National Policy on Mitigation and Rehabilitation Measures for People Displaced by Coastal and River Erosion 2022

National Disaster Management Authority
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## Contents

Abbreviations 5  
Preamble 7  
1 Introduction 8  
1.1 Focus of the National Policy 8  
1.2 Objective of the National Policy 9  
1.3 Intended Audience of the National Policy 9  
1.4 A Consultative Evidence-based Policy 9  
1.5 Summary of the National Policy 10  
2 The Challenge—Coastal and River Erosion 12  
2.1 Coastal Erosion in India 12  
2.1.1 The Coastal Ecosystems 12  
2.1.2 Coastal Erosion 14  
2.1.3 Factors Escalating Coastal Erosion 14  
2.1.4 Communities Affected by Coastal Erosion 15  
2.1.5 Challenges due to Coastal Erosion 15  
2.1.5.1 Destruction of Basic Facilities 15  
2.1.5.2 Displacement of Vulnerable Groups 15  
2.1.5.3 Disruption of Livelihoods 15  
2.1.5.4 Damage to Housing 16  
2.1.5.5 Inadequate Compensation for Loss of House or Land 16  
2.1.5.6 Psychological Impact 16  
2.2 River Erosion in India 17  
2.2.1 The River Ecosystems 17  
2.2.2 River Erosion 17  
2.2.2.1 Brahmaputra and its Tributaries in Assam 18  
2.2.2.2 West Bengal 18  
2.2.2.3 Bihar 19  
2.2.2.4 Uttarakhand and Uttar Pradesh 19  
2.2.3 Factors Escalating River Erosion 19  
2.2.4 Communities Affected by River Erosion 20  
2.2.5 Challenges due to River Erosion 20  
2.2.5.1 Homelessness—Often with Multiple Displacements 20  
2.2.5.2 Loss of Land and Assetlessness 20  
2.2.5.3 Land Transaction and Agreement 20  
2.2.5.4 Distress Migration 20  
2.2.5.5 Loss of Social Identity and Aggravated Vulnerabilities 21  
2.3 The Need for Policy Intervention 21  
2.3.1 Impact on Communities 21  
2.3.2 Climate Change and Human Interventions 22  
2.4 Current and Future Measures to Tackle Erosion 22  
2.4.1 Non-structural Measures 22  
2.4.2 Structural Measures 23  
3 Institutional Mechanisms for Managing Coastal and River Erosion 24  
3.1 Institutional Framework for Disaster Management in India 25  
3.2 Financing Mitigation and Rehabilitation 25  
3.3 Roles of Institutions and Authorities 26  
3.3.1 Panchayat-level committee 26  
3.3.2 District Disaster Management Authority 27
3.3.3 State Disaster Management Authority 28
3.3.4 National Disaster Management Authority 29
3.4 Institutional Capacities 30
4 Mitigation and Rehabilitation of Coastal-Erosion Affected and Vulnerable Areas:
Programmatic Response 31
4.1 Mitigation Measures 31
4.1.1 Safeguarding coastlines 31
4.1.2 Supporting the vulnerable 32
4.1.3 Ensuring access to basic services 33
4.1.4 Fostering cooperation 33
4.1.5 Minimising impact 34
4.1.6 Adopting non-structural measures 34
4.1.7 Adopting structural measures 35
4.2 Mitigation Implementation Processes 36
4.3 Mitigation and Rehabilitation of River-Erosion Affected and Vulnerable Areas:
Programmatic Response 42
5.1 Mitigation Measures 42
5.1.1 General strategies 42
5.1.2 Supporting the vulnerable 43
5.1.3 Ensuring access to basic services 44
5.1.4 Securing livelihoods 44
5.1.5 Innovative approaches 45
5.1.6 Mitigation measures for unique locations 45
5.1.7 Non-structural mitigation measures 46
5.1.8 Structural mitigation measures 47
5.2 Mitigation Implementation Processes 47
5.2.1 Generic processes 47
5.2.2 Processes at the district level 48
5.3 Rehabilitation Measures 49
5.3.1 Rehabilitation interventions framework 49
5.3.2 Housing and habitat-related services 50
5.4 Rehabilitation Implementation Processes 51
5.4.1 Generic processes 51
5.4.2 Innovative processes 52
5.4.3 Securing livelihoods 52
5.4.4 Ensuring access to basic services 53
5.4.5 Housing and habitat-related services 53
5.5 Mitigation and Rehabilitation Plan Submission and Approval Process 53
6 Impact Monitoring and Evaluation of Mitigation and Rehabilitation Programmes 55
6.1 Scope of Impact Monitoring and Evaluation 55
6.2 Roles and Responsibilities 55
6.3 Organisation and Funding 56
6.4 Protocols
6.4.1 Planning 56
6.4.2 Strategy Formulation 57

7 National-level Vulnerability and Impact Assessment of Coastal and River Erosion 58
7.1 Periodic Impact and Vulnerability Assessment 58
7.2 Operational Framework for Impact and Vulnerability Assessment 60

Appendix: Recommendations of the Fifteenth Finance Commission for Erosion Mitigation and Rehabilitation
Mitigation Measures to Prevent Erosion 61
Rehabilitation Measures for People Affected by Erosion 61
Pre-conditions for Assistance 62
Guiding Principles 62
Processes of Mitigation and Rehabilitation 64
Glossary of Technical Terms 65
## Abbreviations

<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>BLRO</td>
<td>Block Land Revenue Officer</td>
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<tr>
<td>CBO</td>
<td>Community-based Organisation</td>
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<tr>
<td>CoR</td>
<td>Commissioner of Relief</td>
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<td>CRZ</td>
<td>Coastal Regulation Zone</td>
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<tr>
<td>CSO</td>
<td>Civil Society Organisation</td>
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<tr>
<td>CWC</td>
<td>Central Water Commission</td>
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<td>DDMA</td>
<td>District Disaster Management Authority</td>
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<td>DDMF</td>
<td>District Disaster Mitigation Fund</td>
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<tr>
<td>DDR</td>
<td>District Disaster Response Fund</td>
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<tr>
<td>Dept. of Revenue</td>
<td>Department of Revenue</td>
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<td>DMA</td>
<td>Disaster Management Act</td>
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<td>DMD</td>
<td>Disaster Management Department</td>
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<tr>
<td>FC</td>
<td>Finance Commission</td>
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<tr>
<td>FMBAP</td>
<td>Flood Management and Border Area Program</td>
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<tr>
<td>GoI</td>
<td>Government of India</td>
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<tr>
<td>IAG</td>
<td>Inter-Agency Coordination</td>
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<td>ICDS</td>
<td>Integrated Child Development Services</td>
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<tr>
<td>IDP</td>
<td>Internally Displaced Person</td>
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<tr>
<td>IMD</td>
<td>India Meteorological Department</td>
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<tr>
<td>Km</td>
<td>Kilometres</td>
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<tr>
<td>M&amp;E</td>
<td>Monitoring and Evaluation</td>
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<tr>
<td>MBL</td>
<td>Minimum Beach Level</td>
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<tr>
<td>MFL</td>
<td>Minimum Floor Level</td>
</tr>
<tr>
<td>MGNREGA</td>
<td>Mahatma Gandhi National Rural Employment Guarantee Act</td>
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<tr>
<td>Abbreviation</td>
<td>Full Form</td>
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<tr>
<td>MHA</td>
<td>Ministry of Home Affairs</td>
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<tr>
<td>NCCR</td>
<td>National Centre for Coastal Research</td>
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<tr>
<td>NCSCM</td>
<td>National Centre for Sustainable Coastal Management</td>
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<tr>
<td>NDMA</td>
<td>National Disaster Management Authority</td>
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<tr>
<td>NDMF</td>
<td>National Disaster Mitigation Fund</td>
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<tr>
<td>NDRF</td>
<td>National Disaster Response Fund</td>
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<tr>
<td>NGO</td>
<td>Non-Governmental Organisations</td>
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<td>NIDM</td>
<td>National Institute of Disaster Management</td>
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<td>NRLM</td>
<td>National Rural Livelihood Mission</td>
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<tr>
<td>NTFP</td>
<td>Non Timber Forest Produce</td>
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<tr>
<td>ODHHR</td>
<td>Owner Driven Housing and Habitation Reconstruction</td>
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<tr>
<td>PDNA</td>
<td>Post Disaster Needs Assessment</td>
</tr>
<tr>
<td>PMAY</td>
<td>Pradhan Mantri Awaas Yojana</td>
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<tr>
<td>R&amp;D</td>
<td>Research and Development</td>
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<tr>
<td>RCC</td>
<td>Reinforced Cement Concrete</td>
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<td>SDMA</td>
<td>State Disaster Management Authority</td>
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<td>SDMF</td>
<td>State Disaster Mitigation Fund</td>
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<tr>
<td>SDRF</td>
<td>State Disaster Response Fund</td>
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<tr>
<td>SHG</td>
<td>Self-help Group</td>
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<tr>
<td>SLR</td>
<td>Sea-level Rise</td>
</tr>
<tr>
<td>SMP</td>
<td>Shoreline Management Plan</td>
</tr>
<tr>
<td>SOP</td>
<td>Standard Operating Procedures</td>
</tr>
<tr>
<td>SRLM</td>
<td>State Rural Livelihood Mission</td>
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<tr>
<td>WRD</td>
<td>Water Resource Department</td>
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<td>XVFC</td>
<td>15th Finance Commission</td>
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Preamble

Land erosion by seas, oceans and rivers not only causes loss of earth but also erodes away at human lives and livelihoods, especially by changing the landscape, biosphere, and plant and animal habitat. In India, this tends to make life of vulnerable populations even more difficult.

Erosion prevention measures at scale are an infrastructural challenge that is being gradually overcome. However, response to and recovery from the disaster caused by coastal and river erosion needs a policy and mechanism to provide immediate relief to affected populations. Such a policy will also offer better pathways for them to regain control of their lives and livelihoods.

This National Policy on Mitigation and Rehabilitation Measures for People Displaced by Coastal and River Erosion 2022 is built around the theme of resilience that is also the bedrock for the Sustainable Development Goals of the United Nations for India by 2030. It was formulated under the guidance of the National Disaster Management Authority in consultation with administrators, coastal communities, civil society, experts and other stakeholders.

The national policy (also referred to as the policy in this document) provides a framework for authorities and administration to contain the hardship and misery caused by erosion to coastal and river communities and help them build their livelihoods and lives back. It also makes many policy recommendations for prevention.
# Introduction

India’s maritime coast and inland flood plains are densely populated centres of diverse economic activities including fisheries, agriculture, manufacturing, trade, and tourism. Erosion severely threatens the country's coastlines and rivers often resulting in the displacement of millions of inhabitants. Erosion events cause loss of life and livelihoods, damage public and private property, affect people’s well-being, and negatively impact the ecology. They lead to adverse outcomes in the form of assetlessness, homelessness, and extreme regional poverty.

Human (anthropogenic) activities have compounded the incidence and magnitude of erosion, exposing millions to chronic and unpredictable calamity. Climate change, with its attendant extreme natural events, has further escalated erosion. As a result, habitations along the coastline and rivers have become even more vulnerable. Erosion and its consequences have been specifically distressful for women and other vulnerable groups such as, children, senior citizens, physically challenged, and the socially and economically marginalised.

Taking cognizance of the tremendous adverse effects of coastal and river erosion, the 15th Finance Commission (XVFC) recommended,

- “Mitigation Measures to Prevent Erosion” under the National Disaster Mitigation Fund (NDMF);
- “Resettlement of Displaced People Affected by Erosion” under the National Disaster Response Fund (NDRF);
- Development of norms by National Disaster Management Authority (NDMA) and/or Ministry of Home Affairs for approval of these funds for affected states to the extent of 90% of the cost for undertaking erosion mitigation works; and
- Development of a policy by Government of India (GOI) as well as state governments to address the extensive displacement of people caused by erosion.

## 1.1 Focus of the National Policy

The priority of the National Policy on Mitigation and Rehabilitation Measures for People Displaced by Coastal and River Erosion 2022—or the National Policy—is to lay out procedures and systems to address the present and future erosion-related local challenges. It focuses on the development of decentralised strategies and processes for mitigation and rehabilitation.
1.2 Objective of the National Policy

The policy aims to reduce and eliminate the vulnerabilities along the coastline and river. It intends to not only minimise the risks emanating from climate change events and anthropogenic activities but also maximise the adaptive capacity and resilience of communities affected by coastal and river erosion.

