

BEYOND THE TIDE

Building Flood and Erosion Resilience in The Gambia

Cécile Arnaud-Lorillou, Keren Carla Charles, Fabio Cian, Nfamara K Dampha,
Scott Ferguson, Borja Gonzalez Reguero, Tamara Bah

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1818 H Street NW
Washington DC 20433
Telephone: 202-473-1000
Internet: www.worldbank.org

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Acronyms and Abbreviations

AAD	Annual Average Damages
ARC	Africa Risk Capacity
BAC	Brikama Area Council
CBA	Cost-Benefit Analysis
CBO	Community-Based Organization
CSO	Civil Society Organization
DRF	Disaster Risk Finance
DRM	Disaster Risk Management
DRR	Disaster Risk Reduction
DTM	Digital Terrain Model
DWR	Department of Water Resources
EBA	Ecosystem-Based Adaptation
EPoA	Emergency Plan of Action
EWS	Early Warning Strategy
GBA	Greater Banjul Area
GBV	Gender-Based Violence
GDP	Gross Domestic Product
GFDRR	Global Facility for Disaster Reduction and Recovery
GMA	Gambia Maritime Authority
GoTG	Government of The Gambia
GPA	Gambia Port Authority
GTB	Gambia Tourism Board
ICZM	Integrated Coastal Zone Management
IPCC	Inter-governmental Panel on Climate Change
IWRM	Integrated Water Resources Management
KMC	Kanifing Municipal Council
LGA	Local Government Authority
MCA	Multicriteria Analysis
MECCNAR	Ministry of Environment, Climate Change, and Natural Resources
MOA	Ministry of Agriculture
MoFWR	Ministry of Fisheries and Water Resources
MOLGLRA	Ministry of Local Government, Lands, and Regional Administration
NBS	Nature-Based Solution(s)

NCCP	National Climate Change Policy
NDC	Nationally Determined Contribution
NDMA	National Disaster Management Agency
NEA	National Environment Agency
NEMA	National Environment Management
NEMC	National Environmental Management Council
NFCS-GAM	National Framework for Climate Services
NGO	Nongovernmental Organization
NRA	National Roads Authority
O&M	Operation and Maintenance
OCHA	Coordination of Humanitarian Affairs
SFV	Social Flood Vulnerability
SPCR	Strategic Program for Climate Resilience
SWM	Solid Waste Management
TDA	Tourism Development Area
TWNP	Tanbi Wetland National Park
UN	United Nations
UNDAC	United Nations Disaster Assessment and Coordination
WASH	Water, Sanitation, and Hygiene
WFP	World Food Programme



Executive Summary

The Greater Banjul Area (GBA)—encompassing Banjul City, Kanifing Municipality, and surrounding districts in the West Coast Region—is increasingly exposed to flooding and coastal erosion driven by rapid urbanization, environmental degradation, and climate change. As the economic and population center of The Gambia, the GBA hosts a large concentration of residential settlements, tourism infrastructure, and public assets. Coastal urban areas now accommodate nearly 60 percent of the national population, while tourism—largely concentrated along the coastal corridor—contributes approximately 12–16 percent of GDP and supports more than 75,000 jobs. This concentration of people and economic activity in low-lying coastal areas significantly increases exposure to climate hazards.

Flooding and coastal erosion represent the most significant climate risks facing the GBA. Pluvial flooding, driven by intense rainfall events, expanding impervious surfaces, and limited drainage capacity, frequently affects densely populated districts such as Kotu Stream, Ebo Town, Jeshwang, and Banjul City. Coastal erosion and sea-level rise pose additional risks along the western coastline, particularly in the Senegambia–Kololi–Kotu tourism corridor, where shoreline retreat threatens hotels, public infrastructure, and coastal ecosystems. Recent analysis from the Gambia Country Climate Development Report suggests that more than US\$2.1 billion in assets—equivalent to over 90 percent of national GDP—are located within 800 meters of the coastline, underscoring the scale of economic exposure in coastal Gambia.

This report presents a comprehensive assessment of flood and coastal erosion risks in the Greater Banjul Area and identifies priority actions to strengthen climate resilience. Building on previous analytical work, including the Greater Banjul flood and coastal risk assessment conducted by Royal Haskoning—the study integrates hazard analysis, exposure mapping, vulnerability assessment, and policy analysis to inform risk-informed investment planning. The report also reviews the institutional and policy framework for flood and coastal risk management in The Gambia, identifying opportunities to strengthen coordination and scale up nature-based solutions.

The assessment identifies 19 priority zones across the GBA based on geography, hazard exposure, and vulnerability patterns. This spatial analysis allows for targeted interventions that address local risk drivers while maximizing the effectiveness of investments. In several

areas, flood risks are closely linked to inadequate drainage systems, urban expansion into wetlands and floodplains, and the blockage of waterways by solid waste accumulation. Coastal zones face additional pressures from shoreline retreat, storm surge impacts, and degradation of natural coastal buffers such as mangroves and wetlands.

The report highlights the important role that nature-based solutions (NBS) can play in reducing flood and coastal risks while delivering broader environmental and socio-economic co-benefits. Restoring mangrove ecosystems, protecting coastal wetlands, implementing sustainable urban drainage systems, and expanding green infrastructure can complement conventional flood protection measures while supporting biodiversity, fisheries productivity, and urban environmental quality. Mangrove restoration in coastal areas such as the **Tanbi Wetland Complex and Oyster Creek** could significantly enhance coastal protection while generating ecosystem service benefits valued at **approximately US\$30 million**.

To support decision-making, the analysis applies cost-benefit analysis and multicriteria analysis to evaluate the feasibility and effectiveness of potential interventions. Priority measures identified in the report include upgrading urban drainage systems in flood-prone districts, strengthening coastal protection in erosion hotspots, establishing coastal setback zones, improving early warning and flood forecasting systems, and enhancing institutional capacity for disaster risk management. These investments should be complemented by improved land-use planning, stronger environmental regulation, and better coordination among national and local authorities.

The report further underscores that climate projections of rainfall variability, extreme precipitation events, and sea-level rise will continue to intensify flood and coastal risks in the coming decades. Addressing these challenges will require integrated approaches that combine infrastructure investments, ecosystem restoration, improved urban planning, and stronger governance frameworks. Scaling up nature-based solutions and strengthening municipal capacity for climate-resilient urban development will be particularly important for reducing long-term vulnerability.

This report provides a strategic framework for strengthening flood and coastal resilience in The Gambia. The Gambia can reduce climate risks by prioritizing targeted investments, strengthening policy implementation, and integrating ecosystem-based approaches into climate adaptation strategies, while protecting critical economic assets and supporting sustainable development in the Greater Banjul Area. The lessons and methodologies presented in this report may also provide useful guidance for other coastal cities facing similar climate and urbanization challenges.

The analysis presented in this report draws on work conducted under The Gambia program on innovative governance for flood and drought risk management, supported by the Global Water Security and Sanitation Partnership (GWSP) and the Global Facility for Disaster Reduction and Recovery (GFDRR), as well as the Greater Banjul flood and coastal risk assessment undertaken by Royal Haskoning.



1. Introduction

This report builds upon earlier analytical work conducted under the World Bank–supported Flood and Coastal Risk Assessment and Priority Investment Planning for Greater Banjul, undertaken by Royal HaskoningDHV in 2021. That study produced the core flood and coastal erosion hazard modeling, risk mapping, and preliminary prioritization of structural and non-structural investments for the Greater Banjul Area. The present report consolidates these analytical foundations with complementary analyses undertaken under the PROBLUE and GFDRR programs, including institutional diagnostics, nature-based solutions (NbS) opportunities, and policy recommendations. Together, these analyses provide an integrated evidence base to inform national planning and World Bank–supported operations on flood and coastal resilience in The Gambia.

The Gambia is a small West African state of 11,360 km² situated along the Gambia River, surrounded by the Atlantic Ocean to the west and Senegal along all other borders. The country has 80 km of open ocean coast and approximately 200 km of sheltered coast within the tidal reaches of the River Gambia. The Gambia experiences considerable inter-annual and inter-decadal climate variability. The Gambia is characterized by a low-income economy, which heightens its exposure to climate and disaster risks. The current total population is estimated at 2.4 million (2020), with an annual growth rate of about 3 percent, linked to a high birth rate and a decline in the infant mortality rate. Around 40 percent of the population is between 13 and 30 years of age. The agriculture sector accounts for about 30 percent of gross domestic product (GDP) and employs 75 percent of the workforce, especially women, but is highly vulnerable to weather shocks, and the impacts of climate change are a growing concern.

The coastal zones of The Gambia are important tourism areas that also provide natural resources and ecosystem services for income, food security, and recreation and contribute significantly to the country’s development through the provision of employment and transportation. The Greater Banjul Area (GBA), which comprises Banjul and the West Coast areas, concentrates a large fraction of the nation’s population, economy, and tourism activities. Since the 1960s, the tourism industry has been one of the fastest-growing sectors of the economy, contributing 12 percent of GDP in 1989, estimated to be nearly 20 percent in 2018. The growth in tourist arrivals rose from 528 visitors in 1966 to 162,000 in 2017. Overall, the tourism sector supported 107,500 Gambian jobs, including 42,000 direct jobs in 2017, and the industry’s contribution grows by 3.5 percent yearly.¹

¹ International Trade Administration. “Gambia - Travel and Tourism.” Country Commercial Guides, U.S. Department of Commerce, <https://www.trade.gov/country-commercial-guides/gambia-travel-and-tourism>.

The coastal zone in The Gambia includes habitats that border the Atlantic Ocean as well as brackish water environments that extend for about 200 km inland along the Gambia River. Coastal habitats of The Gambia consist of rocky/red cliffs, sandy beaches and dunes, mangrove forests, brackish lagoons, mud flats, and living reefs. Its rich biodiversity is, however, threatened by habitat destruction from urbanization, agricultural expansion, uncontrolled burning, and wood extraction, which has also led to degradation of ecosystem services. Atlantic fisheries resources have also declined due to increasing fishing intensity, illegal, unregulated, and unreported fisheries activities, and unsustainable fishing practices involving local artisanal fishers but mostly foreign industrial fishing fleets. A rapid, unplanned urban expansion has resulted in the growth of illegal and vulnerable settlements in the coastal zone due to low public awareness and institutional capacity to implement plans and enforce regulations. The uncontrolled nature of the urbanization process is a critical factor that is exacerbating social and environmental unsustainability, which is primarily apparent in the GBA but also manifests in other urban centers.

The Gambia is among the countries most vulnerable to climate change.² The increasing climate vulnerability is a result of a low-lying topography, high dependence on subsistence rain-fed agriculture, and inadequate drainage and stormwater management systems in a context of rapidly expanding unplanned urban expansion. Such climate vulnerability is linked to widespread poverty and limited adaptive capacity. It also affects the tourism industry in varied dimensions, including threats from sea level rise, urban flooding, and coastal erosion (Figure 1.1). The situation is exacerbated by a lack of clarity and enforcement of development control within the tourism development area (TDA), often leading to conflicts between stakeholders and ecosystem degradation such as the partial destruction of the Bijilo forest. Other examples include the unsuccessful beach nourishment in Banjul and the Senegambia area or degradation of coastal beach and dune systems, which have highlighted the importance of a coherent and well-planned approach to reducing vulnerability in key tourist areas in the GBA.

Figure 1.1 Erosion and coastal protection in Bakau (left) and a large culvert in Tabokotoh damaged by urban flooding (right)



Source: Flood and Coastal Risk Assessment and Priority Investment Planning for Greater Banjul: Investment Options Report (2021).

² Strategic Program for Climate Resilience [SPCR] 2017.

Climate change and floods are expected to affect the lives and livelihoods of residents in The Gambia, but they will also disproportionately affect women and other vulnerable groups. Projections show an increase in the occurrence of heavy rainfall events and drought events.³ Because no formal solid waste disposal systems are in place in urban areas, waste is often burned, either at dumpsites or where generated.⁴ Additionally, dumping of solid waste into wetlands is widespread, and some households and businesses burn or litter where the waste is generated.⁵ Local governments are responsible for domestic solid waste management (SWM), and each municipality provides collection services individually. However, the coverage does not reach all areas.⁶ The limited formal waste collection service combined with widespread and unregulated dumping of domestic waste further poses a major health threat for the growing population, especially women and children.

The Gambia also faces large financial constraints for climate resilience investments. There is a large dependence on donor funding, and limited public resources are often overstretched across ambitious development plans (SCPR 2017). Yet, the country has significant climate finance needs. A national assessment of investment and financial flows from 2011 indicated that approximately US\$1.35 billion was needed up to 2030 to implement priority actions to reduce greenhouse gas emissions from the energy sector and forest degradation and adapt to the impacts of climate change in the agriculture and water sectors.⁷ The Gambia's SPCR (2017) estimated that strengthening climate resilience specifically could cost up to US\$315.8 million for the next 25 years.² Recent estimates reveal the total cost of implementing The Gambia's Long-Term Climate Change Strategy (LTS) stands at USD 4.0 billion at today's prices. This equates to an average funding requirement of USD 138 million per annum from now until 2050 in order to achieve the country's net-zero emissions target.⁸ In addition to constraints associated with planning, provisional budget, and resource allocation, funding sources for climate resilience continue to be inadequate and limited.

