.9%. Isolation or exclusion is reported by 4%. These changes, while subtle, significantly weaken social networks and traditional mutual support systems that are crucial for community resilience. As a result, communities become more vulnerable to future shocks and stresses, losing critical social cohesion that aids recovery and collective action.

Qualitative findings reveal that disasters have deeply affected community unity. Participants frequently described rising mistrust and the gradual breakdown of traditional support mechanisms. Concerns were raised about the postponement of important social milestones such as marriages, which disrupted cultural continuity and social cohesion. Many noted the increasing difficulty in maintaining social bonds, especially among displaced populations or those living in temporary shelters. Additionally, some participants recounted conflicts arising over scarce resources in shelters and relief camps, further straining community relationships and exacerbating social fragmentation.

6.4.4.7 Access to WASH Services

Access to Water, Sanitation, and Hygiene (WASH) services is severely impacted long-term. Poor sanitation facilities

affect 81.9%, while lack of safe drinking water is nearly as critical at 80.4%. Contaminated water sources plague 62.9%, increasing risks of waterborne diseases. Poor waste disposal impacts 40.5%, and lack of hygiene supplies affects 22.1%. These deficits lead to chronic health problems, increase disease burden, and reduce overall quality of life, especially for women, children, and the elderly. Long-term degradation of WASH infrastructure also hampers development and community well-being.

Qualitative findings reveal that rapid-onset disasters such as floods and cyclones cause extensive damage to sanitation systems, leaving many communities without access to clean water and adequate hygiene facilities. Participants frequently reported contamination of water sources following these events, resulting in increased incidences of waterborne illnesses such as diarrhea, typhoid, and dysentery. In contrast, slow-onset phenomena like salinity intrusion have led to a persistent scarcity of safe drinking water, which exacerbates health challenges and heightens vulnerability during subsequent disasters.

6.4.4.8 Ecosystem Services and Biodiversity

Ecosystem degradation is a significant and ongoing challenge in affected areas. A majority of respondents (76.4%) report decreased soil quality, posing serious risks to agricultural productivity and food security. Even more concerning is the widespread loss of biodiversity, affecting 86.3% of communities. This loss undermines the resilience of ecosystems and diminishes vital services such as pollination, water purification, and climate regulation. The depletion of these natural resources directly threatens livelihoods, particularly for those who depend heavily on fishing, farming, and other natural-resource-based activities, while also jeopardizing long-term environmental sustainability and community adaptive capacity.

Qualitative data reveal that environmental hazards such as salinity intrusion, floods, and cyclones have caused persistent damage to agricultural lands, fish farms, and freshwater sources. Participants highlighted how these ecosystem changes have led to reduced crop yields, compromised fish stocks, and deteriorated water quality, all of which intensify economic hardship. The degradation of natural assets further entrenches vulnerability, making communities less able to cope with and recover from future environmental shocks.

6.4.4.9 Medical Services

Medical service availability is compromised in the long term. Shortages of medicines affect 53%, while lack of access to healthcare facilities affects 52%. Unavailability of doctors affects 48.6%, limiting critical healthcare provision. Damage to infrastructure, though less common (7.8%), further exacerbates these challenges. This results in poorer health outcomes, increased mortality and morbidity rates, and reduced capacity to respond to ongoing and future health crises.

Qualitative findings further highlight how access to healthcare becomes severely restricted during and after disasters due to damaged roads, flooding, and destroyed transportation routes. Participants recounted numerous instances of delayed medical assistance, particularly affecting vulnerable groups such as pregnant women, the elderly, and those with chronic illnesses. The shortage of emergency medical supplies and healthcare personnel in disaster-affected areas was frequently emphasized, compounding the health challenges faced by communities and limiting their ability to recover and rebuild.

6.4.4.10 Physical Health

Physical health in affected communities is burdened by a range of persistent issues. Waterborne diseases impact 56.7% of individuals, while skin diseases affect 39.6%. Other significant health concerns include malnutrition (15.6%), respiratory infections (15.3%), and injuries (13.1%). These conditions not only diminish individual well-being but also place considerable strain on families and local health systems. The prevalence of chronic illnesses can trap households in cycles of poverty and reduce overall community productivity over time.

These health challenges are exacerbated by inadequate sanitation, scarcity of clean drinking water, and limited access to healthcare services. Participants in focus group discussions highlighted the cascading nature of these health problems, which drain family resources and lead to increased economic hardship and emotional stress. Rapid-onset disasters such as floods and cyclones were linked to spikes in waterborne diseases, while slow-onset environmental stresses, including salinity intrusion and prolonged drought, contributed to long-term health effects such as strokes and escalating psychological distress.

"When disasters occur, we cannot even cook rice because the stoves remain submerged underwater. Due to the lack of embankments, water enters and washes away houses and belongings. Fish enclosures are destroyed, and cattle, goats, ducks, and chickens die. Agriculture is ruined, and there is no access to food or clean water, forcing us to depend on others for help. The water situation becomes so severe that even bathing is not possible. People suffer from fever, diarrhea, typhoid, dysentery, ovarian diseases and skin diseases. As the houses were inundated, there was no opportunity to store a suppository for treating fever." **A Female FGD Participant**

6.4.4.11 Territory

Loss of territory is a critical long-term impact, with 19.3% losing farmland or grazing areas, which threatens food security and livelihoods. Erosion of homestead land affects 14.6%, causing displacement and housing insecurity. Permanent submergence of land affects 13.4%, signaling irreversible environmental changes and forced migration. Land disputes are rare (0.9%) but can arise from these pressures, leading to social tension and conflict.

6.4.4.12 Human Mobility

Long-term impacts on human mobility are severe. Loss of sense of place and belonging affects 78.3%, leading to identity and psychological distress. Disruption of social networks and family structures affects 83.2%, weakening social support systems and community cohesion. Mental and emotional distress related to displacement affects 67.5%. Disruption of religious and cultural traditions affects 20.3%, further fracturing community life. These factors contribute to protracted displacement, loss of cultural identity, and diminished resilience among displaced and migrating populations.