These objectives will be achieved through the window of the NDMF or State Disaster Mitigation Fund (SDMF) and NDRF or State Disaster Response Fund (SDRF).

1.3 Intended Audience of the National Policy

The National Policy will assist functionaries from the following institutions engaged in mitigation, recovery, reconstruction, and rehabilitation measures:

- NDMA,
- State Disaster Management Authorities (SDMAs),
- District Disaster Management Authorities (DDMAs),
- sectoral ministries and departments,
- non-governmental organisations (NGOs),
- civil society organisations (CSOs),
- community-based organisation (CBOs), and
- sector experts and researchers.

It will guide mitigation and rehabilitation action at national-, state-, district-, and Panchayat-levels in areas vulnerable or affected by coastal or river erosion.

1.4 A Consultative Evidence-based Policy

Representatives from the Union ministries, state government departments, government institutions and thematic experts were involved in the deliberation process.

A national webinar on rehabilitation of displaced people affected by erosion was organised by NDMA. This was followed by a series of online national consultations with NGOs and thematic experts.

The perspectives of the vulnerable communities from Kerala, Tamil Nadu, Andhra Pradesh, Odisha, Assam, West Bengal, Bihar, and Uttar Pradesh were gathered through field-level
consultations organised in collaboration with local NGOs. Peoples' experiences were documented through focus group discussions and household surveys in these eight states. The local partner NGO also interacted with government officials, thematic experts from institutions, and independent experts at the panchayat-, block-, or district-levels to get their inputs on the existing problem and probable strategies.

The draft guidelines were then shared with SDMA functionaries, sectoral ministries and departments, institutions, NGOs, and experts. The feedback from all stakeholders were compiled and incorporated to finalise the National Policy.

The National Policy is supported by recent empirical evidence through the multi-level consultations and deliberations undertaken for its formulation. This forward looking policy retains the scope to incorporate future changes to keep pace with the evolving erosion landscape in India.

The consultations also correlated the increased coastline and river erosion to climate change, sea-level rise (SLR), storm and tidal surge, wind, wave actions, and extreme weather events such as, cyclones, cloud bursts, etc. The National Policy and its programmatic recommendations intend to ensure safety of erosion-affected habitat and sustainability of people's well-being. It is thus the bedrock of India's climate change adaptation.

1.5 Summary of the National Policy

<table>
<thead>
<tr>
<th>Box 1.1: The National Policy Focuses on</th>
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<tr>
<td>• Enhancing resilience of the affected and vulnerable communities through social, economic, and structural protection strategies</td>
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<td>• Restoring the living standards of people in areas prone to erosion risk through sustenance of local incomes and livelihoods</td>
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<tr>
<td>• Seeking to empower erosion affected and vulnerable women by minimising their vulnerabilities and recommending social and economic measures to build resilience</td>
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<td>• Covering land entitlements, livelihood restoration, roles and responsibilities of Panchayat-, district-, state-, and national-level institutions, programmatic recommendations, mitigation and rehabilitation responses, monitoring and evaluation (M&amp;E) of programmes, etc.</td>
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<tr>
<td>• Suggesting ways to strengthen the technical and institutional capacities of ministries and national and sub-national authorities and departments working on erosion—i.e.,</td>
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Chapter 2 describes the physical process and extent of coastline and river erosions in India and their impact on people, livelihoods, and economic standards. It presents evidence linking erosion to low income, outmigration, increased drudgery of women, poor infrastructure, etc. It thus correlates regional backwardness of areas that face erosion-risk with the recurring nature of both forms of erosion.

Chapter 3 elaborates the institutional mechanisms for managing mitigation and rehabilitation responses.

Chapter 4 details the district level programmatic responses for mitigation and rehabilitation of the erosion affected and vulnerable in the coastal areas.

Chapter 5 does the same for river erosion.

Chapter 6 explains the M&E framework for the programmatic responses.

Chapter 7 illustrates the institutional mechanism and operations for impact and vulnerability assessment of areas affected by and vulnerable to erosion.

XVFC recommendations for mitigation and rehabilitation responses in erosion affected and vulnerable areas are presented in the Appendix. It also includes the guiding principles of such responses.

A glossary of technical terms is presented at the end.
2 The Challenge—Coastal and River Erosion

2.1 Coastal Erosion in India

2.1.1 The Coastal Ecosystems

Coastal India (Figure 2.1) is characterised by estuaries, marshes, mangroves, lagoons, salt pond/pan, seagrass beds, coral reefs, croplands, mudflats, sandy beaches, creeks, coastal shelf ecosystems, and habitations.

![Figure 2.1: Geomorphology of Indian Coasts](image)

- Sandy beaches: 43%
- Rocky: 11%
- Mudflats: 36%
- Marshland: 10%
- Major estuaries: 97
- Lagoons: 34

India’s coastal ecosystem also includes a wide range of flora and fauna, including endemic species. A majority of the coastal population is dependent on the coast for their livelihoods.

![Figure 2.2: A snapshot of the Indian Coastline](image)

- Geographical: 7,516.6 km coastline
- Political: Spanning 9 states and two Union Territories—Lakshadweep and Andaman and Nicobar Islands—encompassing 66 districts
• Demographic: Home to 171 million citizens—14.1% of the country’s population
• Economic: 13 major ports | 46 fishing harbours | 187 minor ports

The coastal ecosystems deliver a wide range of services (Figure 2.3).

**Figure 2.3: Coastal Ecosystem Services**

- Provisioning services: Food, fibre, timber, fuel, medicines, and other resources
- Regulating services: Freshwater storage, hydrological balance, waste processing, flood/storm protection, erosion control, shoreline stabilisation, regulation of water quality and carbon sequestration
- Cultural services: Amenity, recreational, and aesthetic nonmaterial benefits, which support people in spiritual, social, and cultural dimensions
- Supporting services: Nutrient regulation, nutrient cycling, and soil fertility, besides biodiversity conservation

These services are valuable not only to the local communities, but also for the national economy, exports, and global trade. The smallholder dominated coastal zone populations produce considerable food and allied supplies. The coastal land-use systems including integrated farming of fish/shrimp in rice paddies, coconut-based mixed farming, spice crops, home garden, and agroforestry contribute significantly to food and nutritional security. Coastal agriculture and aquaculture, notably rice and seafoods, account for a substantial part of the country’s food output.

Deltas (fluvial landforms) are an alluvial landscape formed by silt, sand, clay, and gravel (sediment) transported by a river to its mouth. They are formed at the coastal interface where tides or waves do not completely remove the sediments. India has four major deltas, namely, Ganga–Brahmaputra, Mahanadi, Krishna–Godavari, and Indus apart from two other prominent river deltas—Cooum and Kabani.

Climate change has resulted in widespread loss of productivity and infrastructure due to extreme events such as cyclones, very heavy precipitation, and floods. These, in turn, increase the incidence of diseases, parasites, and algal bloom hazards in aquaculture. Sea-level rise, enhanced cyclones, storm surges, and other hazards, adversely impact the coastal ecosystem services. Destruction of plantations and agricultural crops owing to sea water
intrusion and soil salinisation can cause more sustained damage to provisioning services.
Food security, especially in the low-lying coastal areas and small islands, is intrinsically linked to climate change and SLR.

2.1.2 Coastal Erosion
Several geographical features and weather phenomenon make the Indian coasts vulnerable to erosion. Coastal geomorphology, coastal vegetation, wind, waves, tides, and currents are the key natural factors that prevent or precipitate erosion. Coastal erosion involves the removal of rock, soil, and sand from the coasts by wave and wind action. Erosion causes loss of coastal habitat and aesthetics resulting in biodiversity loss and diminished tourism activities.

According to the National Centre for Coastal Research (NCCR), Ministry of Earth Sciences (MoES), Government of India (GOI), varying degrees of erosion impacted over 33.6% of the coastline in the past 28 years.

As reported by NCCR, around 26% of surveyed coastline in India has increased land area (accretion), which may even obstruct inflow of seawater in deltas, estuaries, and creeks, thus disturbing the breeding cycles of aquatic flora and fauna.

The overall coastal erosion along the country's coastline has exceeded accretion by about six per cent. During 1990–2016, India witnessed the most severe coastal erosion in West Bengal (63%), Puducherry (57%), Kerala (45%), and Tamil Nadu (41%). Barring Kerala, the west coast has been relatively stable. Along coastal India, 98 pockets are under the threat of erosion (Figure 2.4).

<table>
<thead>
<tr>
<th>Figure 2.4: Prominent Pockets of Coastal Erosion</th>
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<tbody>
<tr>
<td>Tamil Nadu: 26</td>
</tr>
<tr>
<td>West Bengal: 16</td>
</tr>
<tr>
<td>Kerala: 12</td>
</tr>
<tr>
<td>Maharashtra: 8</td>
</tr>
<tr>
<td>Gujarat including Daman and Diu: 8</td>
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</tbody>
</table>

2.1.3 Factors Escalating Coastal Erosion
Consultations with members of the coastal community revealed two drivers of coastal erosions—natural (geographical) and anthropogenic.

- Along more than 75% of Indian coastline prone to cyclones and tsunamis, erosion is caused by SLR, storm and tidal surge, cyclone, wind, and wave actions.
• In the low-lying coastal ecosystems such as the Sundarbans, destruction of the mangroves causes erosion—precipitating loss of habitat and farmland.\textsuperscript{xvii}

• Ad hoc anthropogenic factors such as land reclamation, construction, coastal structures, dredging, sand mining, and coral mining,\textsuperscript{xviii} including removal of sand from the beaches and the coastal dunes, accelerate erosion.

• Ports too contribute to anthropogenic pressure that disrupts the natural path of the sea. Thus, they become one of the prime human-induced factors behind escalation of coastal erosion and related outcomes and adverse impacts.\textsuperscript{xix}

2.1.4 Communities Affected by Coastal Erosion

• Fisherfolk, fish sellers/fish vending undertaken largely by women, dry fish marketing, labourers engaged in fisheries, etc.

• Weaver communities, coastal agriculturists, families living along the coast etc.

• Salt-pan workers, people associated with coastal tourism, small vendors, and petty traders etc.

• Vulnerable and displaced women, children, and the elderly people.

2.1.5 Challenges due to Coastal Erosion

2.1.5.1 Destruction of Basic Facilities
Erosion forces families living along the coastline to move inland, sometimes far away from their previous home. This not only curbs their living spaces but displaced households often also lose access to basic services. Lack of proper health services, safe drinking water, sanitation, and schooling facilities as well as disrupted road communication and electricity linger on, making the business of routine daily living extremely difficult.

Overlapping and interdependent systems are put at a disadvantage, compounding the loss.

2.1.5.2 Displacement of Vulnerable Groups
Women, infants, adolescents, elderly, disabled, and other vulnerable groups are forced to endure even greater social and economic insecurities due to coastal erosion induced displacement.

2.1.5.3 Disruption of Livelihoods
Coastal erosion reduces common spaces for activities like mending nets, drying fish, storage of gear, and beach landing of artisanal boats. Damaged nets are brought back to the village
for drying and mending, as frequently replacing them is too expensive. Women who dry the fish have to work within the limited spaces of their homesteads or homes, thus putting limits on volumes. Fish vendors—often women—have to travel farther to procure fish that adds to costs and time. These impact the livelihoods of the women.

Reduced beach area forces fisherfolk to use alternate landing areas or harbours, which adds to their transportation costs. Fishing boats and their outboard engines have to be moored far from habitat at the harbour making the assets unsafe. This is a major worry for the fisherfolk.

2.1.5.4 Damage to Housing
House construction costs and time and effort to make them liveable are extremely high. Displaced populations are often unwilling to give up houses they have already built at substantial cost, for alternative provided by the government, owing to apprehensions on quality, facilities, and location. The deadweight loss of value of the house, damaged or vacated due to erosion, is burdensome for the poor.

2.1.5.5 Inadequate Compensation for Loss of House or Land
Inadequate—or even zero—compensation is disbursed in certain cases to the erosion-affected populations. Absence of a well-defined and transparent assessment and evaluation process is the underlying reason.