The 'Gambia Integrated Urban and Coastal Resilience Program' has facilitated the dialogue between the Government of The Gambia (GoTG) and the World Bank to develop a framework for advancing disaster and climate resilience in the GBA. Supported by PROBLUE, the World Bank's Blue Economy Multi-Donor Trust Fund, which aids the development of integrated, sustainable, and healthy marine and coastal resources, the program has focused on addressing marine pollution from litter, plastics, and land-based sources; developing nature-based infrastructure; and building government capacity; and identifying climate risk mitigation solutions in an integrated way to deliver more and long-lasting benefits to the country and communities. The program also built on the initial outputs of the '**Flood and Coastal Risk Assessment and Priority Investment Planning for Greater Banjul**', a project funded by the African Caribbean Pacific (EU Natural Disaster Risk Reduction Program) through the Global

3 Goy Garcia et al 2022.

4 Goy Garcia et al 2022; Maci and Kitchin 2020.

5 Goy Garcia et al. 2022.

6 Goy Garcia et al. 2022.

7 Jarju and UNDP 2011.

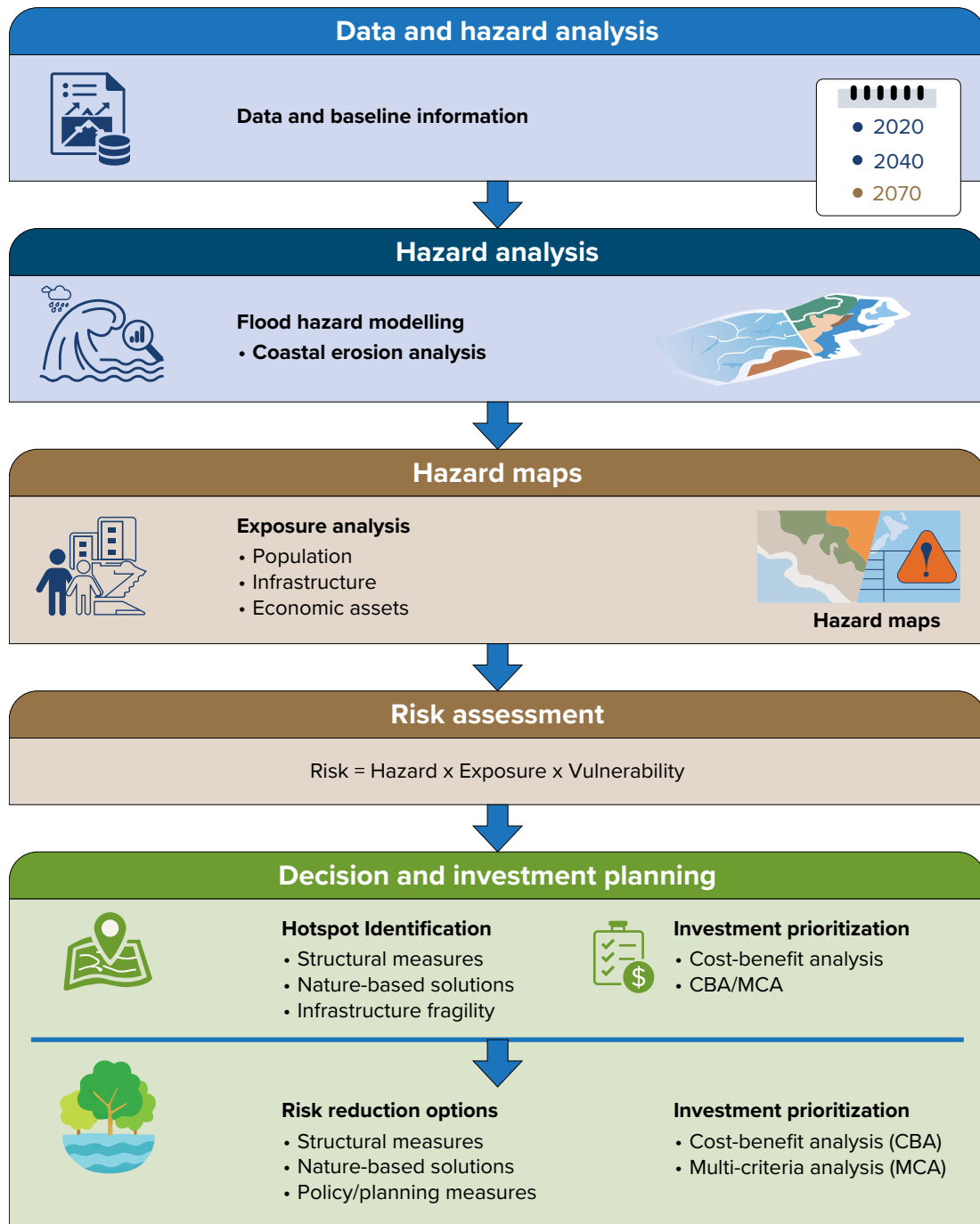
8 https://unfccc.int/sites/default/files/resource/Long_Term_Climate_Change_Strategy_of_The_Gambia_Final.pdf

Facility for Disaster Reduction and Recovery (GFDRR). The technical assistance characterized the flood and erosion risks in the GBA and the Kombo North/Saint Mary district and helped identify measures and investments for hazard risk mitigation.

To clarify how the different analytical components of the study connect—from hazard modelling to investment prioritization, the overall analytical workflow applied in this report is summarized in Figure 1.2. This figure illustrates the analytical workflow used to identify and prioritize flood and coastal risk reduction investments. Hazard modelling outputs are combined with exposure and vulnerability analysis to generate risk maps and identify priority hotspots. Potential interventions, including structural infrastructure, nature-based solutions, and policy measures—are subsequently evaluated and prioritized using cost-benefit and multi-criteria analyses. The analytical framework integrates hazard modelling, socio-economic exposure analysis, and policy-oriented decision tools to support risk-informed investment planning. This approach allows decision-makers to identify priority flood and coastal erosion hotspots and evaluate alternative risk reduction strategies using both economic efficiency and broader social and environmental criteria.

Building on these technical assistances, this report summarizes the methodology followed to determine the various interventions, aiming to demonstrate how this approach can be scaled up and applied to other regions. Chapter 2 of this report summarizes the institutional and policy context for flood and coastal risk management and identifies entry points and opportunities for nature-based solutions (NBS). Chapter 3 presents the disaster risk assessment for urban and coastal areas. Chapter 4 evaluates risk reduction measures, including cost-benefit analysis (CBAs) and multicriteria analysis (MCA). Chapter 5 focuses on identifying specific NBS projects. Chapter 6 analyzes the gender aspects of the assessment and proposed interventions. Finally, Chapter 7 outlines the main conclusions and explains how to apply and replicate the approach in other regions.

Figure 1.2 Analytical Framework for Risk-Informed Flood and Coastal Resilience Planning in the Greater Banjul Area





2. Institutional and Policy Context for Flood Risk Management and Nature-Based Solutions

This chapter characterizes the institutional and policy context for flood risk management in the country, to identify gaps, opportunities, and entry points for risk reduction measures and nature-based adaptation. By assessing policy and initiatives using the EPIC Response framework⁹ for hydroclimatic risks assessment and examining flood risk management and governance structures and functions in The Gambia, the chapter identifies the roles of various government agencies in managing flood risks and underscores areas where collaboration among agencies could be improved.

The country's vulnerability to hydroclimatic risks includes pluvial, fluvial, and coastal flooding hazards, among others such as rising sea levels and coastal erosion. These hazards and risks are compounded by high poverty rates, lack of infrastructure resilience, limited financial resources, institutional fragility, and absence of robust social safety nets.¹⁰ To support the risk analysis and the proposed solutions, this policy and institutional analysis identifies critical policy, legislative, funding, and institutional coordination strengths and gaps related to flood risk management and governance in The Gambia.¹¹

2.1 Overview of Governance and Policy Framework

The Gambia has made significant progress in developing national policies and institutional arrangements addressing climate change, disaster risk management, water governance, and environmental protection. These frameworks collectively shape the country's approach to managing flood and coastal risks. However, many instruments have only recently been

⁹ <https://www.worldbank.org/en/topic/water/publication/an-epic-response-innovative-governance-for-flood-and-drought-risk-management>

¹⁰ Amuzu et al. 2018; Coates and Manneh 2014; Dampha 2020.

¹¹ World Bank 2024.

updated, remain under development, or face implementation constraints due to limited institutional capacity, financing gaps, and fragmented coordination across sectors. As a result, while the policy architecture for climate resilience is expanding, effective implementation of flood risk management and nature-based solutions remains uneven.

Flood risk management in The Gambia is not governed by a single comprehensive framework. Instead, responsibilities are distributed across several sectoral laws and policies covering disaster risk reduction, water resources management, environmental governance, and climate change adaptation. This fragmented structure requires strong coordination among institutions and policy instruments to ensure effective risk reduction, particularly in vulnerable urban and coastal areas such as the Greater Banjul Area (GBA).

Policy analysis highlights several persistent governance gaps affecting flood risk management and coastal resilience:

Key governance gaps

- Absence of detailed regulations and operational guidelines for **integrated water resources management (IWRM) and floodplain management**.
- Limited capacity for **real-time flood forecasting and hydrometeorological monitoring**.
- Insufficient **contingency funds and financial mechanisms** to support disaster response, recovery, and rehabilitation.
- Weak coordination among institutions responsible for **water management, disaster risk reduction, environmental protection, and urban planning**.
- Limited regulatory frameworks and investment strategies to support **nature-based solutions (NBS)** for flood risk reduction.
- Capacity constraints at the **local government level**, including limited access to technical expertise, financing, and climate risk data.
- Weak institutional mechanisms for **post-disaster recovery coordination**, often leaving flood-affected communities to rely on self-managed recovery efforts.

Addressing these challenges will require strengthening the policy and institutional environment for flood risk management and climate resilience. Priority actions include:

Recommended policy and institutional actions

- Strengthen and update **flood risk regulatory frameworks**, including new regulations and operational guidelines to improve coordination across institutions responsible for flood risk management.

- Increase **budgetary allocations and financial mechanisms** for flood risk reduction, response, recovery, and rehabilitation, including stronger engagement from the Ministry of Finance and development partners.
- Develop a **national policy and strategic framework for nature-based solutions**, supported by a detailed implementation action plan to promote ecosystem-based approaches for flood mitigation, biodiversity protection, and ecosystem service provision.
- Continue supporting policy reforms and regulatory development through initiatives such as the **West Africa Coastal Areas Resilience Investment Project (WACA ResIP2)**, including the finalization and implementation of the forthcoming **Climate Change Act** and **Integrated Coastal Zone Management (ICZM) Act**.
- Strengthen collaboration between NDMA and natural resource management institutions—including the **Departments of Water Resources, Forestry, Parks and Wildlife**—to scale up ecosystem-based disaster risk reduction approaches.
- Support **local government councils and the National Roads Authority (NRA)** in developing climate-resilient stormwater and drainage infrastructure, including investments in green infrastructure and improved flood safety guidelines.

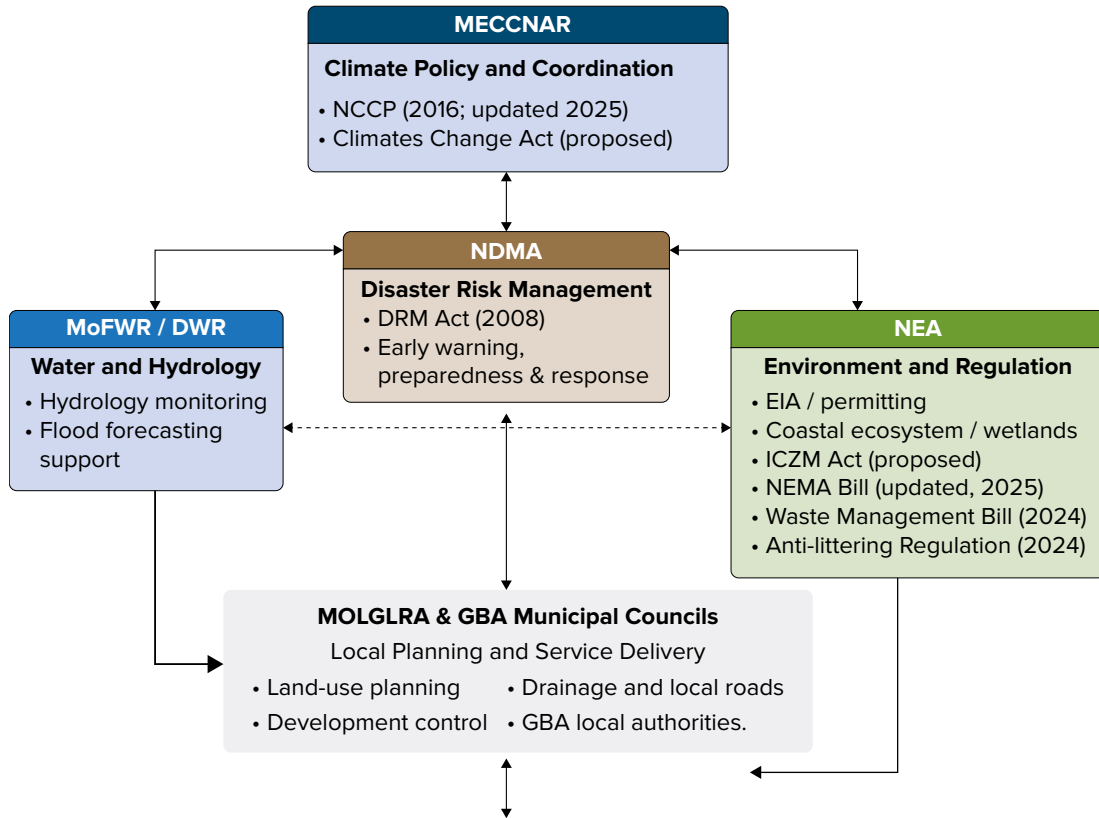
The Government of The Gambia, with support from development partners, has begun advancing several initiatives to strengthen the enabling environment for flood and coastal resilience. These include revising disaster management policies, updating environmental legislation, developing new climate governance frameworks, and supporting local governments in improving stormwater and drainage infrastructure systems. Programs such as **WACA ResIP2** have also contributed to strengthening policy development and institutional coordination for coastal risk management and climate resilience.

The following sections provide a more detailed overview of the **institutional governance landscape (Section 2.1.1)** and the **policy and regulatory frameworks shaping flood risk management (Section 2.1.2)** in The Gambia.

2.1.1 Flood Risk Governance Landscape

Flood and coastal risk management in The Gambia is implemented through a network of institutions with complementary mandates across climate governance, disaster risk management, water resources monitoring, environmental regulation, and local planning. These institutions collectively form the operational governance framework responsible for addressing flood hazards, coastal erosion, and drainage management challenges, particularly in rapidly urbanizing coastal areas such as the Greater Banjul Area (GBA). The main institutional relationships are summarized in Figure 2.1.

Figure 2.1 Institutional Framework for Flood and Coastal Risk Management in The Gambia



At the national level, the Ministry of Environment, Climate Change and Natural Resources (MECCNAR) provides overall leadership for climate governance and environmental management. The ministry is responsible for coordinating national climate actions, overseeing climate-related programs, and guiding the integration of climate resilience into development planning. MECCNAR also facilitates coordination among government agencies and development partners working on climate adaptation and environmental sustainability.