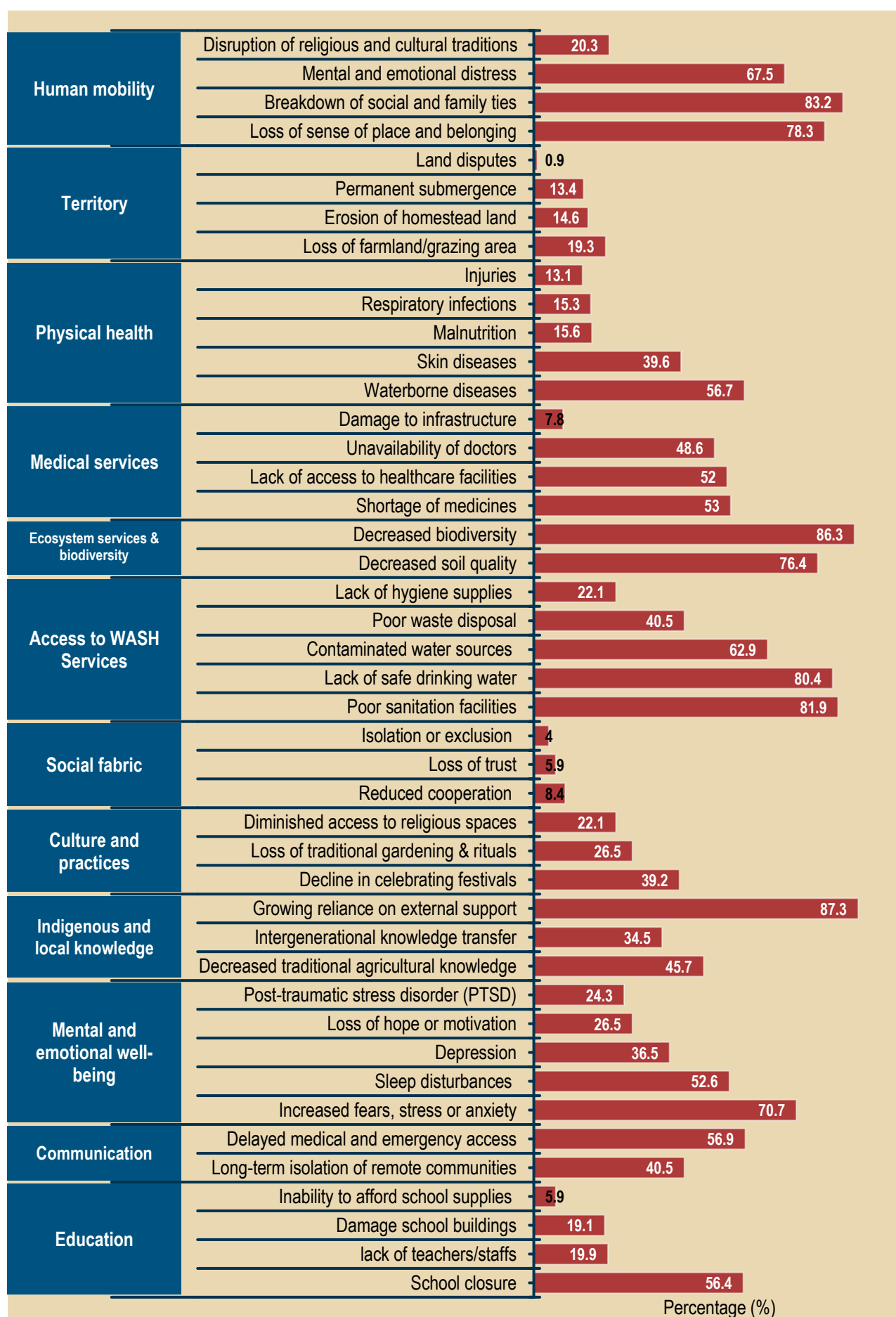


Figure 6. Short and long-term impacts of L&D on life and livelihoods.

6.4.5 Barriers to Addressing the Various Types of Loss and Damage (L&D)

Recovery from both economic and non-economic loss and damage (L&D) in climate-vulnerable areas remains significantly hindered by a combination of governance failures, resource constraints, social inequalities, and communication gaps. These barriers obstruct timely response, long-term resilience-building, and equitable access to recovery resources.

6.4.5.1 Barriers to Address Economic Loss and Damage (ELD)

Economic recovery efforts are primarily stalled by ineffective governance and inadequate financial mechanisms. An overwhelming 69.5% of respondents identified ineffective government policies as a critical obstacle, which reflects systemic limitations in designing and implementing coordinated economic recovery strategies. Furthermore, 61.4% cited limited disaster relief funding, indicating insufficient allocation of resources to support affected communities.

Bureaucratic delays in accessing recovery funds, reported by 41.4%, further compound these issues, often resulting in delays in assistance reaching those in need. At the local level, the lack of community-level financial coordination (37.1%) hampers grassroots-level resilience-building.

Environmental degradation and climate variability also pose direct threats to economic livelihoods. Around 22.7% reported that degradation of natural resources impairs their

income-generating activities, while 16.2% pointed to unpredictable environmental patterns as a factor in ongoing livelihood disruptions. The lack of climate-resilient infrastructure (16.5%) in key economic sectors also reduces communities' ability to withstand and bounce back from repeated shocks.

Communication barriers also hinder recovery; 22.1% reported poor dissemination of information on available economic relief programs. Social inequalities further deepen disparities, with 14.6% of respondents noting unequal access to financial aid. Additionally, lack of access to essential recovery resources (13.4%) and inadequate early warning systems (9%) leave communities unprepared and more exposed to future hazards.

6.4.5.2 Barriers to Address Non-Economic Loss and Damage (NELD)

The recovery process from non-economic loss and damage (NELD)—which includes emotional, cultural, and ecological impacts—faces even more nuanced and deeply embedded challenges. The most prominent among these is the limited government focus on mental health and emotional recovery, cited by 70.4% of respondents. This is compounded by a lack of information about mental health support services (60.1%), pointing to a widespread communication and awareness deficit.

The absence of support programs for displaced or vulnerable groups (47%) significantly increases their psychosocial and cultural vulnerabilities, while poor communication about continuity of education and medical services (40.8%) disrupts community efforts to maintain normalcy.

There is a significant neglect of cultural and social dimensions in disaster recovery efforts. Only 24.9% noted the presence of awareness campaigns to preserve cultural

or social values, while 23.4% highlighted weak community support systems for emotional or physical recovery. Policy frameworks also fall short in restoring cultural heritage and biodiversity, with 19% reporting this as a major gap.

Environmental and social changes are also integral to NELD. The loss of biodiversity affecting cultural or ecological identity (18.7%), climate change worsening health and social vulnerabilities (18.4%), and social inequalities limiting access to recovery services (17.1%) all reflect how intertwined these challenges are. Moreover, limited access to trauma counseling for marginalized groups (14.6%), landscape degradation undermining place attachment (14.3%), and inequitable access to education and healthcare for displaced families (12.8%) reflect the multi-dimensional nature of NELD.

Finally, loss of community cohesion (12.5%) and restrictive gender norms (6.5%) present further social and cultural barriers that hinder inclusive and holistic recovery efforts.

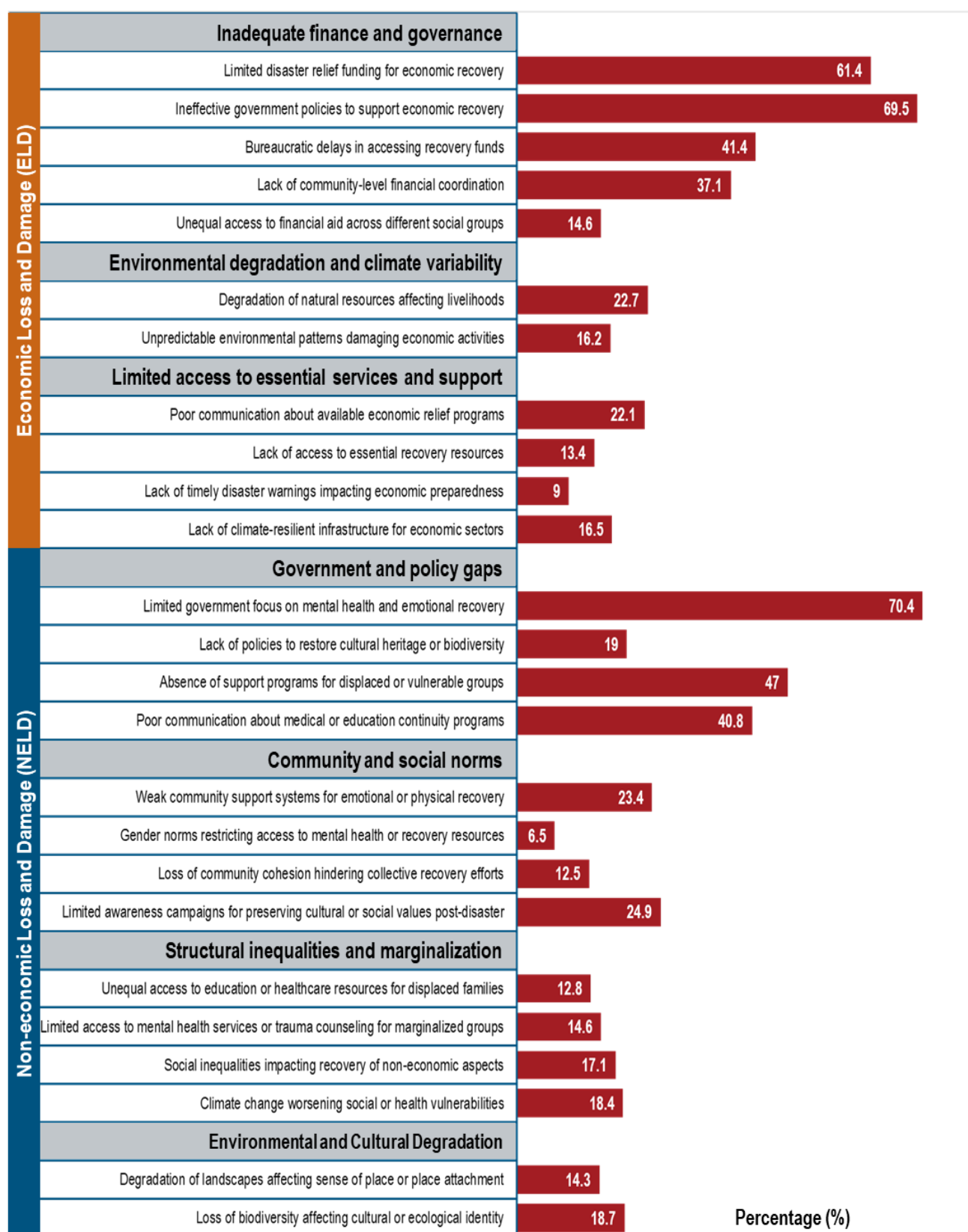


Figure 7. Barriers faced in addressing ELD & NELD by respondent

6.5 Methods and Strategies to Address ELD and NELD

6.5.1 Methods and Strategies to Address ELD

6.5.1.1 Formal and Informal Support Strategies

Communities access a range of formal and informal support mechanisms to cope with disaster impacts and economic challenges. Support from NGOs and international organizations is the most widely utilized formal resource, with 23.7% of respondents receiving some form of assistance. Relief funds, often distributed in the immediate aftermath of disasters, are accessed by 13.4%, providing crucial short-term financial relief. Government compensation programs, however, reach only 8.4% of affected people, suggesting limited coverage or accessibility of official disaster compensation schemes. Training programs focused on disaster-resilient livelihoods and employment generation are notably scarce, each accessed by a mere 0.6% of respondents, indicating significant gaps in capacity-building and livelihood diversification initiatives.