Families that lose their land to erosion are not compensated either. The SDRF norms do not recognise this loss or ownership cannot be authenticating due to unavailability of patta (ownership papers).

2.1.5.6 Psychological Impact
Loss or constant fear of losing homes built through years of hard work has a debilitating psychological impact on the fishing communities, especially women who ensure the safety of their children. Loss of playground and recreation facilities adds to the psychological stress of children and younger members of the community. The emotional instability from displacement and relocation to either relatives' houses or temporary camps causes psychological trauma.
2.2 River Erosion in India

2.2.1 The River Ecosystems

Rivers in India flow through the Himalayas (glaciers), non-Himalayan high mountains, Western and Eastern Ghats, central Indian plateaus and forests as well as densely populated cities, towns, villages, farmlands, floodplains, sandbanks and deltas. River systems have sustained lives and livelihoods and provided means of waterway transportation of people and goods through the ages. Even in mountainous regions, rivers have human settlements—tightly packed on mountainsides, clearings or valleys.

The dynamic rivers of Indo-Ganga–Brahmaputra (IGB) plains are infamous for the hazard they cause. xxiv Large rivers Himalayan Rivers including Ganga, Ghagra, Ramganga, Rapti, Bagmati, Koshi, Teesta and Brahmaputra shift their position vigorously and result in river erosion in India’s heartland. xxv Floods, cloudbursts, earthquakes, opening up of new streams, rivers changing course, and human interventions, especially along the Himalayan Rivers, trigger erosion and, similar to coastal erosion, disrupt lives and livelihoods. As a slow, continuous and endemic phenomenon, river erosion traps vulnerable populations in poverty and assetlessness in the long term. As a result, numerous erosion-affected pockets along the IGB plains are afflicted by social, economic and cultural backwardness.

2.2.2 River Erosion

This fluvial geomorphological phenomenon is initiated by precipitation in the mountainous areas. The first order stream formation causes soil erosion uphill and alluviation in the flood plains, which leads to sediment build-up on the riverbed resulting in the braiding of the river. Heavy sedimentation at times even open-up a new river channel. Aggradation, alluviation, braiding and meandering makes rivers erode banks as a complex natural process. xxvi Over a long period the process contributes to the formation of floodplains and alluvial terraces. xxvii
In stable river systems, the rate of erosion is much slower and on a smaller scale compared to unstable river systems. River erosion could be either bank scour or mass failure.

- **Bank scour**: Direct removal of bank materials by a flowing river, mostly observed in smaller streams and the upper reaches of larger streams and rivers.
- **Mass failure**: Large chunks of river material become unstable and topple into the stream (collapse and slump) in a single event, generally witnessed in the lower reaches of large streams and rivers. It is linked to the scouring of lower rivers.

According to the NDMA Bihar and Assam are the two most erosion affected states in India. The riverine areas of West Bengal too face erosion.

### 2.2.2.1 Brahmaputra and its Tributaries in Assam

The plains of Assam have been heavily affected by river erosion since 1950. An estimated 12.6 thousand hectares of land was lost and 77.8 thousand people were displaced in 2014. Chirang, Kokrajhar, Dhubri, Haflong, Hailakandi, Sivasagar, Silchar, Kamrup Metropolitan district, Baksa, Nalbari, Lakhimpur, Darrang, Sonitpur, Dhemaji and Nagaon districts of Assam are most affected by river erosion. A sharp rise in braiding intensity during 1990–2008 has worsened the situation (Figure 2.5).

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<thead>
<tr>
<th>Main Stem</th>
<th>Major Tributaries</th>
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</table>

- Land area lost during 1990 – 2008
  - South bank: 515 sq. km
  - North bank: 539 sq. km

- Land area lost during 1997 – 2008
  - South bank: 397 sq. km
  - North bank: 328 sq. km

- Southern tributaries: 223 sq. km
- Northern tributaries: 416 sq. km

- Southern tributaries: 187 sq. km
- Northern tributaries: 356 sq. km

Notes: sq. km = square kilometres

### 2.2.2.2 West Bengal

The geomorphology of West Bengal is purely riverine. Erosion of Ganges and Fulhar rivers in Malda and Murshidabad districts of West Bengal has been calamitous in the recent past as has erosion due flash floods in North Bengal districts particularly Jalpaiguri. The Ganga
upstream of Farakka Barrage in Malda district of West Bengal has been undergoing extensive erosion along the left bank despite strong protection through the decades. The upstream is so clogged with sediment that the river is compelled to alter its course. According to the Irrigation and Waterway Department of West Bengal, large land tract gets eroded due to a constant swing of the river to the left. According to official data ~14,335 hectares of exceedingly productive land was lost from the left bank of the river between 1931 and 1978 due to erosion and an estimated 4,247 hectares (>200 km²) between 1979 and 2004. A roughly equivalent area has emerged along the right bank of the river. Since 1960s, the river has eroded a huge tract of land at a very high rate leading to annual bank cutting and population displacement in erosion-affected blocks of Manikchak, Kaliachak and Ratua.

2.2.2.3 Bihar
The banks of Gandak, Kamla Balan, Bagmati, Kosi and Mahananda continuously erode due to the lateral movements of these rivers in Bihar. The rivers are constantly changing due to extensive flooding of very high magnitude, channel widening and change in channel pattern. Displacement of people living on the banks of these rivers remains a major concern.

2.2.2.4 Uttarakhand and Uttar Pradesh
Bank erosion along the river Ganga and its tributaries and others including Sharda, Ghaghara, Gorra, Rapti, Rohin and Saraya have also been affecting Uttarakhand and Uttar Pradesh, precipitating significant destruction of crops, habitats and infrastructure.

2.2.3 Factors Escalating River Erosion
- Floods, human interventions and their complex interplay alter the course and regime of a river, resulting in accelerated and enhanced erosion.
- River erosion is enhanced due to
  - Instances of rapid inundation and retreat in quick succession;
  - Redirection and acceleration of flow around infrastructure, obstructions, debris or vegetation within the stream channel;
  - Excessive or inappropriate sand and gravel extraction and
  - Intense rainfall events such as cyclones, cloud burst, etc.
- River erosion, unlike other hazards, has no fixed onset–offset.
2.2.4 Communities Affected by River Erosion
River erosion largely affects communities living along the rivers, including the small and marginal farmers, landless households, embankment dwellers, non-timber forest produce (NTFP) collectors, farm labourers, inland and brackish water fish cultivators, boatmen, handicraft, laundry and hide workers, small entrepreneurs, etc.

2.2.5 Challenges due to River Erosion

2.2.5.1 Homelessness—Often with Multiple Displacements
Displacement due to river erosion mostly results in homelessness. In the absence of any policy or plan, the homeless are compelled to settle in proximate vacant lands without any permission or ownership. This often leads to the homeless being displaced multiple times. Repeated search for alternate sites and frequent rebuilding is expensive and disrupts their life and livelihood.

2.2.5.2 Loss of Land and Assetlessness
The recovery of lost agricultural land is uncertain and indefinite for households. Lack of clear policy and mechanism to assign ownership of newly emerged land (sand bars, diara, char, sapori, etc.) making it the playground for extra-legal forces further complicates land access and ownership. Such communities also experience loss of stored grains and household belongings. The assetless households are also forced to borrow at exorbitant rate of interests from local moneylenders to survive.

2.2.5.3 Land Transaction and Agreement
Education and awareness regarding procedures and protocols for land deals for such poor communities is often a challenge. Hurried purchase of land and lack of knowledge concerning land agreement and transactions coupled with the pressure to resettle, frequently result in additional problems for the displaced households.

2.2.5.4 Distress Migration
River delta islands are gradually disappearing due to river erosion in Sundarbans (West Bengal) and Majuli (Assam). The former characterised by loss of large tracts of lands, destruction of water sources, razing of mud houses and damages to the embankment, etc. The land area of Majuli island, the biggest river island in India, is slowly reducing, resulting in the disappearance of many villages. To overcome assetlessness, lack of significant savings and limited local livelihood opportunities, a low-barrier choice is to head to the nearest
towns and cities as migrant casual labour or other small time jobs. This forced migration is creating a class of landless and rootless poor.\textsuperscript{xlii}

2.2.5.5 Loss of Social Identity and Aggravated Vulnerabilities
Loss of land and habitat often takes with it the social identity of the affected communities.\textsuperscript{xliii} It is a nearly impossible task to re-establish their original identity in a new locality due to loss of context, resources, associations, language, culture, and social contract.

Forced displacement due to river erosion leads to social insecurity for women, children, and adolescent girls as they have to survive in poor basic conditions, no means of livelihood and limited earning opportunities. At times women, adolescent children, and elderly are left behind in the village without support as men migrate to urban centres in search of jobs.\textsuperscript{xliv}

2.3 The Need for Policy Intervention

2.3.1 Impact on Communities
Communities living in geographies frequently affected by coastal and river erosion are exposed to the following:

- Long-lasting impact
  - Permanent loss of land: Largely irreplaceable
  - Loss of fertile land: Sustained hardship for agricultural communities

- Severe disruptions
  - Local economy, development and basic services: Severely interrupted
  - Local livelihoods (fishing, agricultural and allied): Severe short-term uncertainty
  - Local economic opportunities: Diminished
  - Distress migration: Substantial increase

- Immediate loss of decades of effort and evolution
  - Habitat (property and livelihood): Immediate loss with slow recovery
  - Culture, traditions and indigenous knowledge: Immediately made redundant\textsuperscript{xlv}
  - Practices, socioeconomic networks and governance mechanisms: Abruptly compromised
2.3.2 Climate Change and Human Interventions
- Accumulating future risk
  - Erosion and overall coastal vulnerability\textsuperscript{xlvi}: Heightened risk
  - Erosivity of rivers: Risk from increased precipitation duration–intensity
  - Human-induced structural interventions: Amplified erosion

Adaptation measures to counter the rising threat of climate change and indiscriminate structural interventions are therefore imperative. Active efforts towards mitigation and rehabilitation through a National Policy with clearly articulated strategies are necessary to ensure social, economic, cultural and developmental security and sustainability.

2.4 Current and Future Measures to Tackle Erosion

Most of the current interventions to prevent coastal and river erosion are structural in nature. However, in view of the exacerbated risks, diverse protection measures to minimise impact and effectively restore the lived experience of the affected population are necessary. The policy must address the underlying factors of social and economic backwardness in the erosion affected and vulnerable regions. It should also attempt to contain the impact on women, children, elderly and persons with disability by safeguarding assets and livelihoods that are crucial to restoring normalcy.

Impact of erosion on housing, livelihoods, drinking water, sanitation, community spaces, community infrastructure, commons, education, health, transportation and cultural practices for various vulnerable groups varies in intensity. A panchayat-level community-based process focusing on social inclusion, especially for vulnerable groups like women, children, persons with disability and senior citizens, is a desirable component of the policy.

2.4.1 Non-structural Measures

Knowledge, practice or agreement to prevent and reduce risks and impact of erosion through guidelines, policies and legislations are non-structural measures. To that end, the policies and guidelines listed below are already in place.

- Disaster Management Act (DMA) (2005),
- National Environmental Policy (2006),
- National Rehabilitation and Resettlement Policy (2007),
• National Disaster Management Guidelines—Management of Floods (2008),
• National Disaster Management Guidelines—Management of Cyclones (2008),
• National Disaster Management Policy (2009),
• Wetlands (Conservation and Management) Rules (2010),
• Coastal Regulation Zone Notification (2011),
• National Water Policy (2012),
• National Guidelines for Recovery and Reconstruction (2020), and
• Technical Guidelines for Disaster Mitigation Fund (NDMF and SDMF).

Preventive measures, public awareness and training and education are also non-structural in nature, for instance, mapping of erosion affected and vulnerable areas, instituting continuous monitoring and early warning systems tracking seasonal variations. Developing an information collection system, disseminating location-specific prevention and impact-reduction measures and instituting awareness programs are equally necessary.

Streamlining legal and land-use regulations, planning for vulnerable areas, developing emergency and evacuation plans, insurance, designing local and alternative livelihood improvement programmes etc. are some of the administrative and procedural measures.

The India Meteorological Department (IMD) can play an institutional role in increasing public awareness and imparting training on climate- and weather-related causes of erosion. National Centre for Sustainable Coastal Management (NCSCM) and National Centre for Coastal Research (NCCR) could assist in mitigation and rehabilitation effort by leveraging satellite imagery, sensors, high-capacity computation, etc.