The National Disaster Management Agency (NDMA) serves as the lead institution responsible for disaster risk management and emergency coordination. NDMA oversees national disaster preparedness, early warning dissemination, emergency response, and post-disaster recovery efforts. The agency operates through a multi-level disaster management system that includes national, regional, district, and community-level committees, allowing disaster risk management activities to be implemented across governance levels. In the context of flood risk management, NDMA plays a critical role in coordinating emergency preparedness, contingency planning, and response activities during flood events.

Water resources governance and hydrological monitoring are managed by the Department of Water Resources (DWR) under the Ministry of Fisheries and Water Resources (MoFWR). DWR is responsible for monitoring surface and groundwater systems, collecting hydrological

and meteorological data, and supporting flood forecasting and water resources planning. These functions are essential for understanding flood dynamics, managing river basin systems, and supporting early warning mechanisms for flood events.

Environmental regulation and ecosystem protection are overseen by the National Environment Agency (NEA). NEA plays an important role in enforcing environmental compliance, overseeing environmental impact assessments, and protecting ecosystems such as wetlands and coastal habitats. These ecosystems are critical for natural flood regulation and coastal protection, making environmental governance an important component of flood and coastal risk management.

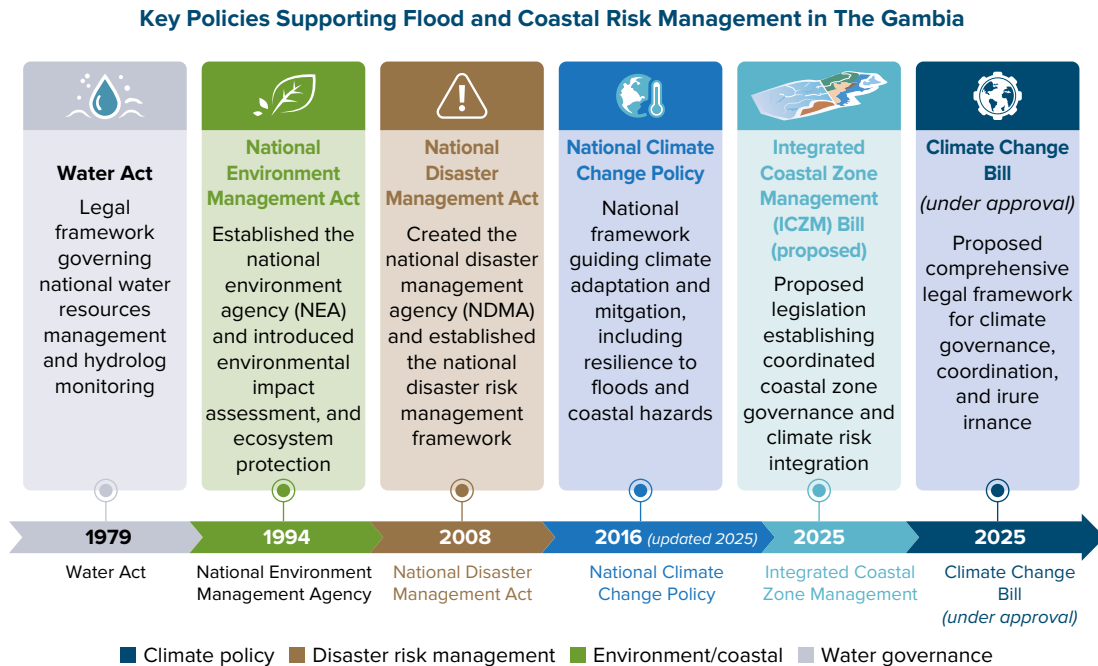
At the subnational level, the Ministry of Local Government, Lands and Regional Administration (MOLGLRA) and municipal authorities are responsible for implementing many of the practical measures that influence flood risk outcomes. Local government councils oversee land-use planning, development control, drainage maintenance, and local infrastructure management. In the Greater Banjul Area, these responsibilities are particularly important because flood risk drivers, including rapid urban expansion, drainage obstruction, settlement encroachment into wetlands, and weak enforcement of zoning regulations—often manifest at the municipal level.

Despite the presence of these institutional mandates, coordination challenges remain. Responsibilities for flood risk management are distributed across multiple sectors, including climate governance, disaster management, water resources, environmental regulation, and urban planning. Data systems are not fully integrated across agencies, and coordination between national institutions and local authorities remains limited. Strengthening collaboration among these institutions, particularly between MECCNAR, NDMA, DWR, NEA, and local governments—will be essential to improve flood risk governance and enhance resilience in coastal urban areas.

2.1.2 Flood Risk Policy Landscape

The policy landscape for flood risk management in The Gambia consists of a range of laws, policies, strategies, and action plans addressing disaster risk reduction, water governance, climate adaptation, environmental management, and sectoral development planning. These frameworks collectively provide the legal and strategic foundation for addressing flood hazards and coastal risks, although they remain dispersed across multiple sectors rather than consolidated into a single flood risk management framework. As a result, effective coordination among institutions responsible for climate policy, disaster risk management, water resources, environmental regulation, and local planning is critical for managing flood and coastal risks. The institutional relationships among these actors are summarized in Figure 2.2.

Figure 2.2 Key Policies Supporting Flood and Coastal Risk Management in The Gambia



This figure reflects the evolution of policy frameworks relevant to flood and coastal risk management, showing increasing integration of climate resilience into national governance. Key milestones include the Water Act (1979), which established the legal framework for water resources management; the National Environment Management Act (1994), which created the National Environment Agency; and the National Disaster Management Act (2008), which established the National Disaster Management Agency and the disaster risk management architecture. More recent policies, including the National Climate Change Policy (2016) and the National Early Warning Strategy (2021), strengthened climate adaptation and disaster preparedness. The proposed Integrated Coastal Zone Management Bill and Climate Change Bill (2025) aim to further enhance institutional coordination and strengthen governance of coastal ecosystems and climate resilience.

At the core of the disaster risk governance framework is the **National Disaster Management Act (2008)**, which establishes the national institutional framework for disaster preparedness, response, and recovery. The Act identifies flooding as a major hazard and mandates coordinated disaster management activities across national and local levels. Complementing this legislation are several national strategies and planning instruments that guide disaster risk reduction and preparedness. **These include National Disaster Management Policy (2024), the National Disaster Risk Reduction and Management Plan (2019–2030), the National Early Warning Strategy (2021–2026), and the National Disaster Management Strategic Plan (2024–2033) with its associated Medium-Term Implementation Plan (2024–2028).** Together, these frameworks emphasize strengthening early warning systems, disaster preparedness, and the integration of climate risk considerations into disaster management planning.

Water governance policies also play an important role in flood risk management. The Water Act (1979) provides the legal framework governing national water resources management and hydrological monitoring. The **National Water Resources Policy (2006)** complements this framework by guiding sustainable water resources planning and management. These instruments mandate monitoring of surface and groundwater resources, support hydrological data collection, and guide water use planning. However, both frameworks predate current climate challenges and do not fully address the increasing importance of climate-driven flood risks, integrated river basin management, and urban drainage pressures.

Climate change policies increasingly incorporate flood risk management and ecosystem-based adaptation approaches. The **National Climate Change Policy (2016, updated in 2025)** provides an overarching framework for climate adaptation and mitigation actions. Supporting implementation instruments include the **Strategic Program for Climate Resilience (SPCR, 2017)** and the **Nationally Determined Contribution (NDC, 2021)**, both of which emphasize strengthening resilience to hydro-climatic hazards through ecosystem restoration, climate-resilient infrastructure, and improved climate information systems.

The Government of The Gambia has also launched the Long-Term Climate-Neutral Development Strategy (2050), which highlights the need for resilience-building measures across sectors to address risks associated with floods, droughts, sea-level rise, and coastal erosion. Similarly, frameworks such as the **National Framework for Climate Services** and the **Third National Communication to the UNFCCC** emphasize strengthening climate information systems and integrating climate adaptation into national development planning.

In addition, the Climate Change Bill (2025), currently under consideration in the National Assembly as of early 2026, aims to establish a comprehensive legal framework for climate governance, institutional coordination, climate finance mechanisms, and climate action monitoring systems. Once enacted, the law is expected to strengthen the policy foundation for climate resilience and enhance integration of climate risks, including floods and coastal hazards, into national development planning.

The provisions of the proposed Climate Change Act include establishment of a National Climate Change Council (NCCC) and National Climate Change Department under MECCNAR as the executive secretariat of the National Climate Change Council, creating a coherent national Measurement, Reporting, and Verification (MRV), transparency, compliance and enforcement system, preparation of a single annual climate work plan and budget, and stronger requirements for decentralized climate action through local government authorities. The national assembly select committee's report also emphasized subsidiarity, local participation, climate information access, and stronger links between national and local climate action, all of which are highly relevant for managing flood and coastal risks in the Greater Banjul Area.

Environmental and coastal governance frameworks also contribute to flood risk reduction. The **National Environment Management Act (1994)** established the legal framework for

environmental protection and environmental impact assessment in The Gambia. Ongoing legislative updates, including the **Waste Management Bill (2024)**, **Asbestos Regulation (2024)**, **Anti-Littering Regulation (2024)**, and an updated **NEMA Bill (2025)**—seek to strengthen environmental regulation and urban environmental management. Although these instruments are not flood-specific, they influence key drivers of urban flooding such as solid waste management, drainage obstruction, and environmental compliance.

Coastal governance is also evolving to address growing risks associated with coastal flooding and erosion. Coastal governance is expected to be strengthened through the proposed **Integrated Coastal Zone Management (ICZM) Bill (2025)**, which aims to establish a coordinated framework for managing coastal ecosystems, shoreline development, and marine resources. The legislation emphasizes sustainable coastal development, biodiversity protection, and stronger coordination across sectors such as tourism, fisheries, environmental management, and infrastructure planning. Once enacted, the ICZM framework could play a significant role in addressing coastal erosion and flood risks in the Greater Banjul Area by promoting integrated management of coastal infrastructure, wetlands, mangroves, and tourism development zones.

Beyond these core legal frameworks, several sectoral strategies incorporate climate resilience and disaster risk considerations. These include the **Forestry Sub-Sector Policy**, the **Agriculture and Natural Resources Policy**, and the **Climate Change–Integrated Fisheries Strategic Action Plan**.

Despite this broad policy architecture, flood risk management in The Gambia remains largely reactive, with greater emphasis placed on disaster response than on proactive risk reduction measures such as floodplain zoning, climate-resilient infrastructure planning, and ecosystem-based flood mitigation. Strengthening the policy framework will therefore require improved coordination across sectoral policies, clearer regulatory mechanisms for flood risk mapping and land-use planning, and increased investment in both gray and nature-based flood protection measures.

The proposed **Climate Change Act** and **ICZM Act**, together with ongoing updates to environmental and disaster risk management legislation, provide important opportunities to strengthen the enabling policy framework for managing flood and coastal risks.

2.2 Flood Risk Preparedness, Response, Financing, and Recovery

The GoTG's policy and institutional mechanisms to prepare, plan, and respond better to floods through more effective forecasting, response, recovery, and risk financing are summarized below.

2.2.1 Flood Risk Planning, Preparedness, and Forecasting

The Gambia has National and Regional Multi-hazard Contingency Plans, which include flood risk management. The plans are developed by NDMA in consultation with all relevant stakeholders such as development partners and local stakeholders, including nonstate actors, private companies, civil society organizations (CSOs), and community members. The identified hazards in the plans include flash floods, droughts, windstorms, fire outbreaks, pest infestation, and disease outbreaks. They seek to ensure that flood risk mitigation measures become higher priorities for the government. However, implementing and updating the contingency plans and developing new regional contingency plans for the West Coast Region and others have been challenging due to limited financial resources, limited institutional coordination, and lack of institutional awareness of sector-specific roles when contingency plans are being simulated for better preparedness or activated during emergency events.

Currently, The Gambia has limited capacity for real-time flood forecasting. DWR is expected to issue early warning bulletins for flood risk management, but the forecasting has not been regular or effective for flood risk mitigation and response. Sometimes, NDMA collaborates with DWR, local government area councils, and NGOs to issue and disseminate early warning information on floods. But the flood events of July 30 and 31, 2022, among other recent floods, exemplified poor forecasting and response measures to reduce damage and protect lives, livelihoods, and properties. In fact, DWR did not issue early warning bulletins to the public about the risk of this recent flood episode.

Flood preparedness and response strategies are minimally prioritized in The Gambia. NDMA, DWR, and partners are reactive responders to flood damages. However, the National Early Warning Strategy (EWS) 2021–2026 seeks to enhance proactiveness and emphasizes an integrated approach combining efforts from the government, UN agencies, NGOs, key development partners, and local communities. The strategy highlights a people-centered approach, focusing on risk knowledge, technical monitoring, warning services, communication, dissemination of warnings, and community response capability. To enhance national capacity, the Africa Risk Capacity (ARC) River Flood Model (AFM-R) is also expected to provide daily information on flood extent across Africa, focusing on large-scale river flooding if launched.

2.2.2 Flood Response, Relief, and Recovery

In The Gambia, NDMA coordinates flood emergency response and relief in consultation with relevant government agencies such as DWR, NEA, LGAs, CSOs (HELP-Gambia, Red Cross), the private sector, and other bilateral and multilateral institutions such as the World Food Programme (WFP), Red Cross, and other UN agencies (United Nations Disaster Assessment and Coordination [UNDAC], Coordination of Humanitarian Affairs [OCHA], and so on).

The President's office typically declares a state of flood emergency, which allows for multi-donor intervention and immediate response. As the highest decision-making body,

the National Disaster Management Governing Council, chaired by the Vice President, plays a critical role in emergency response activities. Regional disaster committees are generally the first responders in flood emergencies. NDMA's regional coordinators and committee members conduct rapid and detailed assessments in flood-affected communities. The Crisis Management Tactical Group, composed of professionals from various departments, provides technical support and advice on disaster response. NDMA also mobilizes resources to support victims and partners with CSOs and local government councils for flood risk mitigation activities, such as cleaning and dredging stormwater infrastructure systems. Flood impact data help the government and partners effectively respond and deliver relief items and services to the most vulnerable communities.