6.5.1.2 Community-based Coping Mechanisms

Community solidarity plays a smaller but important role in supporting resilience. Rotational credit systems are used by 3.1%, providing informal financial support through community-managed loans and savings. Similarly, community savings groups support 2.8% of households,

facilitating pooled resources that can be drawn upon during times of crisis. Other community strategies, such as seeking general support from neighbors (0.9%), group purchasing or resource sharing (0.6%), and disaster insurance mechanisms (0.6%), are less common. These low percentages highlight the potential for strengthening community financial resilience and collective risk management.

6.5.1.3 Personal Financial Strategies

Individuals frequently resort to personal financial management tactics to recover from disaster-related losses and sustain household needs. Borrowing money is the most common approach, reported by 47% of respondents, underscoring the widespread need for credit and immediate cash flow. Seeking financial aid or loans from informal or formal sources follows, with 25.9% relying on these options to bridge gaps. Using personal savings is another important coping method, employed by 19.3% of households. Selling assets (19.3%) and reducing household expenses (19.3%) are equally common strategies, indicating that people are forced to liquidate resources and tighten budgets to manage prolonged hardships. Only a small minority (4%) attempt to start small businesses as a means to generate income and rebuild economic stability, suggesting barriers to entrepreneurship or limited access to startup capital.

"The current measure being taken is an awareness-raising initiative. To reduce damage to houses, trees around homes are cut down. generally, four months of the year are disaster-prone. Before these disaster-prone months, the branches of the trees are cut down. to prevent damage to fish, small pocket nets are placed around the ponds. farmers cultivate salt-tolerant rice and vegetables so that they are not harmed by floods. among all these measures, raising awareness has been the most effective. This has helped people reduce economic losses." **Mir Sarwar Hossain, NGO Representative, UDMC, Rayenda**

"In the wake of climate-induced disasters, local community networks become a lifeline, offering emotional and social support to help individuals cope with the challenges they face. Religious leaders also play a significant role, providing spiritual guidance and prayers that offer comfort and hope to those struggling with the emotional and psychological impact of these events." **Dr. Injamam, Local knowledgeable person, Pratapnagar**

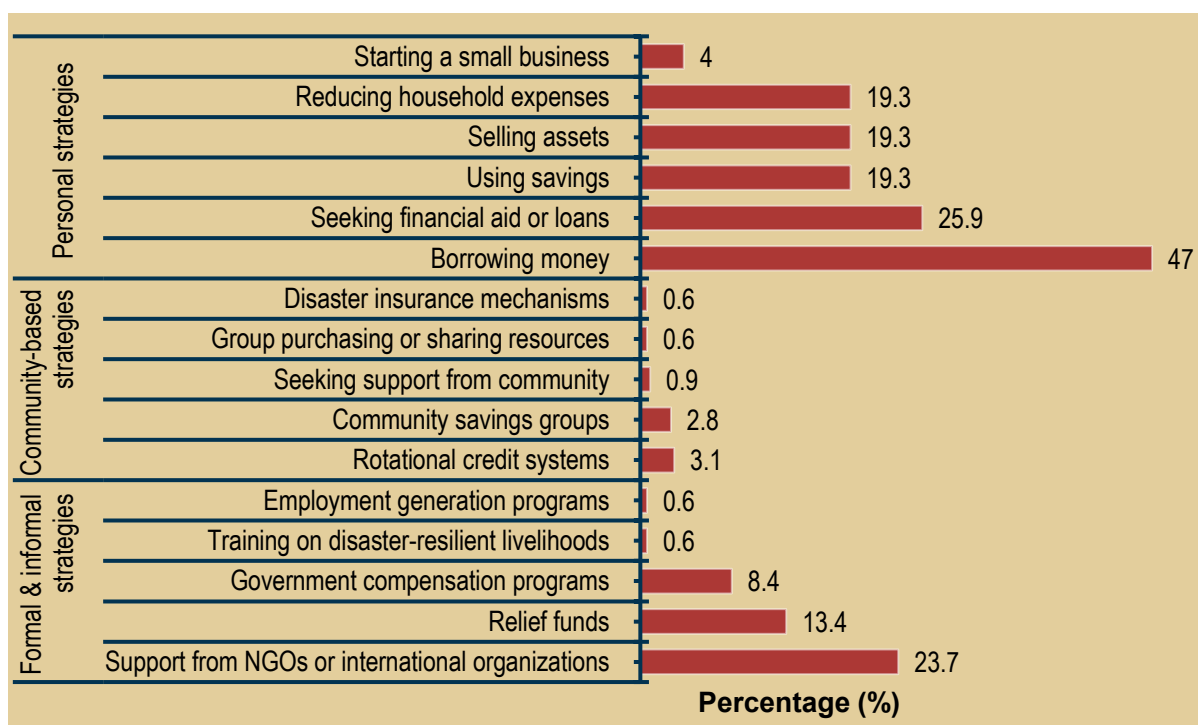


Figure 8. Various types of strategies for addressing ELD.

6.5.2 Methods and Strategies to Address NELD

6.5.2.1 Physical Health

Communities adopt a variety of approaches to manage physical health challenges in the aftermath of disasters and ongoing stresses. Visiting local health clinics remains the most common strategy, with 38.9% of respondents seeking formal medical care. Traditional remedies are nearly as prevalent, used by 36.1% of individuals, reflecting deep-rooted cultural practices and accessibility issues with formal

healthcare. Self-treatment is also widespread, with 21.8% of people managing their health conditions independently, often due to limited access to medical professionals or facilities. Preventative measures such as drinking safe or boiled water are practiced by 19.3%, indicating some awareness of hygiene-related health risks. Additionally, community health workers play a supportive role, although only 12.8% seek their assistance, suggesting potential gaps in outreach or availability of community-level healthcare services.

6.5.2.2 Ecosystem Services and Biodiversity

In response to environmental degradation and biodiversity loss, communities are adopting mixed strategies to sustain agricultural productivity and restore ecological balance. A significant 67.9% of respondents report an increased reliance on chemical fertilizers, likely as an immediate measure to counteract soil nutrient depletion and declining crop yields. However, this practice may have longer-term environmental implications if not managed sustainably. Efforts to restore natural ecosystems are evident through replanting trees, practiced by 45.7%, and conserving naturally growing trees, which 30.5% of respondents actively support. These actions reflect an awareness of the importance of maintaining biodiversity and ecosystem functions essential for climate resilience and sustainable livelihoods.

6.5.2.3 Mental and Emotional Well-being

Mental health coping mechanisms within affected communities are predominantly centered around spiritual and social practices. Praying or engaging in religious rituals is the most common response, reported by 63.1%, highlighting the critical role of faith and spirituality in emotional resilience. Acceptance of the situation as unavoidable is also widespread (57.9%), indicating a psychological adjustment to ongoing hardships. Social support networks remain important, with 34% seeking comfort and assistance from family and friends. Disaster preparedness is increasingly seen as a proactive step, with 22.4% taking measures to better prepare for future events. A smaller portion, 10.6%, consult traditional healers for mental health support, while very few (1.2%) resort to

“When our regular work stops, we still have to run our households. At that point, we take up whatever work we can find. Often, there are five family members to support. We lock up our house and move to places like Jhinaidah or Khulna, renting a home there to make a living. Once the embankment is repaired, we return home. There, we work in agriculture, drive rickshaws, or take up earthwork.