2.4.2 Structural Measures
Physical construction, engineering techniques, technology-driven hazard resistance and resilient structures and systems are structural measures. For instance,

• groynes,
• seawalls,
• offshore breakwater,
• artificial headland,
• natural vegetation,
• mangrove with geo-jute technology,
• non-hazardous e-concrete embankment,
• management of lock gates for brackish water canals,
• canal restoration,
• gabions,
• vanes,
• guide bunds,
• bank revetment,
• bio-engineering measures,
• Reinforced Cement Concrete (RCC) porcupines,
• retaining walls, etc.

Due diligence, scientific assessment and local planning for the site are prerequisites to identify such structural measures. All large-scale projects must be supported by the assigned department such as the state water resource department (WRDs).

Challenges and impact due to erosion varies by location. Developing location-specific structural measures at the sub-district level will require localised identification of challenges and impact of erosion and designing solutions with specific emphasis on mitigation measures.\textsuperscript{xlvii}

3 Institutional Mechanisms for Managing Coastal and River Erosion

Both coastal erosion as a lingering crisis along the long shorelines of India and river erosion as a continuous and slow hazard occurrence pose significant existential risks to vulnerable populations and ecosystems along the long shorelines of India. A robust institutional mechanism is therefore imperative for undertaking periodic impact and vulnerability assessment of the erosion-affected areas, designing and implementing mitigation and rehabilitation measures, and developing pathways for securing these vulnerable communities in the long run. This policy therefore examines the existing institutions for disaster
management in India and makes recommendations for greater focus on reducing the impact of coastal and river erosion.

3.1 Institutional Framework for Disaster Management in India

The Disaster Management Act (DMA), 2005 lays down the institutional and coordination mechanism for effective disaster management at the national, state, district, and local levels. As mandated by this Act, the Government of India (GOI) has created a multi-tiered institutional system of disaster management authorities at the national, state, and district levels—the NDMA headed by the Prime Minister, the SDMAs headed by the respective chief ministers and the DDMAs headed by the district collectors and co-chaired by chairpersons of the local bodies.

These bodies have been set up to facilitate a shift from the hitherto relief-centric approach to a more proactive, holistic, and integrated approach of strengthening disaster preparedness, mitigation, and emergency response. Therefore, for developing and implementing mitigation and rehabilitation responses to coastal and river erosion, this policy document adopts the institutional mechanism outlined in the DMA, 2005.

3.2 Financing Mitigation and Rehabilitation

Financing programmatic responses is an important aspect of federal fiscal relations.

a) The primary responsibility for undertaking mitigation and rehabilitation measures related to coastal and river erosion will reside with the DDMA duly supported by the state governments. The union government will supplement their efforts through logistic and financial support.

b) At the national, state, and district levels, the DMA, 2005 has constituted separate funds for disaster response and mitigation.
i. Thus, the National Disaster Response Fund (NDRF) along with an SDRF in each state, and a DDRF in each district, comprises the institutional structure for multi-tiered financing of disaster response.

ii. Similarly, the DMA, 2005 provides for disaster risk mitigation financing through the National Disaster Mitigation Fund (NDMF) with SDMFs and DDMFs at lower tiers.

c) If the objectives of mitigation and rehabilitation can be met by convergence with existing government developmental schemes, then these schemes may also be pressed into service.

d) The NDMF provides for erosion mitigation measures, while the Recovery and Reconstruction window of the NDRF provides funds for the rehabilitation of the people affected by coastal and river erosion. The NDMF and NDRF will release the funds to the SDMF and SDRF, which in turn will release the funds to the DDMF and DDRF.

3.3 Roles of Institutions and Authorities

3.3.1 Panchayat-level committee
A panchayat-level committee will be constituted to include the elected panchayat and ward members, panchayat-level government extension workers (in livelihoods, health, education, water and sanitation, agriculture, etc.) and representatives of the affected and vulnerable communities. The committee will

a) vet (along with the gram sabha) development plans proposed by the panchayat towards the rehabilitation of the affected persons as well as reduction of vulnerability;

b) facilitate participatory mapping of the panchayat for highlighting its erosion affected and vulnerable areas;
c) monitor and assess the magnitude of erosion in the panchayat and report it to the DDMA;

d) act as a local-resource group for the DDMA;

e) function as an extension of the district redress system, directing erosion-related grievances to the block and district administration; and

f) proactively engage in the planning, designing, and implementation of mitigation and rehabilitation measures with a real time database of affected households.

3.3.2 District Disaster Management Authority

The DDMA will

a) be the nodal agency (supported by other district departments/agencies) for the mitigation and rehabilitation responses at the district level;

b) develop a mitigation and rehabilitation plan for the district through a participatory approach involving the affected and displaced communities, district officials, district- and panchayat-level committees, technical experts and practitioners, elected representatives, and the civil society;

c) coordinate the implementation of the district plan with district departments;

d) ensure provision of funds for mitigation and rehabilitation;

e) review departmental plans at the district level to ensure the integration with mitigation and rehabilitation plans;

f) synchronise the allocations and expenses for mitigation and rehabilitation under DDMF and DDRF with the SDMA;

g) appoint a disaster management professional to monitor, plan, coordinate, and steer mitigation and rehabilitation activities under the guidance of the district collector, in collaboration with other relevant district departments;

h) constitute (in collaboration with other district departments) a district grievance registration and redress system for those affected and displaced by erosion;
i) facilitate the implementation of all relevant central and state-aided schemes in the erosion affected and vulnerable areas;

j) guarantee that the national policy guidelines for prevention, mitigation, preparedness, response, and rehabilitation through non-structural and structural measures laid down by the state and central authorities (as applicable), will be followed at the district level;

k) monitor and document the extent of erosion within the district on a quarterly basis and assist in designing the mitigation and rehabilitation responses;

l) refer to the standard operating procedures (SOP) prepared by NDMA for mitigation and rehabilitation; and

• constitute a panchayat-level committee in consultation with the gram sabha, state and central authorities (as applicable) for a participatory bottom-up approach for mitigation and rehabilitation.

3.3.3 State Disaster Management Authority

The SDMA will

a) develop a state-level plan for mitigation and rehabilitation in erosion affected areas in consultation with state departments (as applicable);

b) submit a state-wide plan for mitigation and rehabilitation to NDMA for approval;

c) appoint a disaster management professional to monitor, plan, coordinate, and steer mitigation and rehabilitation activities under the guidance of the SDMA, in collaboration with NDMA, other relevant district departments, and districts;

d) coordinate the implementation of the state plan in consultation with state departments (as applicable) in erosion-affected and vulnerable districts;

e) recommend provision of funds for mitigation and rehabilitation in consultation with state departments (as applicable);
f) review the developmental plans of the concerned state departments to ensure their integration with mitigation and rehabilitation plans and schemes;

g) synchronise the allocations and expenses under SDMF and SDRF for mitigation and rehabilitation in consultation with state departments (as applicable);

h) refer to the guidelines prepared by NDMA for mitigation and rehabilitation and establish linkages with the policy on coastal and river erosion;

i) periodically engage in monitoring and assessment of the impact of the mitigation and rehabilitation activities by engaging reputed research organisations;

j) constitute (in collaboration with other state departments and departments of vulnerable districts) a state grievance registration and redress system for those affected and displaced by erosion.

3.3.4 National Disaster Management Authority

The NDMA will

a) monitor the preparation of mitigation and rehabilitation plans for coastal and river erosion by the affected and vulnerable states;

b) monitor the implementation of mitigation and rehabilitation by states affected and vulnerable to coastal and river erosion;

c) appoint a disaster management professional to monitor and coordinate, mitigation and rehabilitation activities under the guidance of the NDMA, in collaboration with other relevant SDMAs;

d) facilitate the preparation of SOP for mitigation and rehabilitation responses for communities along the coastline and rivers;

e) coordinate with relevant erosion-specific nodal ministries to ensure collaboration with the state government where the erosion has occurred to provide quick and efficient response;
f) assess and thereafter approve mitigation and rehabilitation plans submitted by SDMAs;

g) coordinate the allocations and expenses under NDRF and NDMF at the national level for mitigation and rehabilitation;

h) collaborate with the SDMAs (or their equivalent, Commissioner of Relief, Disaster Management Division, or Department of Revenue as applicable) for allocations and expenses under SDRF and SDMF;

i) constitute (in collaboration with other central ministries and departments of vulnerable states) a national grievance registration and redress system for those affected and displaced by erosion.

3.4 Institutional Capacities

Institutional capacity is critical to implementing mitigation and rehabilitation measures and to conduct periodic impact and vulnerability assessments of erosion-affected areas. Therefore, the social and technical capabilities of panchayat-level committees, DDMAs, SDMAs, NDMA and other responsible ministries and departments have to be strengthened. Periodic assessment of internal institutional capabilities and inter-ministerial, departmental, and authority coordination will be an integral part of the institutional capacity building component.
4 Mitigation and Rehabilitation of Coastal-Erosion Affected and Vulnerable Areas: Programmatic Response

The field-based consultations in coastal erosion affected states of Kerala, Tamil Nadu, Andhra Pradesh, West Bengal and Odisha along with other national-level consultations organised and supported by NDMA, have recommended the following mitigation and rehabilitation measures.

4.1 Mitigation Measures

4.1.1 Safeguarding coastlines

Safeguarding coastlines must include

a) formulation of state-specific coastal protection policies by the coastal erosion-affected states;

b) participatory mapping of vulnerability drivers of coastal communities for safeguarding lives and strengthening livelihoods;

c) undertaking district-level participatory coastal vulnerability mapping to identify affected areas and design appropriate mitigation responses using a mix of non-structural and structural measures;

d) safeguarding coastlines through innovative and contextual interventions ensuring social, economic, and protective measures;

e) developing nature-based solutions for minimising the impact of sea surge and erosion along the coastline, such as mangrove plantation or the application of geo-jute technology;

f) reclaiming soil from salt-water inundation due to tidal wave/ storm surge;

g) planning and promoting natural buffers for coastal zone management;

h) adhering to regulations in undertaking any new construction in the Coastal Regulation Zone; ensuring that the construction is above the minimum floor
level (MFL) to allow for storm surge, waves, and sea-level rise (SLR) according to climate change projections;

i) planning all coastal protection and management works in accordance with the shoreline management plan of the coast affected or likely to be affected by any intervention proposed following Climate Change Adaptation Guidelines;

j) designing mitigation measures taking into account the minimum beach level or MFL (as applicable) with the least visual, social, and environmental impact;

k) mitigating coastal erosion through beach nourishment, sand by-passing or any other site-specific soft measure taking into account the climate change impacts;

l) developing site-specific mangrove nurseries with local self-help groups to ensure supply of mangroves for plantation;

m) developing a coastline security plan through bottom-up approach as a protection strategy for coastal habitations; and

n) adopting advanced scientific tools for weather forecasting as early warning mechanisms along with decentralised dissemination techniques for coastal erosion vulnerable areas, which are also often sites of overlapping hazards/compound events like tropical storms, storm induced tidal upsurge and tidal upsurge induced coastal flooding.

4.1.2 Supporting the vulnerable
To ensure social, economic, and protective security to the most vulnerable within the erosion-affected communities

a) vulnerability assessment and mitigation planning must be participatory, involving the key stakeholders, that is, the women, adolescents, children and the elderly among the affected populations;

b) social security benefits for women and specifically those above 60 years of age could be secured through self-employment opportunities at the household level;
c) resources may be allocated on priority to vulnerable groups, for instance, women fish vendors affected by coastal erosion may get priority allocation in the fish market or access to subsidy to set up a storage facility;
d) skill enhancement programmes could be run since upskilling may be a prerequisite to be gainfully self-employed;
e) counselling centres could be opened for attending to the mental health of affected and traumatised populations; and
f) awareness generation drives may be conducted among the vulnerable populations about the problems of coastal erosion and the ways to remain safe.