However, the government often lacks resources for early recovery and rehabilitation. The provision of small relief items to flood victims tends to attract stakeholder and donor involvement but often stops there, leaving many victims to recover on their own from the devastating impacts on lives, livelihoods, and properties. When additional resources are available, NDMA takes charge of the distribution of building materials and cash to affected families to rebuild better. Nevertheless no national strategy or plan is in place currently to help communities build back better after being impacted by flood events.

NGOs and community-based organizations (CBOs) complement government efforts to reduce flood risks by providing community-based support to strengthen resilience and enhance the capacity of vulnerable households and disadvantaged populations. For example, HELP-Gambia supports NDMA through volunteer participation in disaster data collection and assessments, especially during and after flood events.

2.2.3 Disaster Risk Finance

According to the Disaster Act (2008), disaster funds in The Gambia are designated for use in preventing, responding to, mitigating, and providing relief from, recovering from, and rehabilitating after disasters. These funds are applicable to flood risk management and are governed by detailed guidelines on their administration, maintenance, sources, application, tax exemption, and reporting at national, regional, and district levels. The Disaster Act empowers the Executive Director of NDMA to authorize national-level fund disbursements, while regional and district Disaster Coordinators and committees handle approvals at their respective levels. Despite the development of national and regional multi-hazard contingency plans by NDMA, there is often limited or no contingency funding allocated for their execution. However, these plans identify the resources needed for managing various hazards, including floods, and outline potential sources and strategies for resource mobilization, such as emergency declarations, contingency plan activation, proposal writing for support, and inter-sectoral meetings.

The development of The Gambia's first Disaster Risk Financing Regulation has been gazetted, while the national DRF strategy remains under drafting due to limited financial and technical support. While the regulation establishes a framework for risk layering and financial

instruments, its operationalization will depend on capitalization, institutional coordination, and integration with the national budget cycle.¹² The DRF regulation and strategy both seek to ensure the timely and cost-effective availability of funds pre-and-post-disaster by addressing financial protection gaps and integrating disaster risk financing into the core public finance system. The DRF regulation (already gazetted) and its accompanying strategy will employ a risk layering approach, combining risk retention and transfer mechanisms, such as insurance, contingency funds, and other tailored financial instruments. These instruments also involve enhancing the capacity of financial and insurance sectors to support DRM and encouraging financial institutions to lend to vulnerable businesses and households. The implementation of the DRF regulation and strategy is led by the NDMA, Ministry of Finance, and involves a coordinated approach with input from various stakeholders, including government agencies, financial institutions, and international partners. Regular assessments and updates will ensure the regulation and strategy adapts to evolving risks and financial landscapes. By implementing the DRF regulation and its strategy, The Gambia will build a resilient framework capable of managing the financial impacts of disasters, thereby protecting its population and economy from severe disruptions.¹³

Since flood risk planning is cross-sectional, the following section examines intersections with ICZM, tourism development planning, and integrated water resources planning that contribute to flood risk reduction and support resilience building in The Gambia.

2.3 Cross-Sectoral Integration

2.3.1 Integrated Coastal Zone Planning

The coastal zone is of high ecological and economic importance for the country. For example, the Tanbi¹⁴ and Baobolon wetland areas are designated Ramsar sites of international importance. However, a high reliance on forests for energy, together with continued illegal encroachment on protected areas by human settlements, has resulted in a significant reduction in mangrove cover, which accounted for 73 percent of the total loss. Forestry comprises less than 1 percent of GDP but provides more than 85 percent of domestic energy needs. Tourism, which is central to the national economy, also depends to a large extent on the sandy beaches and the coastal environment.

In The Gambia, the coastal zone has been assigned an inland boundary that follows the coastal highways which extend from Kartong in the south to the Mansakonko-Farafeni crossing on the Gambia River and along the north bank to Mbankam. This inland area encompasses

¹² Bertram et al. 2023.

¹³ Ibid.

¹⁴ Tanbi Wetland National Park (TWNP) has an area of 6,034 ha. TWNP is a mangrove swamp that fronts the ocean to the North and the Gambia River to the East. It is an estuarine and intertidal forested wetland primarily of low mangrove forest, with a complex of vegetation types on its northern boundary and along the mangrove fringing the mainland. The TWNP functions include coastal stabilization, fish breeding, and recreation.

beach habitats, mangroves, and wetlands, while the seaward boundary up to 4 km offshore (~10 m isobath) hosts key fishing grounds and natural reserves.

Driven by the economic interest of the coastal zone, The Gambia has developed initiatives in recent years to advance ICZM. In 2015, the Strategic Plan for Coastal Zone Management in The Gambia presented a vision for the development of the coastal zone and set out policy directions to address legal, institutional, social, economic, and environmental issues through the establishment of common goals, objectives, and strategies. In 2016, the ICZM Management Plan developed the operating policies, processes, and procedures of an ICZM coordinating body to lead a new model of shared leadership and management of The Gambia's coastal zone.¹⁵ However, the management plan does not alter the statutory authority of national, regional, or local government institutions or affect the rights associated with legally established resource uses or private property within the relevant geographic area.¹⁶

The Gambia has developed a strategic plan for ICZM with a 25-year planning horizon from 2016 to 2040. The plan aims to address 10 cross-cutting issues through a hierarchical framework of goals, objectives, and strategies, including floods, coastal adaptation (rising sea levels), and ecosystem changes. A performance review and amendment of the ICZM Strategic Plan were planned to be done every five years, beginning in 2020, and will continue to ensure the necessary stakeholder consultations.¹⁷ The Integrated Coastal Management bill is at its final approval stage at the National Assembly as of the end of 2025.

The control and management of coastal environments fall within the purview and jurisdiction of NEMA 1994 which has provided for specific provisions relating to coastal zone management. Under the National Environmental Management Council (NEMC), the role of the ICZM Secretariat (ICZM-S) is to promote inter-sectoral coordination on the formulation of the ICZM Strategic Plan, ensure and monitor progress with its implementation by engaging with stakeholders on Action Planning, and provide periodic ICZM Programme reports and updates.

Previous analysis of the institutional and policy landscape for coastal management revealed critical gaps: outdated policies, knowledge gaps, weak capacity to plan and oversee implementation of policies, high fragmentation of mandates, weak coordination structures, and

¹⁵ World Bank (2024). *EPIC Response Report on Hydro-Climatic Risks Governance and Management in The Gambia*, led by Nfamara K Dampha.

¹⁶ The ICZM Strategic Plan began with the establishment of a task team comprising representatives drawn from the ICZM Technical Working Group, which was established under the GCCA Support Project to The Gambia (GC3SP). Approximately 50 GoTG national institutions and local government authorities were involved to ensure full participation and ownership of the ICZM Strategic Plan by key stakeholders. The task team drafted the ICZM Management Plan in 2016.

¹⁷ Based on the common values, principles, and aspirations of stakeholders for sustainable development in the coastal zone, the following vision statement was agreed upon to guide the implementation of the ICZM Programme: "Gambian coastal communities will be places where human activities enhance the natural environment; are resilient to climate change; and where the government, private sector, and communities work together to meet basic needs for income, food, shelter, health care, and education."

knowledge management.¹⁸ Some initiatives in recent years have been a response to address such gaps. Yet, many of the policy documents relevant to flood hazards require updates, implementation, and enforcement.

In summary, some of the main barriers identified for efficient coastal risk management are as follows:

- Limited understanding of coastal dynamics and flood risk, including the effects of climate change.
- Lack of spatial information and data, particularly with regard to coastal hazards, rainfall-runoff, meteorological conditions, sea level rise, and climate change.
- Outdated land use plans and inadequate mapping and information systems to support up-to-date climate-resilient land use planning and management/enforcement.
- Limited attention to waste management that results in clogged drains and accentuates pluvial flooding. Maintenance of the drainage system primarily falls under the responsibility of NDMA and local municipal councils, who perform cleaning campaigns in Banjul City but not often enough to prevent flooding. The NRA (under the Ministry of Works) is responsible for drainage along the major roads of the country.
- Absence of adequate drainage infrastructure for safe and timely stormwater runoff (flash floods).
- Need for adequate landfills for the proper disposal of solid waste.
- Limited financial resources, especially for coastal protection (high cost). Limited attention and financial means for the operation and maintenance (O&M) of investments. General dependence on donor funding.
- In the past, international donor financing for coastal protection in The Gambia has been spent on ad hoc activities, often not implemented following the technical recommendations. These ad hoc responses are not sustainable and frequently attain a limited lifespan.
- Need for an integrated vision, master plan, or strategy on future developments for the GBA (including Banjul City), supported by all institutional stakeholders. However, the Sustainable Urban Development Programme 2020–2040 for The Gambia aims to provide such a unified vision (currently under development, the initial assessment matches the findings in our policy review presented here).
- No formal setback zones or planning restrictions exist yet. Several efforts in this direction have been undertaken, and the ICZM Bill including coastal setback zones is in the process of legal implementation by the NEA.

¹⁸ Watson 2008.

2.3.2 Tourism Development Planning

The threat of climate change on the tourism sector remains a critical challenge for the country. Given that much of the tourism development is in vulnerable areas of the coastline, the lack of climate change considerations in tourism plans represents a significant omission. The Gambia Tourism Board Act of 2011 repealed the Tourism Authority Act, established the Gambia Tourism Board (GTB), and provided for the TDAs. The 2011 Act includes provisions related to the licensing of hotels, nightclubs, casinos, and restaurants as well as for the designation and demarcation of TDAs but lacks environmental responsibilities—whether by the GTB or by a leaseholder—or climate change action, denoting a focus on the product rather than on developing a resilient climate sector. The regulations accompanying the GTB Act included no requirements for environmental impact assessments or mentions of climate-proofing. Yet, the Tourism Policy recognizes the need for a review of tourism-related legislation and draws attention to the need to eliminate the haphazard planning of the coastal area, landscape erosion, indiscriminate sand mining on the beaches, and environmental pollution by refuse dumping and stray livestock. The policy also points to critical evaluation from the Tourism Area Development Board to assess the environmental impact of new hotel building investments.

2.3.3 Integrated Water Resources Planning

The Gambia has no specified national plan for river basin planning critical for flood risk management. However, the National Water Policy calls strongly for an IWRM approach. This policy highlights the likelihood of future climate-driven flood risks across the Gambia River Basin, noting that some 20 percent of the country's surface is in a floodplain, including ponds, small lakes, wetlands, and tidal creeks. The water policy makes substantial reference to current and projected flood risk impacts in The Gambia as sea levels rise. The MECCNAR is now the mandated institution responsible for actively working on River Basin Planning in The Gambia in partnership with relevant agencies involved in IWRM. Currently, implementing IWRM and River Basin Planning has been challenged in The Gambia by the lack of data, instruments, modeling tools, and expertise in DWR and other relevant agencies.

Table 2.1 outlines the main agencies and mandates in relation to flood risk management in The Gambia.

Table 2.1 Regulatory framework for the coastal zones

Name	Responsible agency	Authority	Relevance to coastal management
NEMA 1994	NEA under the Ministry of Environment, Climate Change, and Natural Resources (MECCNAR)	Section 30 of the act captioned ‘Management of Coastal Zone, Rivers and Wetlands’ provides as follows: Unless expressly allowed to do so under any law or by the Agency in writing, No person may in relation to the coastal zone, rivers and any other wetlands; use, erect, reconstruct, place, alter, extend, remove or demolish any part of any structure in, on, under, or over the sea bed; excavate, drill, tunnel or otherwise disturb; introduce or plant any plant or part of a plant whether alien or indigenous; introduce any animal or micro-organism whether alien or indigenous; deposit or dump any substance which is likely to have adverse effects on the environment; divert a river or lagoon, etc.	Review and approve environmental impact assessments for major developments on the coast submitted in accordance with this act or any other law.
NEMA 1994	NEA; Gambia Navy, under Ministry of Defence; Gambia Port Authority (GPA) and Gambia Maritime Authority (GMA) both under the Ministry of Transport Works and Infrastructure (MOTWI)	cap. 72:02 to make provision for the prevention of the dumping of industrial waste; for the protection of the environment and for other matter connected there with dumping” means any disposal of waste unto land within The Gambia or into the waters under the jurisdiction of The Gambia”	Regulate and manage the dumping of waste into waters under the jurisdiction of The Gambia.
Wildlife and Biodiversity Act 2003	Department of Parks and Wildlife Management under MECCNAR	The Secretary of State (Minister) is given powers to designated national parks, national reserves or local sanctuary, collectively referred to in the 2003 Act as “Protected Areas.”	In the coastal zone, Tanji Bird Reserve has been declared, incorporating the Bijilo Inlands as a bird reserve, and part of the coastal area between Banjul and Cape Point has been designated a Ramsar site.

Name	Responsible agency	Authority	Relevance to coastal management
Fisheries Act 2007	Fisheries Department under MoFWR	The Secretary of State (Minister) may, in the interest of conservation, management, and sustainable utilization of fisheries resources by Notice published in the Gazette, declare any area of the fisheries waters and corresponding subjacent areas, including marine protected areas or reserves established under any other laws, to be special management area.	Community-based fisheries management, methods of fishing, the terms and conditions of fishing, and any other conservation and management measure that apply.
The Forest Act 1998	Forestry Department under MECCNAR	It gives the Minister the power to designate forest parks and to provide for the necessary management, protection, and control regime. The regulatory power of the Minister covers prohibitions and the regulation of collection and taking of forest products through licenses.	Within the southern coastal strip, the Bijilo Forest has been designated under this act. The mangroves provide protection for the Gambia River banks, in addition to providing spawning grounds for various fish and crustaceans.
National Tourism Authority Act 2001	GTB under the Ministry of Tourism and Culture (MOTC)	PART 1X of the act provides for “Declaration, Protection, Development and Management of Tourism Development Areas.” Section 58 therefore provides as follows: (1) The President may, on the recommendation of the Secretary of State (Minister), declare any area in The Gambia to be a Tourism Development Area.	The National Tourism Authority is required to collaborate with other institutions in carrying out its mandate within the TDA.
The Mines and Quarries Act 2005	Geology Department under the Ministry of Petroleum and Energy (MOPE)	An act to make provision for prospecting for minerals, for carrying out mining and quarrying operations, and for incidental or connected matters. This act extends to the land beneath the territorial sea and the seabed and subsoil of the continental shelf of The Gambia.	Coordinate all geological, geophysical, and exploration work for the development and exploitation of mineral resources, including construction materials such as sand, clay, gravel, and cockle shells. The department’s activities cover the whole country, and it carries out intensive field investigations both on land and offshore.