These measures we take are not effective at all. Living there feels like being constantly tested. Fighting with water has become so routine that we no longer fear it. But the government pays no attention to us in these areas. If we want to collect 10 kg of rice from the union council, it costs us 300 BDT just to make the trip, and if it rains, it becomes impossible to go.” **A FGD participant from Pratapnagar, Assassuni.**

migrating to other areas as a coping strategy for psychological distress.

6.5.2.4 Medical Services

When formal medical services are compromised, communities employ various alternatives to address healthcare needs. Both using home remedies or over-the-counter medicines and seeking care from alternative healthcare facilities are equally prevalent, each practiced by 43.6% of respondents. These approaches may reflect both accessibility challenges and trust in traditional or informal healthcare providers. Delaying treatment until regular services are restored is reported by 13.4%, suggesting that some individuals endure health issues due to service interruptions. Reliance on mobile health clinics or NGOs is comparatively limited (6.8%), possibly indicating gaps in outreach or capacity of such providers in disaster-affected areas.

6.5.2.5 Human Mobility

Temporary displacement is a common coping response to disasters and environmental stress. A majority of 65.4% of affected people temporarily migrate, either seeking safety, livelihood opportunities, or refuge from immediate threats. Staying on embankments, cyclone shelters, or boats is also common (44.3%), providing emergency shelter during floods and cyclones. These mobility patterns reflect adaptive strategies to manage risk but can also contribute to social disruption and vulnerabilities in host locations.

6.5.2.6 Access to WASH Services

To overcome challenges in accessing clean water and sanitation, affected populations utilize a range of adaptive strategies. Rainwater harvesting is the most widely adopted method, with 65.1% of respondents collecting rainwater to meet their water needs. Many also collect water from distant safe sources (47%) when local supplies are contaminated or unavailable. Temporary latrine construction (38.3%) and boiling or purifying water (36.8%) are important measures to maintain sanitation and reduce disease risks. Sharing facilities with neighbors (23.4%) highlights community cooperation, although it may also point to inadequate infrastructure and overcrowding.

6.5.2.7 Territory

Changes in land use and livelihood are key adaptations to environmental stressors. A moderate share of respondents (15.3%) adopt alternative livelihoods to cope with declining agricultural productivity or loss of traditional income sources. Relocation to higher ground (14.3%) is another strategy to avoid flood-prone or salinity-affected areas. Migration to other regions remains relatively limited (4.7%), as does seeking legal or government support for land reclamation (1.2%), indicating barriers to formal land rights and institutional assistance.

6.5.2.8 Social Fabric

Efforts to rebuild social cohesion and community networks after disruptions are limited but present. Only 4% of respondents actively engage in rebuilding relationships through community events or discussions, and 3.4% participate in community rebuilding activities. Joining local support groups or NGOs is rare (0.6%), which may reflect social fragmentation or limited availability of organized social support structures post-disaster.

6.5.2.9 Culture and Practices

Traditional agricultural and cultural practices are being adapted to changing environmental conditions. Limiting crop growth to the monsoon season is practiced by 23.8%, which may help optimize water use and reduce salinity impacts. Religious rituals practiced at home (10.5%) continue to provide spiritual support and maintain cultural continuity during times of crisis.

6.5.2.10 Indigenous and Local Knowledge

Sharing and applying indigenous knowledge remains a key adaptive resource. A large majority (65.3%) actively share traditional wisdom and experiences, which supports community resilience and cultural identity. Cultivating crops adapted to changing conditions is practiced by 36.4%, demonstrating local innovation and adjustment to environmental challenges.

6.5.2.11 Education

Educational disruption leads to various household-level coping mechanisms. Delaying education temporarily is the most common strategy (38%), reflecting the realities of school closures and damaged infrastructure. Homeschooling children is nearly as widespread (37.4%), often relying on parental or community support to maintain learning. Seeking support from NGOs or relief

organizations (2.2%) and sending children to temporary learning centers (0.3%) are much less frequent, highlighting gaps in formal educational support during crises.

"Locally, the Centre for Disability in Development (CDD) works closely with communities to address the non-economic impacts of disasters. They provide critical support and rehabilitation for individuals with disabilities, ensuring access to healthcare, education, and livelihood opportunities. By raising awareness about the specific challenges faced by people with disabilities during and after disasters, they help reduce the social and emotional toll. Additionally, disaster awareness sessions, including practical demonstrations and discussions on topics like agriculture, first aid, and disaster preparedness, are regularly conducted in schools and colleges by the Cyclone Preparedness Program (CPP) and local government officials. These initiatives build grassroots resilience and empower communities to face future disasters more effectively." **Mintu Fokir, Upazila Team Leader, CPP, Rayenda**

"Women and girls are the worst victims of non-economic loss and damage. During disasters, when areas are waterlogged, our cultural norms often prevent mothers and sisters from accessing toilets or maintaining hygiene properly. I conducted a study and found that a girl often has to wait from morning until night to find an opportunity to defecate or use a toilet. This immense suffering cannot be measured in monetary terms." **-Sheikh Nazmul Huda, Program Coordinator, Jagrata Juba Shangha, Khulna**

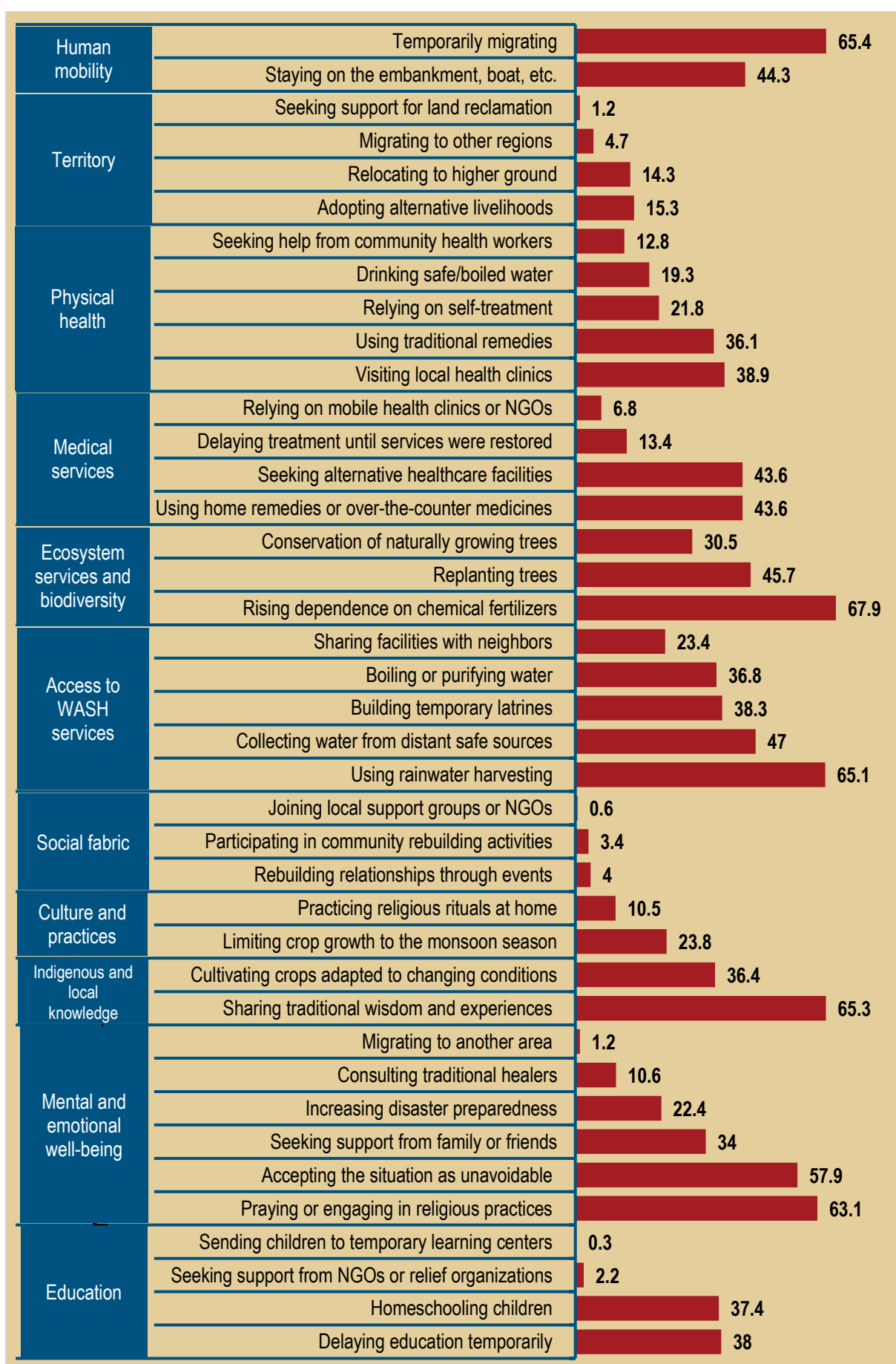


Figure 9. Various types of strategies for addressing NELD adopted by respondents.