4.1.3 Ensuring access to basic services
Access to basic services in temporary settlement must include
a) provisioning of shelters and safe land at the panchayat level for the affected, displaced and vulnerable households;
b) planning for transportation and communication facilities to ensure access to basic services to households during and after erosion-induced temporary displacement;
c) setting up early warning systems for sites that experience overlapping or cascading hazards/compound events;
d) arranging for disaster-resilient toilets for all genders during temporary displacement;
e) ensuring universal access to safe drinking water throughout the period of temporary displacement; and
f) providing special care systems for adolescents, pregnant mothers (including safe houses for emergency deliveries) and lactating mothers to protect them from infections during the temporary displacement period.

4.1.4 Fostering cooperation
Cooperation could be fostered by
a) establishing coordination platforms at the panchayat level to facilitate interactions among technical experts, research organisations, and representatives of panchayat level committees for better understanding and planning of mitigatory approaches to coastal protection; and

b) defining the roles and responsibilities of the panchayat-level committee clearly.

4.1.5 Minimising impact

Impact of coastal erosion may be minimised by

a) acknowledging the impact of climate change and developing mitigation strategies;

b) developing appropriate measures for addressing the drivers of vulnerabilities amongst the coastal population;

c) reducing the climate- and human-induced risks and maximising the adaptive capacity and resilience of affected communities; and

d) involving panchayat-level committees in undertaking awareness generation drives about tropical storms (cyclones), tidal upsurge and coastal flooding and the corresponding safeguards.

4.1.6 Adopting non-structural measures

Non-structural coastal erosion mitigation measures must include

a) utilising existing knowledge such as policies and laws, public awareness, training and education to develop practices that reduce risks and minimise impact of erosion;

b) mapping of coastal erosion affected and vulnerable areas, instituting early warning systems for coastal erosion, development of coastal erosion information distribution system, coastal erosion prevention education, awareness programs, legal and land-use regulations;

c) planning for vulnerable areas, emergency and evacuation plans, insurance, local and alternative livelihood improvement programmes;
d) preparation a post-disaster recovery plan;  

e) promotion of the Integrated Coastal Marine Spatial Plan;  

f) zoning of the coastal erosion affected and prone areas; and  

g) setting up a green belt or buffer zone for preventing coastal hazards, mitigating other  
natural hazards, and addressing the socioeconomic challenges of the local  
communities for ecological sustainability.  

For the purpose of localization of sustainable development goals (LSDGs), the Ministry  
of Panchayati Raj has mapped the 17 SDGs on to nine themes. Of these nine themes,  
Theme 4 is related to the protection and restoration of water-related ecosystems. Mapped  
against the LSDG Theme 4 are the ministries of Rural Development (including the  
Department of Land Resources); Drinking Water and Sanitation; Agriculture and  
Farmers Welfare; Animal Husbandry, Fisheries and Dairying; New and Renewable  
Energy; Environment, Forest and Climate Change; and Skill Development and  
Entrepreneurship; as also the National Remote Sensing Agency, National Informatics  
Centre (GIS).  

4.1.7 Adopting structural measures  

Structural coastal erosion mitigation measures must include:  

a) undertaking physical construction to reduce or avoid possible impacts of coastal  
erosion, or the application of engineering techniques or technology to achieve hazard  
resistance and resilience in structures or systems; for instance, groynes, seawall,  
offshore breakwater, artificial headland, dune building, coastal re-vegetation, etc;  

b) ensuring that all structural measures for safeguarding the coastline from further  
erosion are planned only through participatory approaches and that such structural  
measures also take into equal consideration protection of the costal livelihoods.
4.1.8 Adopting coastal management strategies in collaboration with technical institutions
A comprehensive and contextual coastal management strategy should be adopted in collaboration with technical institutions such as the National Centre for Coastal Research, Ministry of Earth Sciences. Such a strategy could adopt a variety of approaches based on suitability of the specific case. These could include:

a) **doing nothing** and allowing natural dynamics to take their course, for instance in Eden Beach, Puducherry;

b) **realigning management** to recognize natural processes of adjustment and identify a new line of defence, for example in Bagapatia Resettlement, Odisha;

c) **holding the line** through structures constructed along the existing coastline, for example Chellam village, Ernakulum district, Kerala;

d) **moving seawards** by constructing new defences that push the shoreline out, for instance in Puducherry coast;

e) **adopting nature-based solutions** to cope with erosion or inundation, for instance Ramayapatnam in Nellore district, Andhra Pradesh; and

f) planning for interstate coastal erosion management.

4.2 Mitigation Implementation Processes
Programmatic approach to implementation of mitigation measures must include:

a) developing integrated mitigation processes to counter, control and respond to sea encroachment of the coastline;

b) ensuring engagement with coastal communities for co-management of coastal protection in collaboration with the DDMA;

c) organising panchayat-level stakeholder consultations for identifying cost-effective, overarching, and sustainable solutions for coastal protection;
d) enhancing the capacity, reducing vulnerabilities, and building resilience of the erosion-affected and erosion-vulnerable coastal populace;

e) appointing a disaster management professional with inter-disciplinary training at the DDMA for coordinating across concerned government departments to orchestrate a comprehensive mitigation response;

f) ensuring knowledge sharing and regular engagement of the DDMA with related departments and the communities;

g) creating a district-level coordination platform for bringing together technical experts, community representatives and research organisations to better understand and plan mitigatory approaches for coastal protection;

h) undertaking periodic impact evaluation of the mitigation programme in terms of reducing vulnerability, enhancing adaptive capacity and building resilience;

i) prioritising contextual research, including action research for identifying alternate mitigation approaches and techniques; and

j) setting-up mechanisms at the DDMA for systematic monitoring of coastal erosion, salinity intrusion, SLR and all other parameters that are detrimental to the safety of the coastlines and the lives and livelihoods of the coastal communities.

4.3 Rehabilitation Measures

4.3.1 Designing of the rehabilitation plan

Rehabilitation designing must include:

a) mapping (in consultation with the affected communities) of nearby fallow areas that may be taken up for rehabilitation;

b) social mapping of the displaced community for clarity on household profiles and impacts experienced;
c) identifying vulnerabilities of the affected and displaced communities in terms of frequency of encountering erosion, losses (temporary and permanent) and its monetary value, recovery requirements (short and long term) etc., for the rehabilitation package;
d) accounting for prevailing challenges and quality of life being experienced by the affected communities in planning rehabilitation;
e) planning beyond “land-for-land” physical relocation, to ensure access to resources at the new site for a sustainable habitat that includes: houses, homestead and agricultural land; basic services such as drinking water, sanitation, schools, health centres, link roads, etc., and other services and facilities; and
f) strategising to improve standards of living and restore (to the extent possible) traditional livelihoods of the relocated households; prioritising the preservation and restoration of existing livelihood practices of different interest groups in the rehabilitation plan.

4.3.2 Mandatory inclusions in the rehabilitation plan
The rehabilitation plan must
a) include nature-based rehabilitation strategies and structural interventions;

b) incorporate social, economic, and livelihoods restoration measures and erosion-proofing strategies with the consent of the affected communities;

c) address local needs and priorities;

d) provide monetary assistance to households rendered landless and homeless in line with the rehabilitation package defined by the state governments; and

e) provide for the special needs of women at risk.

4.3.3 Housing and habitat-related services
Identifying areas close to the original location must be given priority if rehabilitation is the only option to safeguard the lives and livelihoods of the affected and displaced communities.
Housing and habitat-related services must include

a) planning and implementation of Owner Driven Housing and Habitation Reconstruction (ODHHR);

b) streamlining of short-term rehabilitation to ensure safe and sure passage of affected and displaced communities along with their movable belongings to temporary shelters;

c) protection of social and economic networks of internally displaced persons (IDPs) and especially the most vulnerable, through adequate provisions in panchayat- and district-level relocation plans;

d) easy access to procurement areas, marketing areas, and safe storage spaces for fishing gear, etc. as also access to the beach for traditional activities like drying of fish and nets, community meetings, play spaces, etc.

4.3.4 Access to basic services
Ensuring access to basic services such as clean drinking water, sanitation, drainage system, interconnecting roads, health facilities, education etc., in the relocated site is obligatory prior to initiating the rehabilitation process.

4.4 Rehabilitation Implementation Processes

4.4.1 Generic processes
Generic processes for executing rehabilitation must ensure:

a) time-bound, expeditious and punctual implementation against a pre-defined deadline;

b) homogenous scrutiny of losses by DDMA in consultation with the panchayat-level committees;

c) social mapping of most vulnerable families and individuals with special needs to enable protection, humanitarian assistance, and specific safeguards/provision during rehabilitation;
d) protection of interests of fishing communities and other livelihood groups through consultations with local institutions; and responsive planning thereafter;

e) sharing of the final rehabilitation plan and housing design options with the affected and displaced communities for their acceptance and approval; and

f) conceptualising, planning, designing, and implementing the rehabilitation plan in consultation with women and adolescent children across the vulnerable regions to ensure their safety and cater to their specific requirements.

4.4.2 Innovative processes

Innovative processes of rehabilitation must

a) explore voluntary rehabilitation as an alternative for saving lives and securing livelihoods of affected and displaced communities;

b) prioritise community-based inclusive rehabilitation processes, not driven or steered by individual interests and gains;

c) prepare contemporary, constructive, and sustainable rehabilitation processes and strategies in view of the changing climate scenario for minimising the impact of coastal erosion in the present and future;

d) ensure that the displaced communities are not socially excluded at the new rehabilitation settlement by the original inhabitants;

e) assure uniformity and equity in services provided to displaced communities at the new rehabilitation settlement;

f) ensure access to various government schemes and services along with the entitlements to the rehabilitated households;

g) carry out due diligence for compensation to the displaced communities for their destroyed houses as part of rehabilitation;
h) make available, gainful socio-economic opportunities to the vulnerable, affected and displaced communities; and
i) minimise the rehabilitation-related adverse impacts encountered by the affected communities.

4.4.3 Processes for securing livelihoods
Livelihood security may be ensured by
a) planning for the sustenance of the local livelihood practices;
b) addressing livelihood related challenges of vulnerable communities as part of rehabilitation;
c) relocating the affected and displaced communities appropriately to safeguard their local livelihoods; and
d) ensuring fishing communities the right of access to the coast and seas; ensuring that coastal areas vacated by the affected communities are not diverted to other purposes without their prior consent.

4.5 Mitigation and Rehabilitation Plan Submission and Approval Process
a) The DDMA prepares the mitigation and/or rehabilitation plan and submits it to the SDMA.
b) The SDMA approves the plan and submits it to the NDMA.
c) The NDMA appraises the plan ensuring that it adheres to the provisions of Mitigation Guidelines and Recovery & Reconstruction Guidelines.
d) The NDMA then recommends the plan to the Ministry of Home Affairs, Government of India.
e) The plan is presented before the High-level Committee, which approves the plan and disburses assistance.
5 Mitigation and Rehabilitation of River-Erosion Affected and Vulnerable Areas: Programmatic Response

The field-based consultations in river erosion affected states of Assam, West Bengal, Bihar, and Uttar Pradesh along with other national level consultations organised and supported by NDMA, have recommended the following mitigation and rehabilitation measures.

5.1 Mitigation Measures

5.1.1 General strategies

General strategies for mitigation must include

a) formulation of river erosion protection policies by affected states;

b) mapping of areas vulnerable to river erosion by state using historical satellite imageries to
   i. assess shifting of bank lines;
   ii. highlight areas that have borne the brunt of excessive erosion;
   iii. monitor areas where erosion continues;
   iv. identify areas/stretches that are most vulnerable;

c) setting up of research institutes to study processes, ecosystems, drivers, threats, vulnerabilities and recommend safeguards and strategies to tackle river erosion;

d) generation of state-specific annual river erosion data for sharing with affected states, Central Water Commission (CWC) and NDMA.

e) funding under Flood Management and Border Area Program (FMBAP) scheme for optimised flood management and river management activities;

f) district-level participatory river vulnerability mapping;

g) panchayat-level mitigation planning for vulnerable areas;
h) action towards minimising the erosion-related risks and maximising the adaptive capacity and resilience of affected communities;

i) integration of traditional erosion-management techniques with modern technically planned measures;

j) planning and adoption of non-structural and structural mitigation measures based on distinctive river erosion typologies;

k) promotion of nature-based solutions such as plantation buffers along the river to reduce erosion, sedimentation, flooding and waterlogging;

l) desilting and dredging of rivers at select locations where sedimentation is causing erosion, funded by departmental budgets of State Water Resources Department (WRD) or others, as also the FMBAP scheme;

m) survey of needs of affected and vulnerable households for ensuring appropriate assistance;

n) exploring opportunities for long-term financial security of marginalised and vulnerable households;

o) minimisation of financial dependency of vulnerable households on local money lenders;

p) the involvement of NGOs, CSOs and CBOs in generating awareness among affected households about mitigation strategies and their implementation; and

q) bestowing special powers to panchayat representatives;

r) empowerment and capacity building of panchayat representatives in lives and livelihoods restoration work.