Name	Responsible agency	Authority	Relevance to coastal management
State Land Act 1991, Physical Planning and Development Control	Department of Physical Planning and Housing, Department of Land and Surveys, under the Ministry of Lands, Local Government and Regional Affairs (MOLGRA)	Responsible, among other duties, for long-term planning, design of layouts or subdivisions, and the issuing of development permits for all new developments, as well as changes in land use.	Elaborate standards of use and management for environmentally sensitive areas established in future coastal management plans, national mapping, and survey activities—demarcation of new layout and individual parcels to provide guidelines for physical development.
Ports Act Cap 68:01	Gambia Ports Authority	The Minister may, by order published in the Gazette, declare any place in The Gambia and any navigable channel leading into such place to be a port within the meaning of this act, declare any port within The Gambia to be under the jurisdiction of the Ports Authority, and so on.	This area covers a significant portion of the coastal zone. The wide jurisdictional powers empower the authority to carry out its functions and powers anywhere.
The Local Government Act 2002	Councils of Banjul City, Kanifing Municipality, Brikama, all under MOLGRA	Section 71 of the act confers on a Council the powers to manage the national resources within its area of jurisdiction, the management, protection, and conservation of the environment; the rational management utilization and conservation of natural resources; and so on.	Monitor the state of the environment within its area and the impact on the environment of development activities.

Source: GCCA support project to The Gambia for ICZM and the mainstreaming of climate change (GC3SP).

2.4 Entry Points for Nature based Solutions

The revision of the existing policy and institutional framework also illustrated that NBS can represent an opportunity for green recovery and climate risk management in The Gambia. Furthermore, there is currently no dedicated national strategy or regulation governing nature-based solutions for flood risk management, despite references to ecosystem-based adaptation across multiple climate and environmental policies. This analysis identified specific opportunities to include NBS as cross-cutting strategies that can bridge climate change adaptation, disaster risk, and environmental management objectives.

Clear alignments were identified in the policy landscape analysis for NBS. NBS can be included and are first aligned with the climate resilience priorities identified in the SPCR (2017), especially as they intersect with all four key challenges identified by the strategy: lack of enabling environment, coastal climate-resilient land use planning, climate-resilient infrastructure, and challenges in rural areas. Therefore, NBS could be mainstreamed in the

four priority investment programs outlined in the strategy. The Environmental Action Plan also calls attention to certain policy objectives in direct alignment with NBS for DRM, although it lacks a specific consideration for resilience benefits. However, financing is needed to address the country's budget constraints for climate resilience and general dependence on donor funding. The existing financing constraints limit the country's capacity to make the necessary investments for coastal protection and flood prevention.

Specifically, nature-based investments could be directly aligned with the SPCR investment plan under the following pillars:

- Pillar 1 of the SPCR investment plan can include monitoring of coastal ecosystems, especially under Component 5.
- Pillar 3 represents an opportunity for NBS in climate-resilient water and sanitation and, under Component 3, allows exploring NBS opportunities for climate-resilient roads and drainage infrastructure.
- Pillar 4 also represents an entry point for NBS as this pillar supports the planning, rehabilitation, and management of buffering coastal ecosystems such as mangroves in the riverbanks to build the resilience of fisheries and tourism development in The Gambia.

Further, the reviews of the policy and institutional frameworks demonstrate that there are several policies on flood risk management and coastal erosion that could mainstream NBS in The Gambia, but they are outdated, not implemented or enforced, and suffer from limited capacity to plan and oversee implementation. The high fragmentation of mandates, limited coordination, and weak knowledge management require advancements to clarify roles, responsibilities, and relationships between different institutions to avoid duplication of efforts and conflicting mandates (for example, institutions holding overlapping mandates on the coastal zone).

The private sector is also a valuable potential partner for effective climate change response actions, including developing low-carbon technologies, products, and services and providing green jobs. While a number of private sector organizations are engaging with a level of proficiency in these matters, in general, increased awareness is required of how climate change affects profits and how best to engage with what may be complex concepts for carbon markets. As noted in the NCCP, strong partnerships for implementation and monitoring of climate resilience interventions are required between local administrations, local government, membership organizations, cooperatives, service organizations, and the private sector.

Overall, The Gambia's adaptive and resilience capacities to address climate change hazards needs to be strengthened across several sectors. Weak policy coordination on climate change, conflicting institutional functions, and overlapping mandates hinder efficiency in moving adaptation forward. Yet, future Gambia's National Climate Change Policy and Act could include specific NBS for adaptation and mitigation efforts, while advancing the legislative framework to mainstream climate resilience and risks, including in the tourism development in vulnerable areas of the coastline.



3. Flood and Coastal Erosion Risk in the Greater Banjul Area

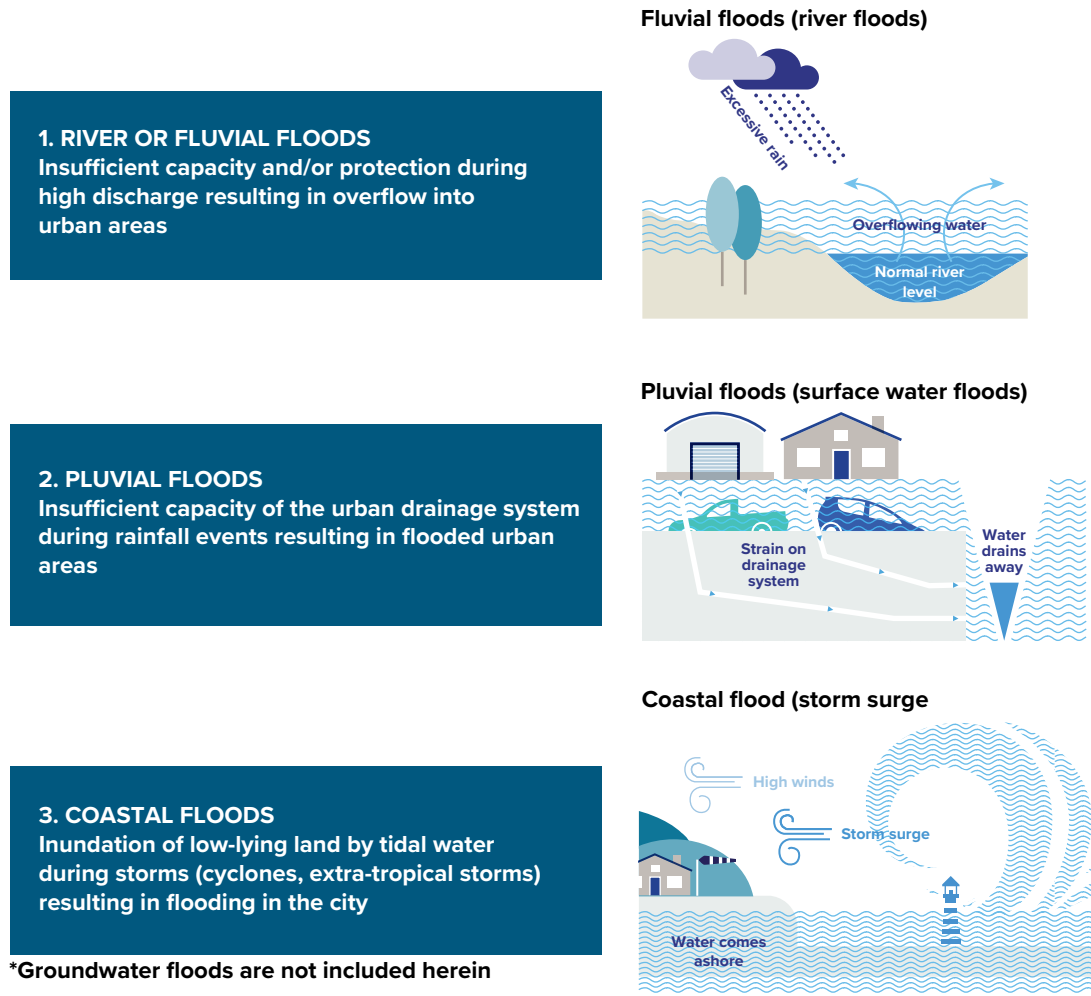
As part of this project, a study was carried out to examine the scale and impacts of both flooding and coastal erosion that affect the GBA. The assessment helped develop an integrated approach to climate risk management with consistent and compatible methods of analysis and outcomes. This informed a decision-making process to identify and select resilience measures based on evidence and risk-based metrics.

3.1 Flood Hazard Assessment Data and Methodology

Three different types of hazards are relevant for the GBA (Figure 3.1): (a) fluvial, (b) pluvial, and (c) coastal flooding.

The extent and scale of this flooding were characterized through a flood hazard model. The 2D hydraulic model was based on a 2.5 m resolution Digital Terrain Model (DTM; NTT AW3D 2.5 Standard) but was also refined by using 1D elements to represent significant culverts or bridges that would not be well represented in the 2D model. Data for these structures were collected by measuring the main dimensions for each structure and included in the model to accurately represent the hydraulics. The model was also improved by correcting the underlying DTM for any systematic vertical errors by using ground truthing survey points collected at the same time as the structure dimensions and the known vertical levels of the coastline.

Figure 3.1 Illustration of different types of flood hazards



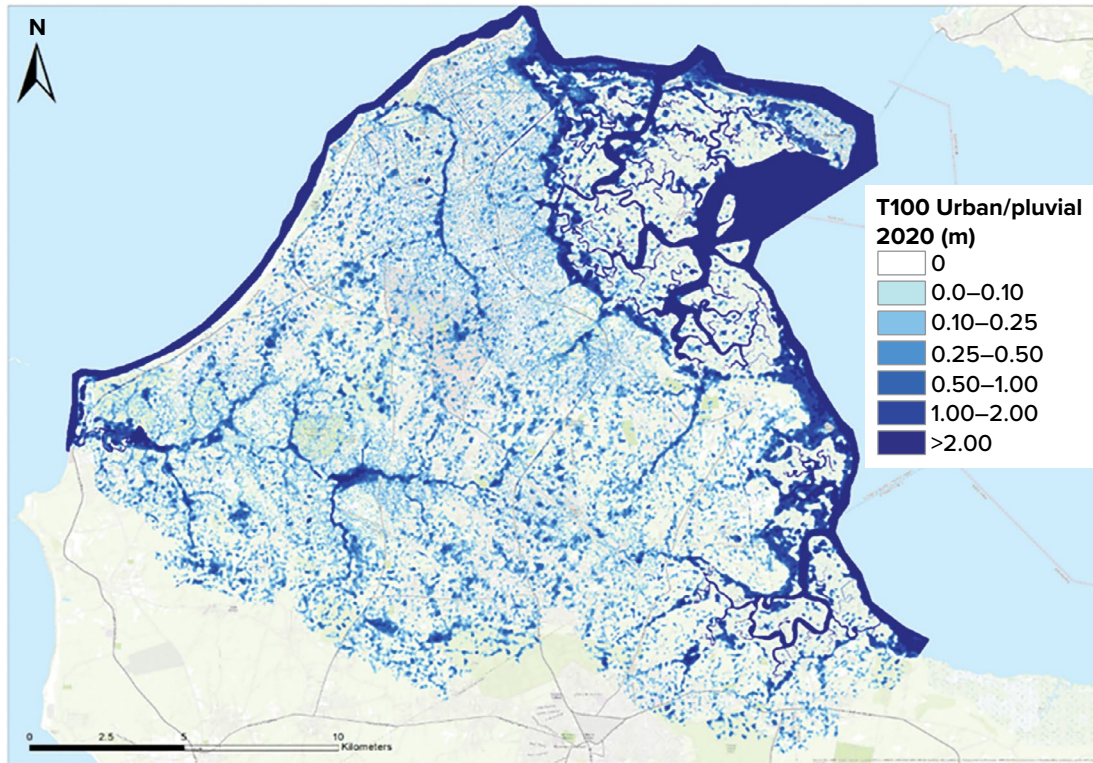
Source: [Urban Flood Risk Handbook: Assessing Risk and Identifying Interventions](#).

Local historic records of rainfall data for different return periods were obtained from a statistical analysis of rainfall records provided by the Met Service for the international airport. The model was used by applying the estimated rainfall event across the entire model domain (that is, the GBA) to simulate extents and depths of flood inundation that might occur for each different rainfall intensity and under different climate scenarios. This approach simulated both pluvial (rainfall-generated flooding) and fluvial (river or stream-generated flooding). No significant rivers flow into or through the GBA. Floodwater generated within the model for this largely urban or peri-urban area reflects both direct rainfall-runoff and rainfall that enters the many small streams and drains crossing the area, resulting in local flooding that can be termed fluvial flooding. Figure 3.2 shows an example of a combined pluvial/fluvial flood map for a '1 in 100 years' event in 2020.

Coastal flooding was assessed using the same model but applying a range of water levels at the coastline (the model's downstream boundary) that reflected the estimates of extreme sea

levels due to a combination of astronomic tides and storm conditions. These water levels were based on a statistical analysis of water levels recorded at Banjul Port, providing a series of extreme events with the equivalent range of return periods as used for the pluvial and fluvial analysis.

Figure 3.2 Flood hazard in the Greater Banjul Area



Source: Appendix 10. Flood and Coastal Risk Assessment and Priority Investment Planning for Greater Banjul: Investment Options Report (2021).

3.2 Flood Damages

The scale of risk associated with flooding across the GBA can be assessed and quantified by combining the level of hazard with the degree of exposure and factoring in the vulnerability of communities exposed to the flooding. From the flood hazard maps, the depth and frequency of flooding were combined with depth-damage relationships¹⁹ to calculate flood risk for each return period. The resulting flood damages were estimated in annual terms by integrating across storm probabilities and calculating annual average damages (AAD).