6.6 Policy and Programmatic Gaps in Addressing L&D

6.6.1 Current Policy Frameworks for Addressing Loss and Damage

Participants in the focus group discussions (FGDs) and key informant interviews (KIIs) highlighted several existing policy frameworks addressing loss and damage in Bangladesh. They mentioned the government-developed Standing Orders on Disaster (SOD) as a primary guideline for disaster response and recovery. The SOD emphasizes systematic collection and reporting of disaster-induced losses to inform effective response and recovery efforts. However, the participants didn't able to mention what is mentioned in the SOD regarding L&D. Participants also referred to BRAC's Standard Operating Procedure (SOP), which focuses on systematic and structured emergency responses. They pointed out the Pani Jibon project, emphasizing its role in addressing economic losses by providing livelihood support, such as distributing seeds, offering training, and promoting innovative agricultural methods. Additionally, this project incorporates

infrastructure development and resilient WASH (Water, Sanitation, and Hygiene) facilities.

Participants stated that international frameworks, such as those from UNFCCC and FAO, provide broad guidelines for addressing loss and damage. However, they also emphasized that these frameworks often lack the localized adaptations necessary for effective implementation in the context of Bangladesh. Moreover, participants noted the existence of domestic policies like the Climate Change Policy, Disaster Management Manual, and Coastal Development Policy, which contribute to the broader policy landscape. Despite their potential, they stated that weak implementation, insufficient intersectoral coordination, and a focus on immediate response rather than systemic issues limit the effectiveness of these policies.

6.6.2 Significant Gaps in Response Mechanisms

- When discussing gaps in the current mechanisms, participants unanimously expressed concern over several critical issues. They mentioned that security during disasters is a significant challenge, as many people fear leaving their homes due to the risk of theft. Additionally, participants noted the lack of intersectoral coordination, with health, WASH, agriculture and infrastructure sectors often working in silos, reducing the effectiveness of disaster responses. Budgetary constraints were frequently brought up, with participants stating that limited funds exacerbate these challenges and restrict the scale of interventions.
- Governance and transparency failures were also highlighted, with participants pointing out the inefficient allocation and monitoring of resources. They expressed that these shortcomings reduce trust in existing mechanisms and hinder their overall impact. Sector-specific issues were discussed in detail:
 - In agriculture, participants mentioned the lack of availability of seeds and saplings during critical periods and fragmented funding as persistent challenges.
 - In the health sector, they emphasized the need for emergency transportation for patients, stating that its absence leaves many vulnerable during crises.
- In the WASH sector in Bangladesh, the financing gap for loss and damage (L&D) resulting from climate change is substantial. Despite growing recognition of the sector's vulnerability to climate impacts such as floods, cyclones, and droughts, the financial resources allocated to WASH are insufficient to cover the increasing needs of affected populations. There is a lack of dedicated financial mechanisms to address L&D in WASH, and existing funds are often inadequate to repair and maintain water and sanitation infrastructure damaged by climate-related events. Furthermore, there is a disconnect between climate adaptation policies and WASH financing, which limits the sector's ability to integrate climate resilience into service delivery.
- Regarding infrastructure, delays due to governance issues and weak monitoring were identified as major obstacles to timely recovery efforts.
- Participants collectively stressed the need for more coordinated, well-funded, and transparent approaches to managing loss and damage.

"To effectively address the multifaceted challenges of economic and non-economic loss and damage (L&D), Bangladesh must bridge the gaps in policy implementation, strengthen disaster response mechanisms, and ensure sector-specific interventions. While existing frameworks like the SOD and BRAC's SOP provide a starting point, their effectiveness is hindered by insufficient planning and inadequate execution. Vulnerabilities such as the lack of agricultural resources post-disaster, poor healthcare transportation, and overlooked emotional and cultural well-being remain critical gaps. A unified approach—empowering local committees, enhancing training for accurate damage assessment, and leveraging international expertise—can transform disaster management into a robust, inclusive, and impactful framework."-District Coordinator, BRAC

6.6.3 Overlooked Aspects of Loss and Damage

- Participants shared that existing frameworks focus primarily on economic recovery while overlooking non-economic losses. They expressed concern that emotional well-being is often ignored, with no formal mechanisms for providing mental health support to disaster-affected populations. Some participants additionally mentioned the lack of attention to cultural preservation, pointing out that cultural assets and heritage sites are rarely protected during disasters.
- Another issue raised was the inadequacy of existing damage assessment processes. Participants noted that tools like the "Damage Forms" fail to capture comprehensive data, especially on non-economic losses. This, they stated, undermines efforts to develop holistic recovery plans that address both tangible and intangible aspects of loss and damage.

6.6.4 Recommendations for Sector-specific Interventions

Participants proposed several sector-specific interventions to address the identified gaps:

- In agriculture, they recommend establishing seed banks and ensuring timely resource availability to mitigate losses. They also emphasized the importance of introducing crop insurance schemes to provide financial security for farmers.
- In the health sector, participants highlighted the need to develop and maintain emergency transportation systems to ensure timely assistance during crises. They further emphasized the necessity of mental health support systems for disaster-affected populations.
- For infrastructure, participants suggested strengthening governance and implementing clear accountability measures to ensure timely completion of projects. They also recommended promoting resilient and adaptive designs to withstand future disasters.
- Participants collectively agreed that cross-sectoral integration is essential. They suggested developing a unified framework that addresses both economic and non-economic losses. Training personnel to conduct accurate and comprehensive damage assessments was also identified as a critical step to improve planning and resource allocation.

Role of key stakeholders

- Participants discussed the roles of various stakeholders in addressing loss and damage. They mentioned that the private sector could contribute through corporate social responsibility (CSR) initiatives, funding disaster mitigation efforts, and supporting infrastructure development. Participants stated that civil society organizations have an important role in raising awareness about existing gaps, advocating for policy reforms, and ensuring grassroots-level involvement in planning and implementation.
- Additionally, they highlighted the importance of international organizations, stating that these entities should provide both funding and technical assistance to strengthen local systems. Participants emphasized the need for these organizations to advocate at global forums for stronger commitments from high-emission countries to finance loss and damage initiatives.

- Finally, participants called on the government to integrate loss and damage frameworks into national planning documents, such as five-year plans, and expand social safety net programs to include disaster recovery efforts. They stressed that by addressing

these gaps and promoting collaboration among stakeholders, Bangladesh could develop a more robust and effective system to manage loss and damage.

6.7 L&D Framework

Based on the findings from the Focus Group Discussions (FGDs) and Key Informant Interviews (KIIs), the participants emphasized that the development of a programmatic framework for loss and damage (L&D) should prioritize core principles such as sustainable embankment construction, equal access to recovery resources, and support for vulnerable populations. They further stated that agriculture, particularly farmers, should be given the highest priority and provided with essential

post-disaster support. The integration of sector-specific priorities into national planning should involve coordinated steps from the district to the national level. The participants also highlighted the importance of addressing the needs of marginalized groups, such as women, the elderly, and indigenous communities, through financial support systems during crises. They emphasized the need for effective monitoring and evaluation through local government involvement and community engagement.

“There are numerous frameworks for addressing loss and damage. For instance, the human rights-based approach is one such framework. In addressing and measuring loss and damage, there’s an approach with four components: adaptation-mitigation, risk management, limits to adaptation, and existential challenges. So far, the climate risk management approach has been the most widely used.

The WASHA International framework is another notable approach, alongside the people-centered approach for tackling loss and damage. There are methods already developed to differentiate between tangible and intangible losses and to identify the hidden costs of intangible losses. The World Risk Index is also utilized to address loss and damage, following frameworks that consider susceptibility, coping capacity, and adaptive capacity.