5.1.2 Supporting the vulnerable
To ensure social, economic, and protective security to the most vulnerable within the erosion-affected communities
a) vulnerability assessment and mitigation planning must be participatory, involving the key stakeholders, that is, the women, adolescents, children and the elderly among the affected populations;
b) special attention must be paid to the needs of those living on lands located within the river channels that is, the diara/char/saporis.

5.1.3 Ensuring access to basic services
Access to basic services at the temporary settlement for displaced communities must include:

a) safe land in each panchayat;
b) transportation/communication facilities;
c) resilient toilets for all genders; and
d) safe drinking water, primary education, Integrated Child Development Services and anganwadi services.

5.1.4 Securing livelihoods
Livelihood security may be ensured by

a) upskilling working adults of affected households;
b) introducing non-farm livelihood activities as viable income generation option;
c) promoting integrated farming systems;
d) organising interested farming households to set up a model cooperative farming practice using the cooperative fund;
e) developing mechanisms for collective marketing of farm produce including perishables such as vegetables; and
f) supporting women producers in marketing backyard poultry, goat and dairy products.
5.1.5 Innovative approaches

Innovative approaches to mitigation must include

a) research and development of decentralised technologies for forecasting sites vulnerable to erosion in each district;

b) dissemination of abovementioned data to panchayats both affected by and vulnerable to erosion;

c) setting up or involving research and academic institutions in social, economic, and technical assessment of river erosion and its impact; and

d) assessing the effectiveness of structural mitigation measures supported either by the State WRDs and related departments or the FMBAP scheme, along with its cost-effectiveness.

5.1.6 Mitigation measures for unique locations

Mitigation measures for unique locations experiencing extensive erosions include

a) utilising Mahatma Gandhi National Rural Employment Guarantee Act (MGNREGA) funds for mangrove plantation by women;

b) building erosion-resilient houses, cattle and poultry sheds;

c) creating alternative livelihood options for inhabitants of islands, deltas and locations experiencing high and continuous erosion;

d) providing technical, material and financial assistance to women for backyard poultry, crab fattening, apiary, and freshwater fisheries;

e) addressing salinity ingress as it impedes agriculture-based livelihoods;

f) provisioning for and prioritising research and piloting of brackish water fisheries and salt tolerant agriculture;

g) promoting use of new technologies like hydroponics and floating cultivation, etc.;
h) ensuring that people affected by or vulnerable to river erosion have priority access to the existing government programmes in health, drinking water and sanitation, education and nutrition;

i) monitoring of nutrition of infants, children, and adolescents through government schemes especially during and post river erosion;

j) planning for drainage of the stagnant water from the island and deltas; and

k) improving logistical assistance by increasing the number of motorised boats for transporting supplies to and from the island/diara/char/sapori/sand bars that dot the river.

5.1.7 Non-structural mitigation measures

Non-structural mitigation measures for river erosion must include:

a) reduction of risks and impacts of river erosion through knowledge-based action including policies and laws, public awareness, training and education;

   i. mapping of erosion affected and vulnerable areas, instituting early warning and forecasting systems for big rivers, their tributaries and other rivulets,

   ii. development of information distribution systems,

   iii. river erosion prevention education, awareness programs, legal and land-use regulations, and land use policy.

b) planning for vulnerable areas, emergency and evacuation plans, insurance, local and alternative livelihood improvement programmes, etc.;

c) a post-disaster recovery plan;

d) zoning of safe land; and

e) developing and updating standards and guidelines for improving river erosion resilience.
For the purpose of localization of sustainable development goals (LSDGs), the Ministry of Panchayati Raj has mapped the 17 SDGs on to nine themes. Of these nine themes, Theme 4 is related to the protection and restoration of water-related ecosystems. Mapped against the LSDG Theme 4 are the ministries of Rural Development (including the Department of Land Resources); Drinking Water and Sanitation; Agriculture and Farmers Welfare; Animal Husbandry, Fisheries and Dairying; New and Renewable Energy; Environment, Forest and Climate Change; and Skill Development and Entrepreneurship; as also the National Remote Sensing Agency, National Informatics Centre (GIS).

5.1.8 Structural mitigation measures

Structural mitigation measures for preventing river erosion must include physical construction to reduce or avoid possible impacts, and the application of engineering techniques and strategies to achieve erosion resistance and resilience. For instance, natural vegetation, gabions, groynes, vanes, submerged bend way weirs, guide bunds, boulders, brick mattressing etc.

5.2 Mitigation Implementation Processes

5.2.1 Generic processes

Generic processes must include:

a) identifying vulnerable areas through district-level participatory river vulnerability mapping;

b) preparing a well-defined panchayat-level mitigation plan;

c) involving the affected and vulnerable households for developing and validating the panchayat-specific plan in the gram sabha;

d) linking the affected families with relevant government schemes and programmes;
e) ensuring that women-headed households have access to benefits provided by
government programmes, trainings, loans, subsidies, agriculture extension support,
etc.
f) constituting a panchayat-level committee for periodic monitoring of erosion at the
local level and reporting back to the DDMA;
g) creating a real time database of affected and vulnerable households through a
bottom-up approach
   i. with the SDMA, panchayat functionaries, research organisations, NGOs
      and CBOs contributing towards creating a comprehensive databased
      template;
   ii. with the gram panchayat as the basic unit for data collection (aggregated
to the district, state, and national levels);
   iii. while ensuring that the database is dynamic and accessible real time to all
      stakeholders;
   iv. while also ensuring that the usual safeguards pertaining to data privacy
      are maintained at all levels; and
   v. which can act as a baseline for various purposes—for example, to inform
decisions on types of rehabilitation measures or impact evaluation of the
mitigation and rehabilitation program.

5.2.2 Processes at the district level

District-level initiatives must include:

a) appointing a disaster management professional at the DDMA for coordinating a
comprehensive mitigation response across the DDMA, concerned government
departments and the communities affected by and vulnerable to river erosion;
b) knowledge sharing and frequent engagement of line departments with the affected and vulnerable communities;

c) creating a district-level coordination platform for bringing together technical experts, community representatives, and research organisations to better understand and plan mitigatory approaches; and

d) promoting contextual research, including action research for identifying alternate mitigation approaches and technologies.

5.3 Rehabilitation Measures

5.3.1 Rehabilitation interventions framework

Rehabilitation measures must include:

a) handing over of the ownership of the relocation land and its lease to displaced households by the state governments;

b) availability of government-approved relocation land (safe from river erosion) with basic facilities and adequate agricultural land securing lives and livelihoods of displaced households;

c) awareness generation and clarity regarding the rehabilitation plan and its roadmap among all stakeholders;

d) sharing of the rehabilitation plan with the panchayat-level committee and the gram sabha;

e) linking of the vulnerable, affected and displaced households with appropriate central and state sponsored social and economic security schemes;

f) compensation (on replacement cost basis) for losses incurred by the affected and displaced communities through a comprehensive rehabilitation package within a predefined time period from the date of the valuation exercise;
g) provision of compensatory agricultural land to households that have lost theirs to river erosion;

h) promotion of contextual alternative livelihood options (on and off farm);

i) imparting of technical vocational training to the affected and displaced households with specific focus on single women;

j) provision of low interest, or interest free loans to the affected and displaced households for reducing their dependence on high interest loans provided by microfinance companies and the local money lenders;

k) integration of the resettled population with the ongoing National Rural Livelihood Mission (NRLM) / State Rural Livelihood Mission (SRLM) programs;

l) support for bank-linked self-help groups formed by women from displaced households, with coordination across the DDMA, panchayat, nodal agencies of the SRLM, and NGOs for smooth implementation; and

m) addressing of the loss of supporting natural ecosystems (green areas, water bodies, etc.) and village commons.

5.3.2 Housing and habitat-related services

Housing and habitat-related services must ensure that:

a) relocation and rehabilitation (if unavoidable) is undertaken as close to the original location as possible while safeguarding lives and livelihoods;

b) ODHHR strategy is included as the rehabilitation strategy;

c) short-term rehabilitation in temporary shelters is streamlined for ensuring safe and sure passage for affected and displaced households along with their movable belongings;
d) till the permanent rehabilitation is completed, the affected people have access to
temporary shelters, with basic amenities like drinking water, sanitation, nutrition,
primary education, and primary health services.

5.4 Rehabilitation Implementation Processes

5.4.1 Generic processes

Generic rehabilitation planning and implementation must include:

a) consultations with the affected and displaced communities, panchayat-level
committee, DDMA officials, elected grassroots functionaries and representatives
of women's group, government extension workers, and NGO representatives;
b) a deep understanding of the reasons why the affected and displaced communities
are reluctant to leave their original place of habitation and why rehabilitation is
their least preferred option;
c) assessment of losses incurred by affected households based on homogenous
scrutiny by the DDMA in consultation with the panchayat-level committee;
d) identification of varying vulnerabilities across affected and displaced households;
e) social mapping of the most vulnerable and those with special needs to ensure
protection and humanitarian assistance;
f) engagement with diverse vulnerable groups to record local requirements and plan
for special care to women, children, the elderly, and persons with disabilities;
g) finalising of a mutually agreed safe rehabilitation site not too far from the original
location;
h) customised planning and rehabilitation design to ensure that life and livelihood
security and continuance is assured despite relocation;
i) time bound, expeditious and punctual execution against a clear deadline;
j) monitoring of the rehabilitation process by women members of displaced households; and

k) meeting the needs of the affected and displaced communities for a safe existence and continuance livelihoods despite the relocation.

5.4.2 Innovative processes

Innovative processes of rehabilitation must:

a) link the housing component in the rehabilitation package with the Pradhan Mantri Awas Yojana, ensuring joint ownership of both woman and man of the household;

b) standardise the process of permanent rehabilitation at the district level in view of the requirements and opportunities at the local level;

c) strengthen land management committees or other such community-based institutions in river-erosion affected and vulnerable areas;

d) resolve local land disputes by

i. encouraging the panchayat to coordinate with the Block Land and Land Reforms Officer; and

ii. motivating land management committees to assist in land consolidation and dispute management;

e) undertake R&D in diverse agro-ecological contexts for developing sustainable livelihood practices, farming methods, resilient seeds etc.

5.4.3 Securing livelihoods

Innovative and natural resource-based livelihood alternatives must be explored for affected and displaced communities in river-erosion challenged ecosystems.
5.4.4 Ensuring access to basic services
a) Affected and displaced household must have access to all basic services, such as sanitation, drinking water, education, rural childcare, and health, at the rehabilitation location.
b) Additionally, access to crop and livestock insurance should be streamlined.
c) The panchayat must ensure that all vulnerable, affected and displaced households have priority access to central and state sponsored schemes pertaining to basic services.

5.4.5 Housing and habitat-related services
Housing and habitat-related services must ensure that:
   a) relocation and rehabilitation (if unavoidable) is undertaken as close to the original location as possible while safeguarding lives and livelihoods;
   b) ODHHR strategy is included as the rehabilitation strategy;
   c) short-term rehabilitation in temporary shelters is streamlined for ensuring safe and sure passage for affected and displaced households along with their movable belongings;
   d) till the permanent rehabilitation is completed, the affected people have access to temporary shelters, with basic amenities like drinking water, sanitation, nutrition, primary education, and primary health services.

5.5 Mitigation and Rehabilitation Plan Submission and Approval Process
a) The DDMA prepares the mitigation and/or rehabilitation plan and submits it to the SDMA.
b) The SDMA approves the plan and submits it to the NDMA.
c) The NDMA appraises the plan ensuring that it adheres to the provisions of Mitigation Guidelines and Recovery & Reconstruction Guidelines.
d) The NDMA then recommends the plan to the Ministry of Home Affairs, Government of India.

e) The plan is presented before the High-level Committee, which approves the plan and disburses assistance.
6 Impact Monitoring and Evaluation of Mitigation and Rehabilitation Programmes

Monitoring and Evaluation (M&E) of the impact of programmatic responses will be carried out at the district-level by DDMA, in collaboration with panchayat-level committees and SDMA and in consultation with the NDMA. The outcome of the M&E exercise will be reported to the NDMA.