The exposure affected by flooding was derived from a land use map, which includes critical infrastructure and the distribution of population density, including the percentage of the poor population. The land use map, developed specifically for and during this study (Figure 3.3)

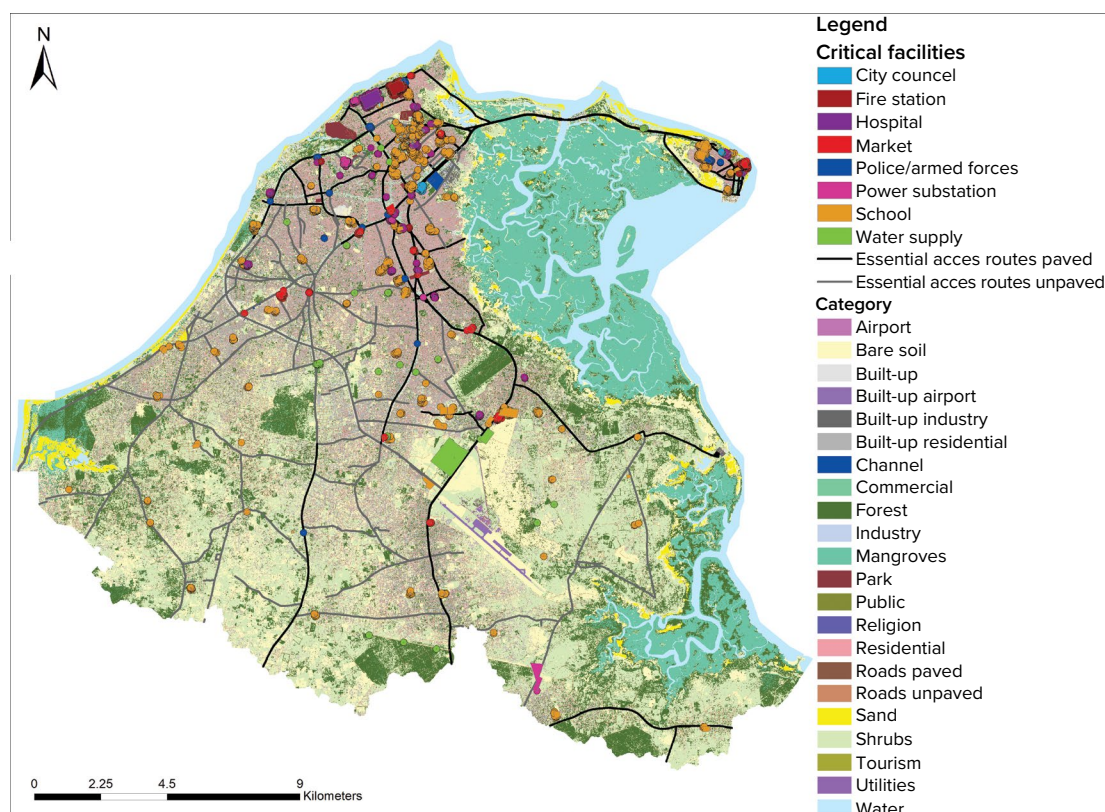
¹⁹ Huirzinga et al. 2017.

shows that the northern area of the GBA is more developed and presents a higher density of housing, hotels, and industries than the southern areas. The population density map shown in Figure 3.4 (left panel) confirms the significantly higher population densities in the northern areas of the GBA, including critical infrastructure. Figure 3.4 (right panel) also shows that, overall, the poverty rates increase in a southern direction, further away from the developed city areas. Also, within the northern more developed area, a distinction can be observed; the eastern areas toward the Tanbi wetland area have higher poverty rates than the more developed western coastal areas between Cape Point and Senegambia as well as the Banjul City area.

Infrastructure and land-use asset values were estimated using land-use classifications combined with standard depth–damage functions to calculate potential flood losses. The analysis focused on estimating direct damages to physical assets based on flood depth and exposure. Indirect economic losses associated with service disruption, supply chain impacts, or wider macroeconomic effects were not included in the risk assessment, which may result in conservative estimates of total infrastructure risk.

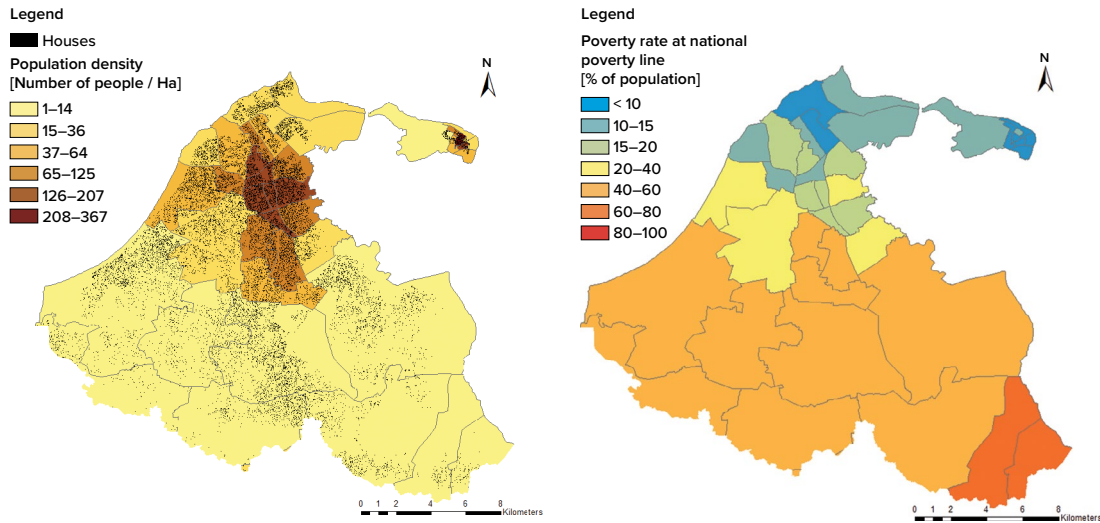
To help organize and distinguish the various factors and causes of risk, the GBA was divided into a set of discrete areas defined principally by their topology, geography, and hydraulic behavior. This also made reporting and selection of focal points for intervention simpler, with the risks determined and quantified for each separate unit.

Figure 3.3 Land use and critical facilities in the Greater Banjul Area



Source: Flood and Coastal Risk Assessment and Priority Investment Planning for Greater Banjul: Investment Options Report (2021).

Figure 3.4 (Left): Population density averaged per ward and spatial spread of residential housing, (Right): Percentage of population under national poverty line



Source: Flood and Coastal Risk Assessment and Priority Investment Planning for Greater Banjul: Investment Options Report (2021).

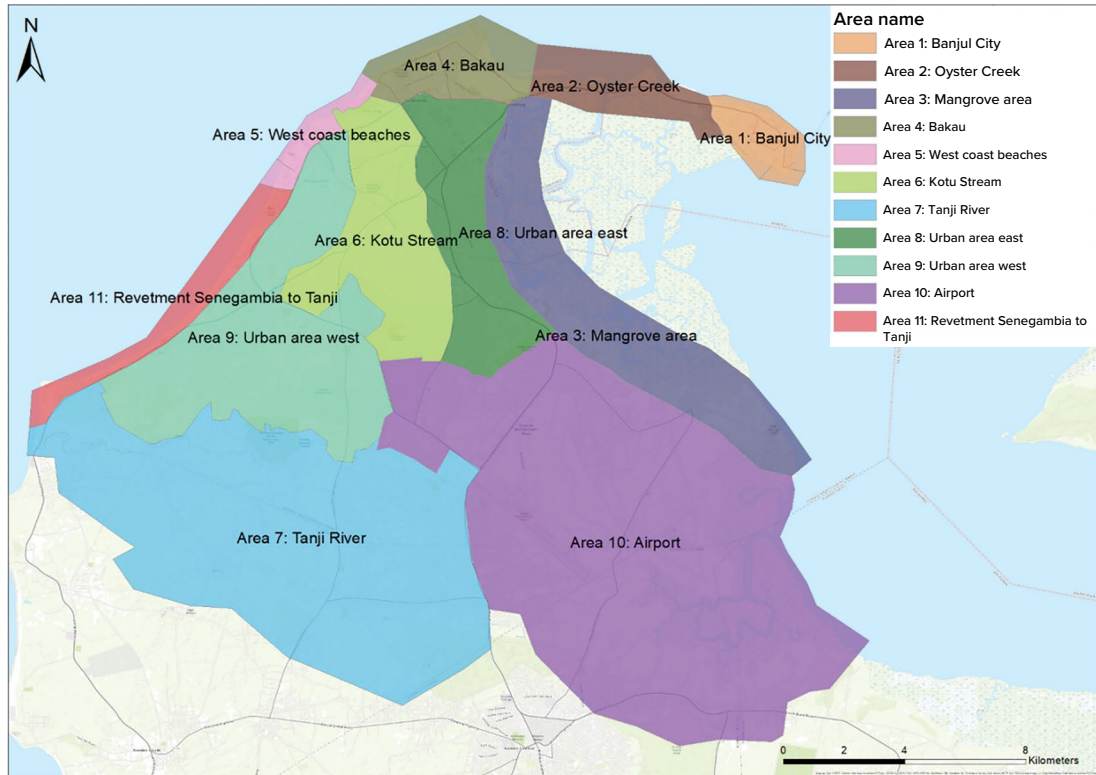
The GBA was divided into 19 areas as follows:

- | | |
|-------------------------------------|--|
| Area 1A: Banjul City | Area 5A: Fajara to Kotu Stream |
| Area 1B: Banjul Port | Area 5B: Kotu Stream to revetment Senegambia |
| Area 1C: Banjul Coastal corridor | Area 5C: Revetment Senegambia |
| Area 1D: Banjul mangrove area | Area 6: Kotu |
| Area 2A: Oyster Creek | Area 7: Tanji River |
| Area 2B: Oyster Creek | Area 8: Urban area east |
| Area 3: Mangrove area | Area 9: Urban area west |
| Area 4A: Oyster creek to Cape point | Area 10: Airport |
| Area 4B: Cliff Cape point Fajara | Area 11: Revetment Senegambia to Tanji |
| Area 4C: Bakau | |

The most important findings of this assessment are as follows:

- In 2020, the dominant risk is pluvial flooding in areas 6 to 10 and coastal flooding in areas 1 to 3 (see Figure 3.5). The total coastal flood risk is significantly smaller than the total pluvial flood risk in the GBA (~10 percent coastal versus 90 percent pluvial in 2020).

Figure 3.5 Flood risk units in the Greater Banjul Area



Source: Flood and Coastal Risk Assessment and Priority Investment Planning for Greater Banjul: Investment Options Report (2021).

- The coastal flood risk increases significantly more toward the future than the pluvial flood risk. For the areas dominated by coastal flooding (areas 1 to 3), the total economic flood risk in order of size doubles from 2020 to 2040 and almost triples from 2040 to 2070 for the projected future SLR scenarios. For the areas which are prone only to pluvial flooding (areas 6 to 10), the economic flood risk increases by 15–20 percent from 2020 to 2040 (based on +10 percent rainfall in climate change scenario) and no further increase toward 2070 (same rainfall increase adopted for 2070).
- Over time, the ratio for the total flood risk in the GBA therefore shifts to approximately 20 percent coastal versus 80 percent pluvial in 2040 and approximately 40 percent coastal versus 60 percent pluvial in 2070. The contribution to the total economic flood risk profile in the GBA for coastal flooding strongly increases over time.
- Furthermore, the concentrated coastal flood risk per hectare (AAD per ha; see Figure 2-7) in areas 1 to 3 is slightly higher than the concentrated pluvial flood risk in areas 6 to 10. The pluvial flood risk is spread out over large areas; these areas contribute significantly to the total flood risk but have a rather low concentrated risk per hectare. When considering flood reduction measures, it is often more cost-effective and efficient to reduce highly concentrated (coastal) flood risks in small areas than to reduce spread-out (pluvial) flood risk over large areas.

3.2.1 Social Flood Vulnerability and Poor Population Affected

Social flood vulnerability (SFV) is a factor between 0 and 1 based on a comparison between the economic flood risk and the income levels of the population (expressing the ability to recover from a flood event in different areas; see 'Flood Risk Report' for further explanation). It can be deduced from the two figures below that the SFV is high in Banjul City and the areas adjacent to the mangroves along the Gambia River as well as in the central urbanized area (around Kotu Stream). In these areas, the income levels are relatively low (poor communities) combined with a medium to high flood risk.

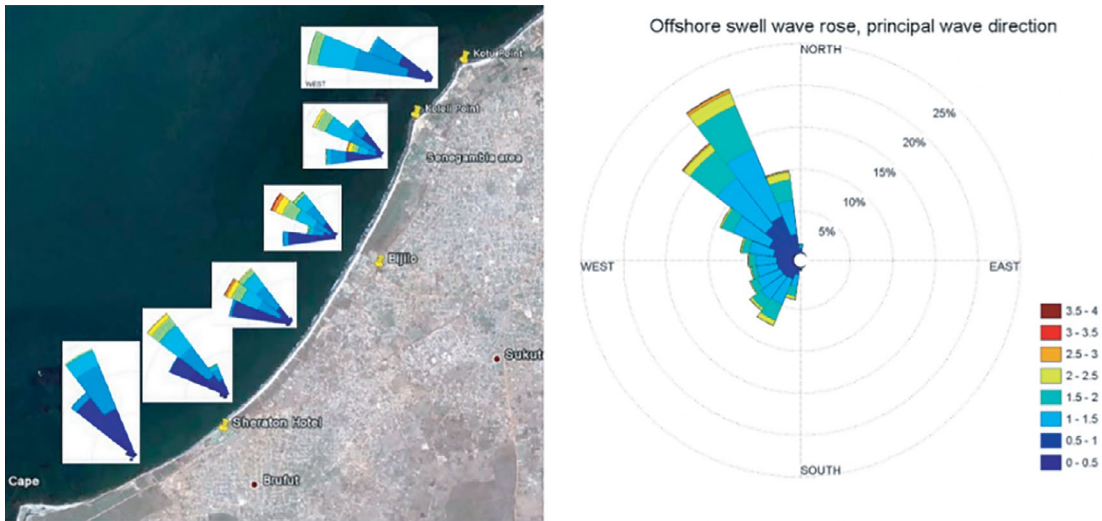
The concentrated population affected (AAP per ha) for the poor population groups is high in the central urbanized areas (areas 6, 8) and medium in Banjul City (area 1). This confirms the relatively high SFV identified for areas 1 (Banjul City), 6 (Kotu Stream), and 8 (inland urban area, including Ebo Town).