Additionally, there is a framework called ‘Transformation in the Context of Loss and Damage’ proposed by Mark Belling and Debra Roberts. This framework views transformation in three ways: as adaptation, as extension, and as liberation. These diverse frameworks offer various perspectives and tools for addressing loss and damage effectively.”-Dr. Md Zakir Hossain, Professor, Urban & Rural Planning Discipline, Khulna University

On collaboration, they noted that while past efforts between sectors existed, coordination was insufficient, and efforts should focus on Community Risk Assessment (CRA) and Risk Reduction Action Plans (RRAP). Finally, they suggested that expert consultation and stakeholder involvement in discussions are essential to ensure that multi-sectoral insights are appropriately integrated into the framework. Finally, we have proposed a framework that

integrates economic and non-economic dimensions into disaster management and recovery processes. It integrates diverse stakeholders and sectors to ensure comprehensive, equitable, and inclusive disaster recovery, emphasizing non-economic losses and damages (NEDL). The sector-wise proposed framework for loss & damages in Bangladesh is explained below:

6.7.1 WASH (Water, Sanitation, and Hygiene)

Key Findings:

- **Poor sanitation:** Inadequate waste disposal and latrine facilities.
- **Lack of safe drinking water:** Contaminated water sources.
- **Contaminated water sources:** Increased exposure to waterborne diseases.

Key Stakeholders:

- Government (local and national)
- NGOs and CSOs Local communities
- International aid agencies

System & Policy-Level Interventions:

- **Policy Entry Point:** National Water and Sanitation Strategy to integrate climate adaptation measures. National Water Policy 1999; Bangladesh Climate Change Strategy and Action Plan (BCCSAP); National Adaptation Plan (NAP)

- **Key Actions:** Climate-proofing water and sanitation systems, community-based water management.
- **Loss & Damage Financing Advocacy Entry Point:** Ministry of Disaster Management and Relief, international climate funds (e.g., Green Climate Fund, Adaptation Fund).

Community-Level Interventions:

- Capacity building for community-based water resource management.
- Promotion of low-cost water purification technologies.
- Establishment of emergency sanitation facilities.

6.7.2 Health & Well-being (Physical and Mental Health Issues)

Key Findings:

- Physical health problems such as skin diseases (itching, sores, blisters), and uterine issues.
- Disruption in medical services.
- Mental health and emotional challenges, including anxiety and financial strain leading to sleepless nights.

Key Stakeholders:

- Ministry of Health and Family Welfare
- Local health institutions
- WHO, UNICEF, NGOs

System & Policy-Level Interventions:

- **Policy Entry Point:** Strengthening health emergency preparedness and mental health integration in disaster response plans. National Health Policy 2011; Mental Health Act 2018; Disaster Management Act 2012
- **Key Actions:** Mobile healthcare units, community mental health programs, improved disease surveillance.
- **Loss & Damage Financing Advocacy Entry Point:** Ministry of Health, development partners (e.g., World Bank, ADB), global health financing mechanisms.

Community-Level Interventions:

- Training community health workers for emergency response.
- Awareness programs on mental health resilience.
- Establishing local emergency medical response teams.
- Mental health support programme

6.7.3 Disruption in Communications

Findings:

- Road or embankment damage leading to communication disruption.
- Breakdown of essential infrastructure including roads, sanitation systems, and electricity.
- Delayed access to healthcare services due to disrupted transportation and communication networks.

Key Stakeholders:

- Bangladesh Telecommunication Regulatory Commission
- Ministry of Post, Telecommunications & IT
- Telecom operators (e.g., Grameenphone, Robi, Banglalink)

System & Policy-Level Interventions:

- **Policy Entry Point:** Developing a resilient digital infrastructure policy. National ICT Policy 2018; Standing Orders on Disaster (SOD)
- **Key Actions:** Strengthening ICT infrastructure, establishing backup networks, and early warning communication systems.
- **Loss & Damage Financing Advocacy Entry Point:** Ministry of ICT, international telecom infrastructure funds, UNDP.

Community-Level Interventions:

- Community-based early warning systems.
- Training on alternative communication strategies during disasters.
- Establishing local emergency communication hubs.

6.7.4 Education

Key Findings:

- **School closures:** Educational institutions shut down due to disasters.
- **Lack of teachers:** Reduced availability of teaching staff.
- **Damage to buildings:** Structural damage affecting learning environments.

Key Stakeholders:

- Ministry of Education
- Local school authorities
- UNICEF, Save the Children

System & Policy-Level Interventions:

- **Policy Entry Point:** Education sector disaster risk reduction (DRR) strategy. National Education Policy 2010; Disaster Risk Reduction (DRR) in Education
- **Key Actions:** Disaster-resilient school buildings, digital learning alternatives, psychosocial support for students.
- **Loss & Damage Financing Advocacy Entry Point:** Ministry of Education, education development partners (e.g., UNESCO, World Bank).

Community-Level Interventions:

- Community-led temporary learning spaces.
- Parent-teacher awareness programs on disaster preparedness.
- School disaster risk reduction clubs.

6.7.5 Loss of Agricultural Productivity

Key Findings:

- Climate events led to crop damage and loss, impacting both food security and income.
- Specific mentions include the destruction of croplands and crops, as well as the damage to fish farms.
- Saltwater intrusion from floods and storms resulted in the death of fish and the degradation of fish ponds, further compounding economic losses.

Key Stakeholders:

- Ministry of Agriculture
- Department of Agricultural Extension (DAE)
- Farmers' associations and cooperatives
- International organizations such as FAO and IFAD

System & Policy-Level Interventions:

- **Policy Entry Point:** National Agriculture Policy (2018), Bangladesh Delta Plan 2100, and Climate Smart Agriculture Strategy.
- **Key Actions:** Promotion of climate-resilient crop varieties, implementation of adaptive farming techniques, and development of irrigation infrastructure for drought-prone areas.
- **Loss & Damage Financing Advocacy Entry Point:** Ministry of Agriculture, donor agencies, Green Climate Fund (GCF), and the World Bank.

Community-Level Interventions:

- Farmer training programs for climate-adaptive practices.
- Community-based water management and flood control systems.
- Livelihood diversification strategies to reduce dependency on farming.

6.7.6 Loss of Territory

Key Findings:

- **Farmland loss:** Reduction in agricultural areas due to flooding and erosion.
- **Erosion:** Gradual loss of land to water bodies.
- **Permanent submergence:** Complete loss of land due to rising water levels.

Key Stakeholders:

- Ministry of Land
- Local government institutions
- Environmental organizations

System & Policy-Level Interventions:

- **Policy Entry Point:** Land zoning and resettlement policy. National Land Use Policy 2001; Bangladesh Delta Plan 2100
- **Key Actions:** Establishing relocation programs, land reclamation efforts, climate-adaptive farming initiatives.
- **Loss & Damage Financing Advocacy Entry Point:** Ministry of Land, donor agencies, UN-Habitat.

Community-Level Interventions:

- Community-based resettlement planning.
- Livelihood diversification programs.
- Legal support for land tenure security.

6.7.7 Environmental Impacts

Key Findings:

- **Loss of biodiversity:** Decline in local flora and fauna.
- **Ecosystem degradation:** Damage to natural habitats affecting livelihoods.

Key Stakeholders:

- Ministry of Environment, Forest and Climate Change
- Department of Environment
- NGOs and research institutions

System & Policy-Level Interventions:

- **Policy Entry Point:** National Environmental Protection Act implementation. Bangladesh Environment Conservation Act 1995; National Adaptation Plan (NAP)
- **Key Actions:** Ecosystem restoration projects, pollution control measures, climate-smart agriculture promotion.
- **Loss & Damage Financing Advocacy Entry Point:** Ministry of Environment, global environmental funds (e.g., GEF, Climate Resilience Fund).

Community-Level Interventions:

- Community-led reforestation initiatives.
- Sustainable waste management practices.
- Biodiversity conservation awareness programs.

6.7.8 Human Mobility (displacement and migration)

Findings:

- Forced migration due to land loss and economic hardships.
- Challenges in accessing resources and employment in host areas.

Key Stakeholders:

- Ministry of Disaster Management and Relief
- Refugee and Migratory Movements Research Unit (RMMRU)
- IOM, UNHCR

System & Policy-Level Interventions:

- **Policy Entry Point:** Climate-induced displacement policy framework. National Strategy on Internal Displacement (NSID); Bangladesh Delta Plan 2100
- **Key Actions:** Safe relocation programs, livelihood support for migrants, integration programs in host communities.
- **Loss & Damage Financing Advocacy Entry Point:** Ministry of Disaster Management, international humanitarian aid, IOM.