6.1 Scope of Impact Monitoring and Evaluation

The scope of M&E is to

a) ensure effective and efficient implementation of mitigation and rehabilitation interventions for the people affected by coastal and river erosion; and

b) monitor the impact of the mitigation and rehabilitation measures on the affected communities.

6.2 Roles and Responsibilities

a) The SDMA with state departments (as applicable) will approve and create a state-level mechanism for undertaking M&E of the programmatic responses.

b) The DDMA will be responsible for carrying out the M&E, and will report on the progress and findings to SDMA, and state departments (as applicable).

c) The SDMA in turn will update the NDMA.

d) The SDMAs and DDMAs will collaborate with organisations and experts in the field of social and technical research in finalising of the template for the M&E exercise.
6.3 Organisation and Funding

a) M&E will be a state-led activity and the funds required for undertaking it will be mainly sourced from SDRF and SDMF with contributions from the NDRF and NDMF, if required.

b) DDMA will be responsible for organising and leading the M&E.

c) The M&E team could either consist of members drawn from the concerned state departments, SDMAs, and DDMAs or experts engaged on a consultancy basis.

d) Representatives from the affected and vulnerable communities must be involved in the M&E process, along with representatives of panchayat-level committees.

e) The DDMA will be responsible for M&E of the following sectors and sub-sectors: Public Works and Transportation; Agriculture and Forestry; Drinking Water and Sanitation; Public Health; Water Resources; Education and Sports; Rural Development; Telecommunication; Livelihoods; Culture; Land and Tourism etc. DDMA can further alter the list of sectors and sub-sectors as appropriate based on the ground realities.

f) Monitoring should be distinct from the impact evaluation of the programmatic response.

g) The responsibility of ensuring the involvement of different departments, various state and central sector schemes and inclusion of the measures recommended by the national policy should rest with the DDMA. The district-level disaster management expert housed in the DDMA should be responsible for coordination and monitoring of the programmatic response.

6.4 Protocols

6.4.1 Planning

The DDMA will ensure M&E as a well-coordinated multi-agency /department/ institution/ individual initiative by adhering to the following protocols:
a) Management team: The M&E management team shall meet regularly to oversee the M&E of the mitigation and rehabilitation works, provide strategic guidance, take decisions, and ensure that the necessary resources are available for the M&E exercise.

b) Coordination team: The M&E coordination team shall be responsible for managing day-to-day planning, coordinating the M&E, analysing the data and observations, preparing the reports, and the tracking progress of the mitigation and rehabilitation measures under the guidance of the management team. The coordination team shall have the principal responsibility in organising the M&E and in ensuring that all logistical arrangements are in place.

c) Sector team: The sector team will be responsible for collecting sector-specific data, undertaking M&E field visits, analysing the progress and estimating the completion schedule of the mitigation and rehabilitation works. Alongside, the team will undertake sectoral assessment of mitigation and rehabilitation plan implementation, with participation from the affected and vulnerable communities.

d) Report secretariat: The report secretariat shall be responsible for coordinating with the sectoral teams for the sector-specific M&E reports. It will then compile and summarise the sectoral reports into one consolidated M&E report on the programmatic response for mitigation and rehabilitation.

e) The M&E management team will outline the objectives and profile of engagement of the coordination team and respective sector team.

6.4.2 Strategy Formulation

a) The M&E team will first review the damages and losses (both temporary and permanent) at the district-level and assess the mitigation and rehabilitation
interventions against the requirements of the affected and vulnerable communities.

b) It will design sequential steps to facilitate a multi-sectoral M&E exercise.

c) It will assess not just the programmatic plan but also the financial planning and institutional functioning.

d) The M&E team will then assess the social compatibility, economic viability, technical feasibility, and protective functionality of mitigation and rehabilitation interventions.

e) It will also assess the strategies for minimising risks of future erosion and the approaches to long-term safe and sustainable existence of the affected and vulnerable communities.

f) The M&E exercise will examine the integration of the following cross-sectoral aspects into the programmatic response:

i. disaster risk reduction and climate change adaptation;

ii. community-centricity;

iii. gender equity and empowerment of women and adolescent girls;

iv. inclusion of marginalised sections of society and people with disabilities; and

v. transparency in redress of grievances.

7 National-level Vulnerability and Impact Assessment of Coastal and River Erosion

7.1 Periodic Impact and Vulnerability Assessment

Periodic impact and vulnerability assessment of affected areas is imperative for establishing the accurate footprint of erosion on housing, livelihoods, communication, infrastructure, education, health, and marginalisation of communities. Knowing the footprint, in turn, helps both in tackling current challenges and preparing adequately for mitigating and averting
future disasters. Therefore, institutionalising periodic impact and vulnerability assessment of erosion is critical for ensuring long-term safety of the affected and vulnerable households.

A research institute with appropriate expertise could adopt a decentralised approach to periodically observing, recording, chronicling, reporting and disseminating learnings on the effects of erosion. This would not only help in identifying the location-based factors responsible for recurring coastal and river erosion events, but will also contribute in determining appropriate measures for mitigation and rehabilitation.

A strong disaster management governance framework is a prerequisite to a robust impact and vulnerability assessment system. For the strengthening the process, the impact and vulnerability assessment can derive its principles from the post-disaster needs assessment (PDNA) tool, which has been mandated by the XVFC.

"We recommend replacing the existing system of assessment of the damages caused by any natural calamity by a two-stage assessment. The first stage should be a smaller assessment, largely to ascertain humanitarian and relief needs. The second assessment should be inter-sectoral and more elaborate, and cover damage, loss, and recovery needs. The Union Government should consider introducing PDNA as defined in the manual on PDNA produced by the NIDM as the standard methodology for carrying out the assessment following a disaster event."

The national assessment of shoreline change for all coastal states and state-wise atlases published by the National Centre for Sustainable Coastal Management, Chennai should be referenced and used during vulnerability mapping in the respective coastal states and union territories.

Periodic impact and vulnerability assessment along the lines described above will:

a) determine the extent of erosion along the coastline and river;
b) estimate the extent of the destruction in terms of the physical and durable assets (both movable and immovable), basic services (such as drinking water, sanitation, education, health, and housing), and disruption of local livelihoods and production;
c) compare the pre-erosion social and economic status of the affected, vulnerable, and displaced households with that post–erosion;
d) outline social and economic security plans
   i. not just taking into consideration the heterogeneity of affected communities and related livelihoods; and
   ii. an ex-post assessment of erosion impact already experienced; but also
   iii. an ex-ante assessment of future vulnerabilities for better targeted and forward-looking programmatic interventions.

7.2 Operational Framework for Impact and Vulnerability Assessment

The SDMA will:

a) consult with state departments (as applicable) and direct the DDMAs to conduct the impact and vulnerability assessment in districts affected by and vulnerable to coastal and river erosion (as applicable);
b) constitute a team of experts to conduct the impact and vulnerability assessment, present causation factors, and report upon the state of erosion;
c) ensure that the impact and vulnerability assessment is undertaken in consultation with the panchayat-level committee and the affected and vulnerable communities.
Appendix: Recommendations of the Fifteenth Finance Commission for Erosion Mitigation and Rehabilitation

According to the report of the Fifteenth Finance Commission (XVFC), the union or federal government provides disaster assistance in a federal system but the primary responsibility for disaster management rests with the states. In India, the union government disburses assistance to the states, either through the National/State Disaster Response Fund (NDRF/SDRF) or other transfers. As mentioned by the XVFC report, coastal erosion is a recurring natural hazard, generally occurring as part of the erosion-accretion cycle. With the predicted rise in sea levels due to climate change, there could be an increase in the rate of coastal erosion.

The rivers emanating from the Himalayan range wreak great annual damage through periodic erosion, especially for the people of Assam, West Bengal, Bihar, Uttar Pradesh, and Uttarakhand. Erosion impedes economic activity in these regions and makes it difficult for the inhabitants to break out of the cycles of recurrent damage and poverty. To address the present and future erosion-related challenges, the XVFC made the following recommendations related to mitigation and rehabilitation measures.

**Mitigation Measures to Prevent Erosion**

In order to prevent erosion, the Commission recommended an allocation of ₹1,500 crore from the proposed National Disaster Mitigation Fund (NDMF) for the award period of 2021–2026. States would need to apply for these funds to undertake mitigation works and NDMA and/or Ministry of Home Affairs (MHA) may develop suitable norms for this purpose. These allocations must be made on a cost-sharing arrangement, with the states contributing 10 per cent of the resources.

**Rehabilitation Measures for People Affected by Erosion**

The XVFC recommended that both the union and state governments develop a policy to deal with the extensive displacement of people by coastal and river erosion. The XVFC recommended that the affected people be provided with alternative settlements and assistance by the government.

The XVFC has allocated ₹1,000 crore at the national level to mitigate the impact of displacement due to coastal and river erosion. According to the XVFC's recommendation, if state governments request assistance for resettling affected people, such assistance may be
made available from resources under the Recovery and Reconstruction window of the NDRF. However, state governments should avail these resources on a cost-sharing basis, contributing 10 per cent of the cost of resettlement.

**Pre-conditions for Assistance**

a) All the earmarked allocations cannot be achieved unless the projects for which they are meant are implemented without undue delay, so that benefits accrue at the earliest to the target group.

b) Projects under NDMF and NDRF should be sanctioned in such a manner that these can be completed within the award period of the Commission.

c) There shall be no spill-over for the liabilities committed for the projects sanctioned against earmarked allocation beyond the award period (2021–2026) of the Commission.

**Guiding Principles**

In view of the recommendations of XVFC and the multi-stakeholder consultations (at the national, state and grassroots levels), following are the guiding principles for the national policy on mitigation and rehabilitation in the coastal and river erosion affected and vulnerable areas:

a) Mitigation and rehabilitation must strategically address problems of erosion arising due to both natural and anthropogenic factors.\(^{lvi}\)

b) In the context of changing climate and its diverse impacts, the key focus must remain on viable, sustainable and innovative mitigation and rehabilitation that enhances adaptive capacity, reduces vulnerability and builds resilience among the erosion affected population.

c) Assessment of the past interventions and their impacts, coupled with the appraisal of peoples' unmet needs must define the outline for mitigation and rehabilitation.
d) Convergence across central and state schemes and across departments and disciplines must be facilitated for most effective interventions.

e) Mitigation and rehabilitation must explore nature-based solutions as appropriate interventions along the erosion affected and vulnerable areas, shifting focus from the command and control of nature to coexisting with it.

f) Mitigation and rehabilitation must promote solutions for the affected population (displaced or otherwise) so that they are able to thrive, supported by resilient life and livelihoods measures adopting the Sendai principle of Building Back Better.

g) Mitigation and rehabilitation must ensure that the diversity within coastal and river erosion with high variables are critically assessed by thematic specialists.

h) How the coastal and river erosion is manifesting locally and impacting lives and livelihoods in each specific context must remain the fundamental consideration for assessing, planning, designing, and implementing mitigation and rehabilitation measures.

i) Local non-structural and inclusive strategies to minimise impacts of coastal and river erosion must be incorporated in the interventions. This can be supplemented by structural and construction interventions which are aimed to control/minimise the incidences of coastal and river erosion.

j) Involvement of the affected or potentially-affected population and the vulnerable sections within those populations should be the basis for deciding the appropriate mechanisms chosen for mitigation and rehabilitation.

k) Mitigation and rehabilitation measures must especially address those erosion-induced risks which manifest because of pre-existing drivers of vulnerability.

l) The rights of the weaker sections of society, such as women (single, deserted, and widowed), senior citizens, members of Scheduled Castes, Scheduled Tribes, the
landless and the poor, must be secured during mitigation and rehabilitation. This can be undertaken by creating obligations on the state for demonstrating concern and sensitivity while engaging with them and ensuring their dignity, participation, and involvement.

m) Mitigation and rehabilitation must focus on panchayat-level community-based decentralised approaches.

n) Mitigation and rehabilitation have to be time bound and proportionate to the local requirements.

o) Mitigation and rehabilitation must incorporate a more nuanced early warning systems, for both coastal and river erosion.