3.3 Coastal Erosion

The approach for assessing coastal erosion distinguished between chronic structural erosion caused by long-shore sediment processes (either derived from variation in wave forcing, changes in shoreline orientation, or manmade interventions), long-term erosion from sea level rise, and temporary cross-shore erosion associated with storm events. The approach was data driven and assessed erosion hazards through detection from remote sensing satellite data and building linear regressions of the shoreline position over time (satellite images were obtained from the Landsat and Sentinel-2 missions covering 2004–2020). The quantitative data were combined with qualitative assessments of shoreline developments based on (not geo-referenced) historical aerial photography, Google Earth images, and satellite data as well as wave data to provide information about the direction of waves and their natural variability (Figure 3.6).

Aerial drone pictures (April 2020) were also used to provide more details about historic coastal interventions and structures to better understand the coastal dynamics. Previous studies on coastal sediment cells and potential sediment transport, combined with local erosion spots pinpointed by stakeholders and through field visits, were also included to complement the remote sensing data.

Figure 3.6 Wave action along the West Coast area



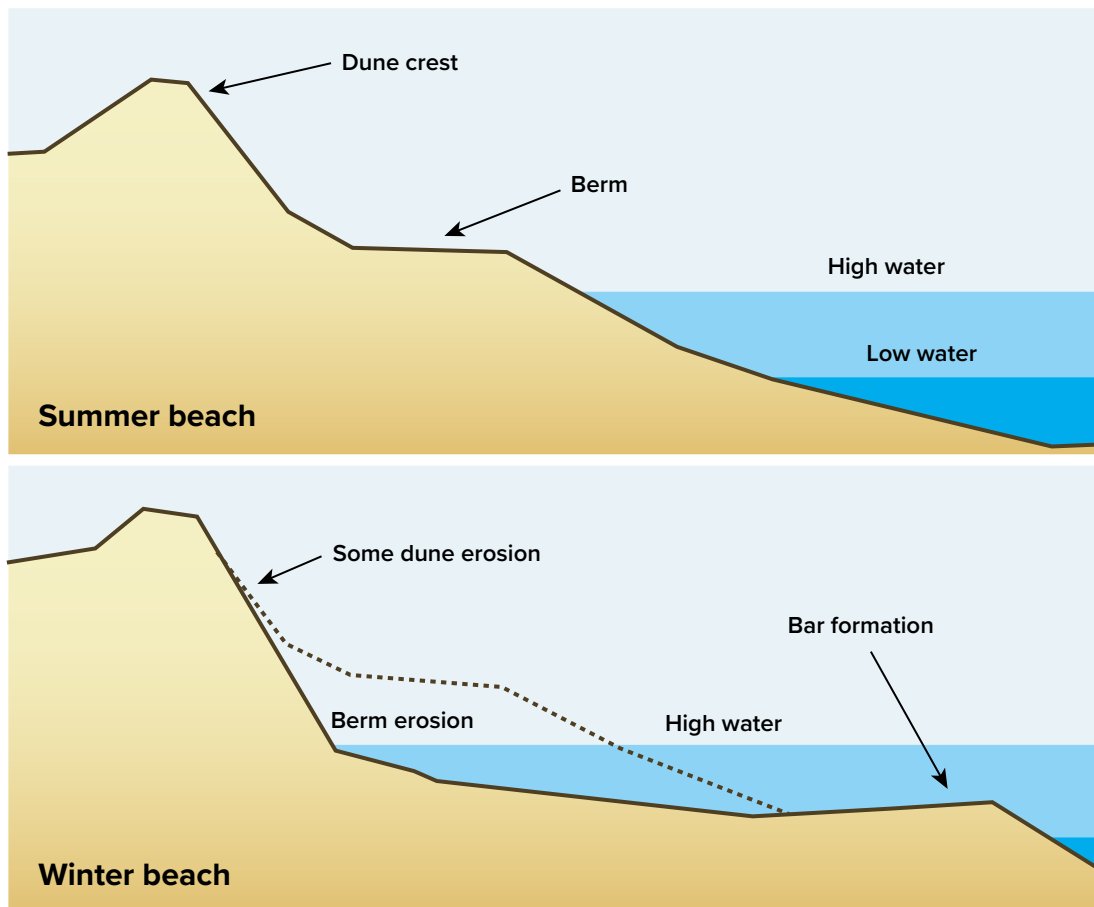
Source: Bijl 2011.

Note: Wave heights from offshore (right) to nearshore (left).

Erosion hazard maps were then developed following a sequence of steps:

1. Definition of a reference coastline position for the present-day situation, considering wet areas (including wave runup), cliff sections, and stretches with revetments
2. Definition of historical coastal erosion rates based on remote sensing
3. Inclusion of local erosion spots in river mouths and lagoons and local (and small-scale) erosion spots identified by stakeholders (not visible from the large-scale LRR analysis)
4. Segmentation of the coastline into coastal cells, factoring in physical and geomorphological characteristics as described in Royal Haskoning (2000)
5. Definition of stable/unstable areas and seasonal variation based on a selection of shorelines from Sentinel satellite data in 2015–2020
6. Mapping of erosion hazard zones by projecting historical erosion rates into the future, adding the potential erosion from sea level rise and temporary erosion induced from extreme storm events (100-year storm event), which were modeled based on a cross-shore morphological model (Figure 3.7).

Figure 3.7 Conceptual illustration of seasonal variation in coastline position

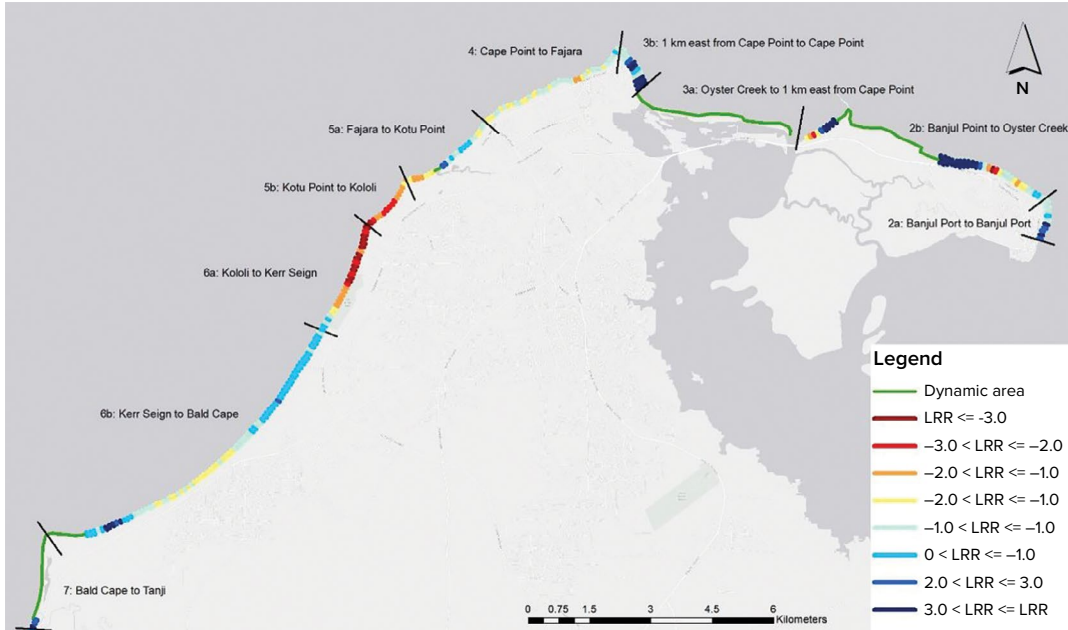


Source: <https://www.friendsofbsp.org/breakingnews/science-of-the-shore-a-tale-of-two-beaches-winter-summer-beach-profiles/>

The results provide historical rates (Figure 3.7) and identification of areas stable or eroding (Figure 3.8). The total potential erosion areas per coastal cell were ultimately separated into permanent (structural) and temporary (storm) erosion sections. Maps of projected erosion for the future were developed based on a linear projection of historic changes, indicating which areas and assets could be affected by shoreline retreat (Figure 3.9).

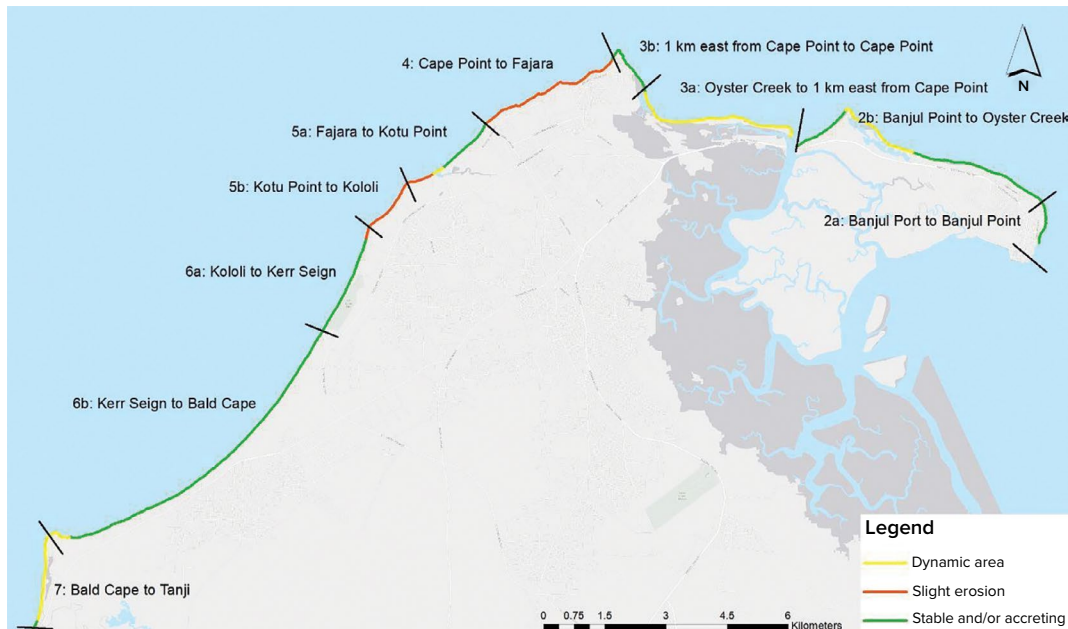
The linear regression rate in meters per year is represented for 2005–2020 (negative values represent erosion, positive values indicate accretion).

Figure 3.8 Historical shorelines change trend from linear regression assessment based on satellite data (LRR : Linear Regression Rate)



Source: Flood and Coastal Risk Assessment and Priority Investment Planning for Greater Banjul, Flood and Erosion Assessment Report, The World Bank, September 2020.

Figure 3.9 Erosion hazard maps



Source: Flood and Coastal Risk Assessment and Priority Investment Planning for Greater Banjul, Flood and Erosion Assessment Report, The World Bank, September 2020.

Note: Prediction of structural erosion/sedimentation (based on historical trend from the linear regression analysis for 2005–2020). Red dots represent potential local erosion spots (values for slight erosion = 0.5–1 m per year).

The erosion hazard maps were used to calculate direct damages to infrastructure within the erosion hazard zones, following a similar valuation method as for flooding damages. In addition to infrastructure damage/loss in eroding areas, indirect damage associated with tourism impact from shoreline loss is important for the GBA given its importance for tourism. The loss of beach width is recognized as detrimental to coastal tourism economies as beaches and hotels along the coastline are affected.²⁰ The information on the touristic economy is used to determine the potential indirect damage due to coastal erosion. However, there is no consensus about estimating these indirect effects of shoreline loss. Several studies have sought to achieve quantitative valuations of the indirect value of beach surface for tourism. For example, in the Philippines, the beach and land lost were valued at US\$50 per m² (Bayani 2009),²¹ while in the northern coast of Crete in Greece using a hedonic pricing model, beaches were estimated at ~US\$54 per m² (Alexandrakis 2015);²² in Viet Nam (Nguyen 2018),²³ it was estimated at US\$29 million by 2040, equivalent to US\$48.3 per m² per year. For the study, a representative value of US\$50 per m² per year was used to quantify the impact of land loss as indirect damage. Additionally, 5 percent of the direct damage was added yearly as indirect damages from loss of revenue from tourism.

Figure 3.10 Projected erosion lines in one of the coastal cells (zoom version)



Source: Zoomed in version of figure 3.9.

20 Semeoshenkova 2015, 2017.

21 Bayani 2009.

22 Alexandrakis 2015.

23 Nguyen 2018.

The analysis showed that almost all the coastline of the Banjul area is at risk of erosion. The estimated erosion width varies from 10 m to 45 m for 2040 and from 20 m to 85 m for 2070 (see Appendix A2 in the technical report for the detailed coastal erosion assessment), but the largest erosion is expected along the West Coast from Fajara to Kerr Seign (area 5). By type of land use, 80 percent of the area affected is natural environment, while the other 20 percent consists of built-up areas and tourism spots. The results of the damage were valued at a total of over US\$4.7 million by 2040 and US\$9.8 million by 2070. Erosion areas and damages per coastal land use were also calculated (Table 3.1).

In the economic risk assessment, natural ecosystems were assigned zero direct asset value because the damage estimation focused on potential losses to built infrastructure and economic assets derived from land-use classifications and associated damage functions. This assumption does not imply that natural ecosystems lack economic or ecological value. Coastal wetlands, mangroves, and natural beaches provide important ecosystem services, including shoreline stabilization, flood attenuation, fisheries support, and biodiversity conservation.

For certain land uses, such as touristic beaches, the assessment includes estimates of indirect economic losses associated with beach loss and reduced tourism services. These values reflect the importance of beach assets for tourism activities in the Greater Banjul Area. In contrast, the damage assessment for most other land uses focuses primarily on direct physical damages to exposed assets. Broader indirect impacts such as disruptions to transport services, tourism activity beyond the beach area, or supply chains, were not quantified within the scope of the analysis. As a result, the estimated damages presented in the assessment should be interpreted as conservative estimates of total economic risk.