Community-Level Interventions:

- Local capacity-building for economic resilience.
- Establishment of community resource centers in host areas.
- Legal aid for displaced populations.

7.

Future Research Direction

Based on the findings presented, several future research directions can be suggested to address the gaps and challenges identified in the study. These directions aim to deepen understanding, improve resilience, and inform policy and intervention strategies for coastal communities facing climate-induced L&D. Here are some potential research directions:

- Future research could focus on evaluating the effectiveness of climate-adaptive agricultural and fishery practices in coastal Bangladesh to mitigate livelihood losses post-disaster. This study would assess innovative approaches such as the cultivation of salt-tolerant crop varieties and the implementation of sustainable aquaculture systems. The research would aim to identify practices that non-governmental organizations (NGOs) can promote to protect and enhance livelihoods against climate-induced disruptions. By analyzing the adaptability and resilience of these practices, the study would provide insights into sustainable strategies for safeguarding the economic well-being of coastal communities.
- Investigating the resilience of communication and infrastructure systems in the face of climate-induced disasters in coastal Bangladesh is another vital research area. This study would explore how disruptions to transportation, communication networks, and essential services affect community response and recovery efforts. It would assess the effectiveness of existing infrastructure improvement projects, such as the Coastal Towns Infrastructure Improvement Project, in enhancing climate resilience. The research would aim to identify key factors that contribute to infrastructure robustness and propose strategies to mitigate vulnerabilities, ensuring sustained connectivity and service delivery during adverse climatic events.
- Another potential research area could be investigating the long-term mental health burden caused by natural disasters, such as PTSD, increased stress, anxiety, and depression among special group of populations such as smallholder farmers, elderly people, and disaster-affected people. This research would focus on tracking the prevalence of conditions like post-traumatic stress disorder (PTSD), depression, and anxiety among affected populations over extended periods. Future research might evaluate the effectiveness of various mental health interventions deployed after climate-induced disasters. This might involve comparing traditional therapeutic approaches with community-led support systems or digital mental health services. It could also identify the effective coping strategies and resilience factors that mitigate mental health challenges in affected communities. The goal is to determine best practices for mitigating psychological distress in diverse populations.
- Another potential research area could be examining how slow-onset climate events, including prolonged droughts and rising temperatures, influence mental health among farmers. This area of study would assess the psychological impact of environmental degradation, loss of livelihoods, and displacement, contributing to conditions such as solastalgia—a term describing the distress caused by environmental change. Insights from this research can guide community-based mental health initiatives and resilience-building programs.

- Another critical research area involves assessing the effectiveness of Water, Sanitation, and Hygiene (WASH) interventions in enhancing public health resilience in coastal Bangladesh. This study would evaluate the implementation of climate-resilient WASH facilities, particularly in healthcare and educational institutions, and their role in preventing disease outbreaks during climate-induced events. It would analyze the challenges and successes of integrating WASH Facility Improvement Tools (WASH FIT) in rural and urban settings, providing insights into best practices for maintaining hygiene standards under changing climatic conditions.
- Exploring the dynamics of educational continuity amidst climate-induced disruptions in coastal Bangladesh is a pertinent research area. This study would investigate how recurrent natural disasters impact educational infrastructure, student attendance, and learning outcomes. It would examine the effectiveness of alternative education delivery methods, such as mobile learning centers and digital platforms, in ensuring uninterrupted learning during and after disasters. The research would also assess the role of community and policy interventions in supporting educational resilience, aiming to identify strategies that can sustain educational attainment in vulnerable coastal regions.
- Examining the long-term environmental impacts—such as loss of biodiversity, ecosystem degradation, and agricultural land damage—and how these changes feed back into economic and social vulnerabilities is a critical area of research. This study would analyze how environmental degradation affects livelihoods and food security, particularly in communities heavily dependent on natural resources. It would also explore the potential for sustainable ecosystem restoration to support long-term recovery, assessing how initiatives like reforestation, soil restoration, and sustainable agriculture can mitigate economic and social vulnerabilities. By understanding these linkages, the research aims to inform policies and practices that promote both environmental health and socioeconomic resilience.
- Examining the role of community awareness and engagement in building resilience against climate-induced challenges in coastal Bangladesh presents another valuable research avenue. This study would assess the impact of community-led awareness campaigns on disaster preparedness, response behaviors, and the adoption of climate-resilient practices. It would explore how participatory approaches in WASH and infrastructure projects influence community ownership and sustainability of interventions. The research would aim to identify effective strategies for fostering community engagement and enhancing adaptive capacities, thereby contributing to more resilient coastal communities.

8.

Recommendations

To address loss and damages and enhance disaster resilience effectively, specific, evidence-based, and feasible recommendations across key sectors must be prioritized.

In agriculture, establishing community-managed seed banks and introducing subsidized crop insurance for smallholder farmers can significantly enhance resilience. Studies have shown that seed banks significantly reduce crop recovery time post-cyclones, while crop insurance schemes in similar contexts increased farmer resilience [13,14]. These interventions can be implemented by leveraging existing agricultural extension services and microfinance institutions, coupled with training on seed preservation and climate-resilient crops.

In the health sector, integrating mental health and psychosocial support services (MHPSS) into disaster response frameworks is essential. Research from disaster-affected settings indicates that MHPSS interventions can reduce PTSD prevalence [15]. This can be achieved by embedding services within primary healthcare networks and training community health workers using WHO's "Mental Health Gap Action Programme" guidelines [16].

For infrastructure, prioritizing disaster-resilient designs for schools and healthcare facilities is critical. Structural retrofitting projects in cyclone-prone regions have demonstrated a significant reduction in economic losses and a decrease in casualty rates. Utilizing local construction firms and public-private partnerships while adhering to UNDRR's "Build Back Better" principles ensures cost-effective and resilient infrastructure.

From a governance perspective, expanding disaster damage assessment tools to include non-economic losses, such as mental health impacts and cultural heritage, is imperative. This can be achieved by updating existing assessment forms with guidance from UNDP's disaster recovery toolkit and standardizing methodologies through workshops [17]. Furthermore, **establishing a multi-sectoral disaster task force** that integrates agriculture, health, and infrastructure sectors can enhance resource coordination and efficiency. Multi-sectoral approaches have proven to reduce resource duplication and improve response efficiency, and this can be achieved by building on existing disaster management committees without requiring new infrastructure.

Engaging the private sector is another key recommendation, as private sector involvement in financing and implementing disaster resilience initiatives has shown to expedite recovery in similar settings. Providing tax incentives and CSR recognition can encourage participation, guided by Bangladesh's CSR reporting framework. Lastly, **securing international funding** for localized climate-resilient projects, such as urban greening and water retention systems, can have long-term benefits. The Green Climate Fund has supported similar successful interventions, and Bangladesh's eligibility makes this an actionable priority.

9.

Conclusion

In conclusion, the study highlights the serious and wide-ranging impacts of climate-induced events in the coastal regions of Bangladesh, with both economic and non-economic losses. Economic damages, such as destruction of infrastructure, income loss, and property damage, were made worse by the lack of proper recovery support, leaving many people without enough help. Non-economic impacts, including disruptions in communication, access to water, healthcare, education, and significant mental health challenges, show the broader effects on society. These results stress the need for policies that address both economic and non-economic losses, with a special focus on vulnerable groups, and for better coordination between the sectors involved in disaster response and recovery.

The policy recommendations from this study suggest improving financial aid mechanisms, better coordination in recovery efforts, and including mental health support and community-based approaches in disaster management. A proposed unified framework for managing loss and damage suggests adaptive, transparent, and well-funded solutions that bring together insights from different sectors and use localized data collection. This framework aims to create a more resilient and fair approach to addressing climate-related losses, making sure that both short-term recovery and long-term resilience are prioritized in future policies and actions.

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2. Annexures

KII participant list with contact information

Table S3. KII participant list with contact information.