Processes of Mitigation and Rehabilitation

The recommended generic process for undertaking mitigation and rehabilitation includes the following steps:

a) Map the potential impact of changing climate and human-induced interventions on coastal and river erosion.

b) Create a database of the diverse challenges confronted by communities affected and vulnerable to coastal and river erosion.

c) Facilitate collaboration between the affected/vulnerable population and mitigation agencies such as the government, non-governmental organisations (NGOs), civil society organisations (CSOs), and community-based organisations (CBOs) for developing a comprehensive strategic response.

d) Involve the local communities, academic and research institutions, and thematic experts, NGOs, CSOs, CBOs and other key stakeholders in the assessment of the affected and vulnerable areas.
e) Prepare a panchayat-specific plan of action to respond to unanticipated coastal and river erosion.
f) Adopt a people-centric approach for implementing mitigation and rehabilitation corresponding to the social, cultural, and economic needs of the affected and vulnerable communities.
g) Link the mitigation and rehabilitation measures with existing government developmental schemes that aim to reduce the marginalisation of the affected communities.
h) In consultation with the affected population, plan the relocation (if required) of those temporarily or permanently displaced to erosion-free areas.
i) Provide psychosocial support to the affected and displaced community members.

The XVFC has allocated resources for mitigation and rehabilitation through the NDMF and the NDRF window for Recovery and Reconstruction. As addressing coastal and river erosion involves mitigation and rehabilitation, the guidelines for NDMF and the National Recovery and Reconstruction are applicable to both the processes. While this policy lays down the processes for assessment of impact and vulnerabilities and suggests how mitigation and rehabilitation plans should be developed, the mechanisms of fund allocation for mitigation and rehabilitation are available through these national guidelines. Hence this policy must be read in conjunction with the guidelines for NDMF and the National Recovery and Reconstruction guidelines.

Glossary of Technical Terms

- **Mitigation**: The lessening or limitation of the adverse impacts of hazards and related disasters.
• **Recovery**: The restoration and improvement where appropriate, of facilities, livelihoods and living conditions of disaster-affected communities, including efforts to reduce disaster risk factors.

• **Rehabilitation**: The restoration of basic services and facilities for the functioning of a community, or a society affected by a disaster and the provision of public utilities and housing as measures to assist long-term recovery.

• **Climate change**:
  
  o A change in the state of the climate that can be identified (e.g., by using statistical tests) by changes in the mean and/or the variability of its properties, and that persists for an extended period, typically decades or longer. Climate change may be due to natural internal processes or external forcings, or to persistent anthropogenic changes in the composition of the atmosphere or in land use. lvii
  
  o A change of climate which is attributed directly or indirectly to human activity that alters the composition of the global atmosphere and which is in addition to natural climate variability observed over comparable time periods. lviii

• **Owner-Driven Housing and Habitation Reconstruction**: This approach promotes household and habitation ownership and direct involvement of the affected households in the designing and reconstruction process.

• **Groynes**: Structures constructed perpendicular to the coastline from the shore into the sea to trap long shore sediment transported or control long shore currents. These reinforced cement concrete or earth-boulder mix type structures help to deflect the flow away from the bank and reduce the near-bank velocity by dissipating the flow energy.

• **Seawall**: A structure constructed parallel to the coastline that shelters the shore from wave action. Use of e-concretes can be considered for this as it is ecologically sustainable.
• **Offshore breakwater**: A structure that parallels the shore and serves as a wave absorber.

• **Artificial headland**: A structure that is constructed to promote natural beaches because it acts as an artificial headland.

• **Dune building**: These structures provide an ideal coastal defence system. They are constructed with sand fences and mesh matting in combination with vegetation planting via sediment entrapment and vegetation colonisation.

• **Coastal re-vegetation**: This helps in improving slope stability, consolidating the sediment, and reducing wave energy moving onshore, and protects the coastline from erosion.

• **Natural vegetation**: The roots of the vegetation help in increasing soil strength around the river bank, making it less prone to erosion. The vegetation acts as a shock absorber during intense rainfall, slowing down the rate of erosion.

• **Gabions**: These are large metal baskets filled with stone and concrete rubble. They are often used in areas with large amount of river erosion to occur.

• **Vanes**: These structures are constructed at the river bends to redistribute flow velocity.

• **Submerged bend way weirs**: These structures are placed at the upstream of bend redirecting the water flow along the eroding bank at an angle perpendicular to the water.

• **Guide bunds**: These structures are constructed at bridge crossings to protect abutments, its upstream and downstream areas from erosion.

• **Boulders**: Graded boulders are placed at the toe of the bank to reduce shear stress and near bank flow velocity.

• **Brick mattressing**: This involves laying of the brick mattresses on the graded bank slope.
• **Mangrove plantation with geo-jute application**: Treated jute (procured from National Jute Corporation) support systems are applied (up to the intertidal flat) to select mangrove sites with sloping river embankments.

• **Affected household**: A family whose primary place of residence or other property or source of livelihood is adversely affected by involuntary displacement due to coastal or river erosion.

• **Affected individual** means abandoned individuals, widow, deserted parent, deserted spouse, deserted single parent, deserted unmarried adolescents, deserted children; children without parents, not having homestead land, agricultural land, or either homestead or agricultural land is adversely affected by involuntary displacement due to coastal or river erosion. Any tenure holder, tenant, lessee, or owner of other property, who on account of coastal or river erosion (including plot in the *abadi* or other property) in the affected area or otherwise, has been involuntarily displaced from such land or other property. Any agricultural (farm or off farm) or non-agricultural labourer, landless person (not having homestead land, agricultural land, or either homestead or agricultural land), fishing; rural artisan, small trader or self-employed person; who has been residing or engaged in any trade, business, occupation or vocation continuously for a period of not less than three years preceding the date of declaration of the affected area, and who has been deprived of earning livelihood or alienated wholly or substantially from the main source of trade, business, occupation or vocation because of loss of land on account of coastal or river erosion.

**Affected area** means area of village or locality notified by the appropriate government.

Where the appropriate Government is of the opinion that there is likely to be involuntary displacement of partial or more families *en masse* along shoreline and rivers due to coastal
or river erosion, it shall declare, by notification in the Official Gazette, area of villages or localities as an affected area.

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1 Ayyappan, S, Mohan Kumar. B., (2022); Coastal Agriculture and Aquaculture in India: Outlooks in the Context of Climate Change; Guest Editorial; Current Science; Vol 122 No 4 - https://www.researchgate.net/publication/358973320_Coastal_agriculture_and_aquaculture_in_India_outlooks_in_the_context_of_climate_change


6 Census of India, 2011.

7 Ayyappan, S, Mohan Kumar. B., (2022); Coastal Agriculture and Aquaculture in India: Outlooks in the Context of Climate Change; Guest Editorial; Current Science; Vol 122 No 4 - https://www.researchgate.net/publication/358973320_Coastal_agriculture_and_aquaculture_in_India_outlooks_in_the_context_of_climate_change.


9 Ayyappan. S, Mohan Kumar. B., (2022); Coastal Agriculture and Aquaculture in India: Outlooks in the Context of Climate Change; Guest Editorial; Current Science; Vol 122 No 4 - https://www.researchgate.net/publication/358973320_Coastal_agriculture_and_aquaculture_in_India_outlooks_in_the_context_of_climate_change.


11 The NCCR is mandated to provide best possible technological and scientific services / support for sustainable management of coastal areas by developing and improving capabilities related to coastal water quality, coastal processes, shoreline management, coastal hazards- vulnerability and coastal ecosystems through multi disciplinary and integrated research programmes. It has been monitoring shoreline erosion using remote sensing data and GIS mapping techniques, and analysed the 6907.18 km long coastline of the mainland for the period from 1990 to 2018.


17 Padma T.V (2022); Scientists Raise Caution as Mangroves Erode Faster Along the Bengal Coastline; Mongabay - https://india.mongabay.com/2022/02/scientists-raise-caution-as-mangroves-erode-faster-along-the-bengal-coastline/

18 NCSCM has conducted shoreline change analysis at the national level and has produced shoreline change (Erosion/Accretion) maps on 1:50,000 scale for all the coastal States/UTs. These maps have also been approved by many coastal States/UTs. Based on the Erosion/Accretion maps produced by NCSCM and as a follow-up of the Hon’ble NGT
order in OA No. 4/2013, the Ministry of Environment, Forest and Climate Change, Govt. of India has issued guidelines to all the State/UT Coastal Zone Management Authorities (SCZMAs) vide letter No. 3-16/2014-I.A.III dated 3/12/2014, that “SCZMAs may not consider permitting any foreshore facilities in the high eroding areas according to the CRZ Notification, 2011”.

xxiv Nature’s Club., (2022); Report on Field-based Consultations across Locations Experiencing Coastal Erosion; Kendrapada; Odisha.

xxv Building and Enabling Disaster Resilience of Coastal Communities., (2022); Report of the Field-based Consultations at Azhikadal Village of Ganapathipuram Panchayath; Kanyakumari; Tamil Nadu.

xxvi District Fishermen Youth Welfare Association., (2022); Coastal Erosion - Impact and Strategies; Report of the Field-based Consultations with Affected Communities and Institutional Stakeholders in Uppada, East Godavari District; Andhra Pradesh.

xxvii Patta also referred to as ‘Record of Rights’, is a document comprising the name of the legal owner of the land property.

xxviii Socio Economic Unit Foundation, (2022); Report on Stake Holders Consultation in Anchuthengu Gramapanchayath Experiencing Costal Erosion; Trivandum District; Kerala.

xxix National Disaster Management Authority., (2021); Proceedings of National Webinar - Formulation of Policy for Resettlement of Displaced People Affected by Coastal and or river erosion; New Delhi.

xx of the 33 districts of Assam, two are hill districts.


xxxi Sharma, N., Garg, R. D., Sarkar, A., Akhtar, P., Kumar, N. (2012); Final Report on Study of Brahmaputra River Erosion and its Control; Department of Water Resources Development and Management; Indian Institute of Technology Roorkee; National Disaster Management Authority of India

xxii Of the 33 districts of Assam, two are hill districts.


xliv Samta., (2022); Report of the Field-based Consultations Across Locations Experiencing River erosion; Khagaria; Bihar.
xlv National Disaster Management Authority., (2021); Proceedings of National Webinar - Formulation of Policy for Resettlement of Displaced People Affected by Coastal and or river erosion; New Delhi
xlvi Explained (2018); How Climate Change can Erode Indian Coastline more Intensely than Ever; The Indian Express - https://indianexpress.com/article/explained/climate-change-research-indian-coastline-rising-sea-level-5244688/
xlvii National Disaster Management Authority., (2021); Proceedings of National Webinar - Formulation of Policy for Resettlement of Displaced People Affected by Coastal and or river erosion; New Delhi.
xlix The CRZ is framed around horizontal distances from the shorelines and controls coastal development. There is a need to consider the vertical dimension, i.e., elevations of land, as well as the horizontal position in view of the climate change projections for sea-level rise, storm surge and waves.

1 Losses include loss of habitat (home and homestead including associated infrastructure like sanitation and drinking water systems), agriculture field, livelihoods, livestock etc

ii The M&E process should be governed by a group of stakeholders that include the elected functionaries of the district panchayat, the administrative head of the district panchayat, the chief executive officer of the DDMA, the district collector, one people’s representatives of the district and at least 10 representatives of the affected and vulnerable communities. This would act as a forum where the M&E exercises would be periodically updated, and comments admitted at the start and end of the exercise. While the SDMA and DDMA should have the autonomy to choose the M&E agency to conduct the actual exercise, the agency will be accountable to the above committee for outcomes.

li The monitoring of the programmatic response will be distinct from the impact evaluation. While the input in terms of programmatic interventions will be multi-sectoral and hence has to be monitored by sector, impact evaluation has to be comprehensive and cross-cutting sectors.

lv Mitigation refers to lessening or minimising of the adverse impacts of a hazardous event. It includes both structural measures as well as non-structural measures aimed at reducing risks.
lvii As defined by the Inter-governmental Panel on Climate Change
lviii As defined by the United Nations Framework Convention on Climate Change