Sl no.	Name	Designation	Organization/office	Contact number
1	Md. Abdul Momin	Chairperson	UDMC	01964153258
2	G M Abdus Salam	Chairman	Local govt.	01740936365
3	S. M. Arafat Hossain	Unit Leader	CPP	01911223879
4	Ruli Biswas	UNO	Local govt.	01322875536
5	Alek Ahmed Samad	Chairman	Local govt.	01918363900
6	SM Atiar	Member	CPP	01764397573
7	**	Member	UDMC	
8	**	Member	Local govt.	
9	Sawkat Chowdhury	Member	CPP	01710864935
10	Mir Sarwar Hossain	NGO Representative	UDMC	01714597485
11	Kawsar Hossain	Member	Local govt.	01717961532
12	Mintu Fokir	Upazila Team Leader	CPP	01758162044
13	Rezaul Karim	Principal	Local knowledgeable person	01724468376
14	Shafiqul Islam	Member	Local govt.	01703258323
15	Amirul Islam	President	BADC	01757426182
16	Injamam	PhD Scholar	Local knowledgeable person	950772787
17	Abdul Rouf	Member	UDMC	01715033003
18	Sohrab	Chairman	Local govt.	01718700172
19	Moniruzzaman Milon	Team Leader	CPP	01723046968
20	Joy Pasa	Coordinator	IRV	0191113161
21	Md Zakir Hossain	Head and Professor	URP Discipline, KU	01992644569
22	Sheikh Nazmul Huda	Program Coordinator	JJS	01712862115
23	Md. Shafiqul Islam	District Coordinator	BRAC	01313407165
24	Mohammad Omar Faruuk	Knowledge Management Officer	HELVETAS	01810601406

Results

Table S4. Characteristics of respondents (n = 321).

Variables	n	%
What is your current age?		
18–29	26	8.1
30–39	80	24.92
40–49	95	29.60
50–59	69	21.5
60 and above	51	15.89

Variables	n	%
What is your gender?		
Male	178	55.45
Female	143	44.55
Other		
What is the highest level of education you have completed?		
No formal education	55	17.13
Primary	145	45.17
Secondary	100	31.15
Higher secondary	9	2.8
Bachelor's degree	9	2.8
Postgraduate or higher	3	0.93
What is your main occupation?		
Agriculture/farming	67	20.87
Fishing	49	15.26
Honey collector	-	-
Wood collector	-	-
Boat driver	8	2.49
Government/Administration	3	0.93
Private sector	2	0.62
Self-employed/Business owner	32	9.97
Daily labor	78	24.3
Homemaker	39	12.15
Unemployed	10	3.12
Other	33	10.28
What is your secondary income source?		
Livestock	104	32.40
Fishing	30	9.35
Day Labor	13	4.05
Agriculture	14	4.36
Sewing/Artisan	3	0.93
Business	3	0.93
Aquaculture	4	1.25
Teaching	2	0.62
Other	8	2.49
Number of people in household	Mean = 5.21	SD = 1.87
What is your monthly household income range?		
Below 5,000 BDT	28	8.72%
5,001–10,000 BDT	174	54.21%
10,001–20,000 BDT	97	30.22%
20,001–40,000 BDT	19	5.92%
Above 40,000 BDT	3	0.93%
How long have you lived in this area?		
Less than 5 years	1	0.31%
5–10 years	5	1.56%

Variables	n	%
More than 10 years	315	98.13%
What type of sanitation facility does your household have?		
Concrete latrine	63	19.63
Slab with water	81	25.23
Pit latrine	127	39.56
Polythene seal, no slab	46	14.33
Open defecation	1	0.31
Others	3	0.93
What is your primary source of drinking water?		
Deep tube well	21	6.54%
Shallow tube well	8	2.49%
Supply water	14	4.36%
Reverse Osmosis	6	1.87%
Surface water	142	44.24%
Rainwater	109	33.96%
Others	21	6.54%
What is your primary source of electricity?		
Grid lines	286	89.1
Solar panel	3	0.93
Both	29	9.03
No electricity	3	0.93

Table S5. Economic and disaster related information (n = 321).

Variables	n	%
Economic Information		
How dependent is your family on natural resources (wood, fish, honey) for income?		
Completely dependent	62	19.31
Partially dependent	88	27.41
Not dependent	171	53.27
What type of structure is your primary residence?		
Pacca (brick/concrete)	33	10.28
Semi-pacca	71	22.12
Kacha	217	67.6
Has your income fluctuated due to climate-related disasters?		
Yes	282	87.85
No	39	12.15
Did you receive any formal financial support (e.g., loans, insurance) to help recover from disasters?		
Yes	107	33.33

Variables	n	%
No	214	66.67
Are you in debt? If yes, what is the primary reason for incurring debt?		
Yes	188	58.57
No	133	41.43
Reasons for incurring debt		
For starting business	18	5.62
House renovation	11	3.44
Survival	10	3.12
Boat construction	6	1.87
Fishing activities (e.g., buying fishing net, cultivation)	4	1.24
Family crisis	4	1.25
Treatment	4	1.24
For agricultural purposes	4	1.25
For buying livestock	2	0.62
Various other purposes	22	6.87
Disaster-related information		
What types of natural disasters have you experienced in the last 10 years?		
Cyclones	320	99.69
Flooding	301	93.77
Storm surges	109	33.96
Salinity intrusion	205	63.86
Heatwaves	113	35.20
River erosion	178	55.45
Landslides	1	0.31
Other	10	3.12
How frequently do you experience such disasters in the last 10 years?		
Once a year	37	11.53
Multiple times a year	279	86.92
Once every few years	5	1.56
Rarely	-	-
Never	-	-
Did your household take any disaster preparedness measures?		
Yes	183	57.01
No	138	42.92
Types of disaster preparedness measures adopted		
Strengthened house structure	147	45.79
Gathered emergency supplies	151	47.04
Planting disaster-resistant crops	5	1.56
Participated in community disaster training	10	3.12
Regularly following weather forecasts and climate predictions	87	27.10
Savings for emergencies	26	8.10
Other (please specify)	12	3.74
Were you informed of the disaster through early warning systems?		

Variables	n	%
Yes	296	92.21
No	25	7.79
How effective was the warning?		
Very effective	98	30.53
Strongly effective	119	37.07
Moderate effective	65	20.25
Slightly effective	13	4.05
Not effective	1	0.31
How accessible were emergency services to your household after the disaster you faced in the last 10 years?		
Very Accessible	3	0.93
Highly Accessible	15	4.67
Moderately Accessible	49	15.26
Little Accessible	100	31.15
Not Accessible	154	47.98
What type of support or assistance did you receive after the disaster you faced in the last 10 years?		
Government relief	71	22.12
Local organizations/NGOs support	83	25.86
Community support (e.g., rehabilitation and reconstruction, loan)	1	0.31
No assistance received	205	63.86
Other (please specify)	8	2.49

Table S6. Identification of economic and non-economic loss & damages.

Economic loss & damage variables	n	%
Types of economic loss & damages experienced		
Income loss	270	84.11
Property damage	213	66.36
Infrastructure damage	279	86.92
Job loss	12	3.74
Investment loss	1	0.31
Loss of production	40	12.46
Cost of recovery	37	11.53
Increased market price of the goods	104	32.40
Loss of livestock	2	1.62
No loss experienced	8	2.49
How significant was the economic impact of the disaster on your livelihood?		
Very Significant	102	31.78
Significant	136	42.37

Economic loss & damage variables	n	%
Moderate	56	17.45
Minor	17	5.30
No Impact	10	3.12
Can you estimate the financial loss you incurred during the most recent disaster?		
No loss experienced	25	7.79
Below <11,000 BDT	124	38.63
11,001–1,10,000 BDT	151	47.04
1,10,001–6,00,000 BDT	18	5.61
Above >6,00,000 BDT	3	0.93
How would you rate the financial support received for disaster recovery?		
Excellent	3	0.93
Good	7	2.18
Satisfactory	26	8.1
Poor	92	28.66
None Received	193	60.12

Table S7. Impacts of ELD on life and livelihoods.

Economic loss & damage variables	n	%
How significant was the economic impact of the disaster on your livelihood?		
Very Significant	102	31.78
Significant	136	42.37
Moderate	56	17.45
Minor	17	5.30
No Impact	10	3.12
Can you estimate the financial loss you incurred during the most recent disaster?		
No loss experienced	25	7.79
Below <11,000 BDT	124	38.63
11,001–1,10,000 BDT	151	47.04
1,10,001–6,00,000 BDT	18	5.61
Above >6,00,000 BDT	3	0.93
How would you rate the financial support received for disaster recovery?		
Excellent	3	0.93
Good	7	2.18
Satisfactory	26	8.1
Poor	92	28.66
None Received	193	60.12