Table 3.1 Projected Coastal Erosion Exposure and Estimated Direct Economic Damages by Land Use (2040–2070)

Total erosion damages (all area's combined)		2040	2070	2040	2070
Direct Damages	Economic value [\$/m ²]	Total Area [m ²]	Total Area [m ²]	Total Damage [M\$]	Total Damage [M\$]
Natural environment	0 \$/m ²	542,726	868,349	0.0	0.0
Built-up	40 \$/m ²	65,670	159,588	2.6	6.4
Commercial	147 \$/m ²	2,761	3,524	0.4	0.5
Industry	98 \$/m ²	2,779	2,779	0.3	0.3
Tourism	400 \$/m ²	3,874	15,555	1.5	6.2
Roads	10 \$/m ²	0	3,979	0.0	0.0
Total		617,810	1,053,774	4.9	13.4
Annually Expected indirect Damages (beach loss)				Damage [M\$/m ² /year]	Damage [M\$/m ² /year]
Touristic beach	50 \$/m ² /year	89,000	182,344	4.5	9.1
Percentage of direct damages	5%			0.2	0.67
Total		127,164	196,982	4.7	9.8
Area 1 Banjul city		2040	2070	2040	2070
Land use class	Economic value [m ²]	Area [m ²]	Area [m ²]	Damage [M\$]	Damage [M\$]
Natural environment	0 \$/m ²	87,098	15,3325	-	-
Built-up	40 \$/m ²	3,716	6,412	0.1	0.3
Commercial	147 \$/m ²	2,761	3,524	0.4	0.5
Industry	98 \$/m ²	-	-	-	-
Tourism	400 \$/m ²	-	-	-	-
Roads	10 \$/m ²	-	180	-	0.0
Total		93,575	163,441	0.6	0.8
Touristic beach	50 \$/m ² /year	-	-	-	-

3.4 Risk Hotspots

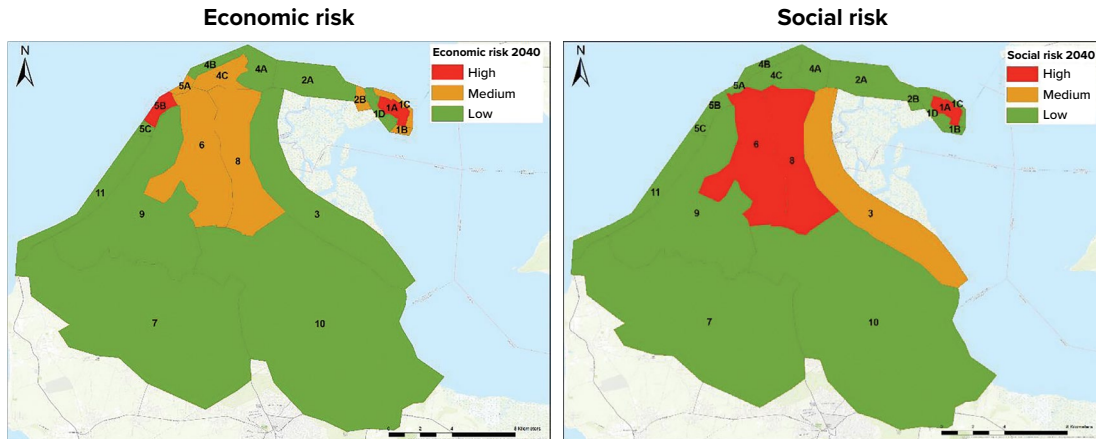
The combined flood risk and coastal erosion assessment analyzed and mapped the risk of both flooding and erosion across the entire GBA. The results of this analysis are presented in Table 3.2, with the risk levels classified as low (LR), medium (MR), and high (HR).

Table 3.2 Overview of risk classification for selected areas based on economic and social risk (flood and erosion) High risk/Medium risk/Low risk

Area	Main risks	Economic risk (AAD)			Social risk (AAP, SFV)		
		2020	2040	2070	2020	2040	2070
Area 1A. Banjul City	Coastal/pluvial flooding	MR	HR	HR	MR	HR	HR
Area 1B. Banjul Port	Coastal/pluvial flooding	MR	MR	HR	LR	LR	LR
Area 1C. Banjul coastal corridor	Coastal/pluvial flooding	LR	MR	HR	LR	LR	LR
Area 1D. Banjul former mangrove	Coastal/pluvial flooding	LR	LR	LR	LR	LR	LR
Area 2A. Oyster Creek east	Coastal/pluvial flooding	LR	LR	LR	LR	LR	LR
Area 2B. Oyster Creek west	Coastal/pluvial flooding	MR	MR	HR	LR	LR	LR
Area 3. Mangrove coastal zone	Coastal/pluvial flooding	LR	LR	LR	LR	MR	MR
Area 4A. Oyster Creek - Cape Point	Coastal erosion	LR	LR	MR	LR	LR	LR
Area 4B. Cliffs Cape Point to Fajara	Coastal erosion	LR	LR	MR	LR	LR	LR
Area 4C. Bakau inland	Pluvial flooding	MR	MR	MR	LR	LR	LR
Area 5A. Fajara to Kotu Stream	Coastal erosion	LR	MR	HR	LR	LR	LR
Area 5B. Kotu Stream to Senegambia	Coastal erosion	LR	HR	HR	LR	LR	LR
Area 6. Kotu Stream	Fluvial/pluvial flooding	LR	MR	MR	MR	HR	HR
Area 7. Tanji River	Fluvial/pluvial flooding	LR	LR	LR	LR	LR	LR
Area 8. Urban areas inland East of Kotu Stream (for example Ebo Town)	Pluvial flooding	LR	MR	MR	MR	HR	HR
Area 9. Urban areas inland West of Kotu Stream	Pluvial flooding	LR	LR	LR	LR	LR	LR
Area 10. Airport area	Pluvial flooding	LR	LR	LR	LR	LR	LR
Area 11. Senegambia- Tanji	Coastal erosion (SLR)	LR	LR	MR	LR	LR	LR

Source: Flood and Coastal Risk Assessment and Priority Investment Planning for Greater Banjul: Investment Options Report (2021).

Figure 3.11 Risk mapping 2040



Source: Flood and Coastal Risk Assessment and Priority Investment Planning for Greater Banjul: Investment Options Report (2021)

Following extensive stakeholder consultation and broad dissemination of the results, the GoTG selected the top five priority areas where further investigations into possible mitigation would be focused. These are shown in Figure 3.12, with the primary source of risk identified as coastal erosion, coastal flooding, pluvial and fluvial flooding, or a combination.

Figure 3.12 Hotspot areas for which different risk mitigation measures were further studied



Source: Flood and Coastal Risk Assessment and Priority Investment Planning for Greater Banjul: Investment Options Report (2021)



4. Risk Reduction Options

4.1 Evaluation and Prioritization of the Proposed Interventions

The prioritization of flood and coastal risk reduction measures was carried out using a combined analytical approach integrating Cost-Benefit Analysis (CBA) and Multi-Criteria Analysis (MCA). The CBA assessed the economic efficiency of interventions by comparing implementation and maintenance costs with the expected reduction in flood damages. The MCA complemented the economic analysis by evaluating broader social, environmental, and implementation criteria, including technical feasibility, environmental impacts, institutional capacity requirements, and social benefits. This combined approach ensured that both economic performance and wider resilience benefits were considered when identifying priority investments.

In addition to structural and nature-based solutions, non-structural measures such as land-use planning, floodplain regulation, early warning systems, and improved drainage maintenance were also considered as part of the long list of interventions and evaluated qualitatively through the MCA framework

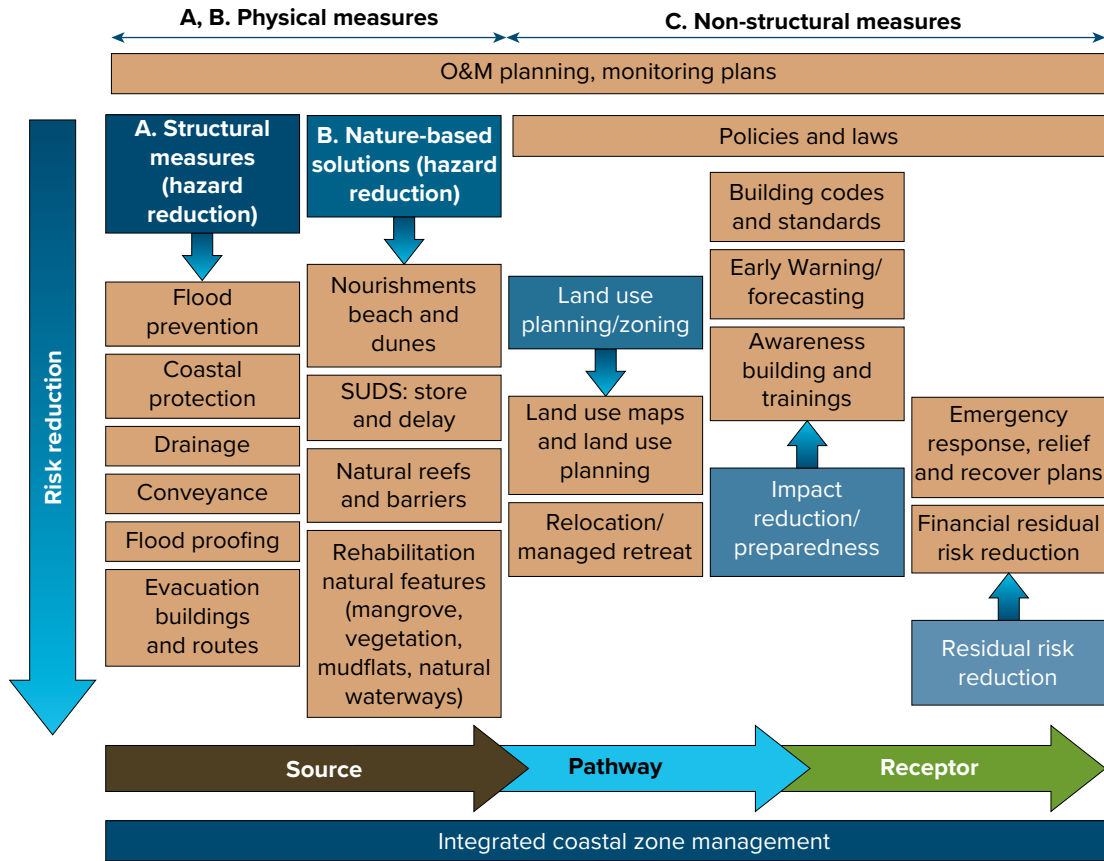
A long list of measures was prepared based on international practices, stakeholder input, and the results of the hazard assessment. The main potential flood and erosion response measures, as shown in Figure 4.1, are structured as follows:

- A. Structural measures
- B. Nature- based solutions
- C. Non-structural measures.

The long list of potential measures was drafted based on international best practices, the Global Climate Change Alliance report,²⁴ the workshop in March 2020 during the inception phase, and the virtual workshop in May 2020 about the erosion and flood hazard assessment. Based on the local conditions, the long list was filtered to a more site-specific short list per hotspot area. Measures not deemed effective or realistic at a certain hotspot area were excluded (for example, erosion measures for a hotspot area not subject to significant erosion are excluded). The final short-listed options are summarized in Table 4.1.

²⁴ GCCA, February 2015.

Figure 4.1 Overview of types of measures in terms of risk reduction and impact on different levels (source, pathway, receptors)



Source: Flood and Coastal Risk Assessment and Priority Investment Planning for Greater Banjul: Investment Options Report (2021).

Table 4.1 Proposed solutions for each priority area

Area	Hazard	Proposed solutions
1A. Banjul City	Flooding and sea level rise submergence	Dike system and flood wall upgrade Single lane road Drainage (canals)
1B. Banjul Port	Flooding and sea level rise submergence	Waterfront creation Raising ground level
1C. Banjul Coastal Corridor	Flooding and sea level rise submergence Coastal erosion	Dike system and flood wall upgrade Waterfront creation
A2. Oyster Creek	Coastal flooding Coastal erosion	Elevation of assets Coastal revetments Pumping capacity
A3 and 8. Mangrove waterfront	Coastal/pluvial flooding	Drainage system Wet proofing of buildings

Area	Hazard	Proposed solutions
A5. Senegambia coast	Coastal erosion	Offshore/detached breakwaters Beach and dune restoration
A6. Kotu Stream	Fluvial, pluvial flooding Local erosion at river mouth	River widening Drainage Culverts, sluices, gates, and bridges Local flood walls Wet proofing

4.2 Integrated Strategy per Hotspot Area

Based on the selected short list of potential measures per hotspot area (Table 4.1) and the hazard and risk results, a subset of measures were selected for each priority area. The package of measures per hotspot area was then subjected to further analysis, through a Cost-benefit analysis and a Multi criteria analysis as described in Section 4.3. Such a comparison led to a prioritization of measures first between hotspot areas and then within each area to identify the most effective measures with the highest potential for positive impacts. This selection was developed into an investment plan, in which final choices were made based on budget availability and preferences from the responsible authorities.

4.3 Evaluation of the Integrated Strategies

The evaluation of the integrated strategies (packages of measures) was prepared based on

- Conceptual design and cost estimates,
- CBA, and
- MCA.

Based on the CBA ranking and the MCA scores (high, medium, low), conclusions were drawn about the priority and potential phasing for investments in flood and erosion reduction measures.

4.3.1 Conceptual Design and Cost Estimates

Conceptual designs were prepared for all areas, including main dimensions and preliminary cost estimates based on unit prices. These conceptual designs were prepared for those measures identified from the CBA and MCA.

4.3.2 Cost-benefit analysis

For the CBA, the costs and benefits were determined for each of the flood and erosion protection packages per area. The total costs for these measures included investment costs (derived from conceptual designs) and O&M costs. The damage that is prevented, or in other words the 'benefits', was monetized and used in the CBA for each hotspot area.

4.3.3 Multi criteria analysis

In the MCA, different types of intangible benefits and constraints were compared. The MCA served as an input to prioritize measures between the different hotspot areas and select the different types of measures (or alternatives) within each hotspot area.

4.4 Conclusions and Recommendations

The resulting prioritization for investment and recommendations for follow-up actions/a phased approach is summarized in Table 4.2. Improving the accuracy of the risk analysis, including the elevation data, was found necessary to refine the study in subsequent prefeasibility analyses. Further studies should also refine the identified measures and elements for the selected areas. Some specific recommendations are also included in this section.

It is noted that the conceptual designs, the MCA, and the CBA have been elaborated based on high-level assessments, fitting this phase of the project aiming to identify potential investment options in the Greater Banjul Region. The identified potential investment options require further feasibility studies, and in some cases more detailed surveys and investigations, before final conclusions can be drawn on the feasibility of the proposed investment options.

Table 4.2 Summary of recommended measures

Area	Measures	Priority	Investment level (US\$, millions)	Explanation/recommendations follow-up
Area 1. Banjul City	1a. Heightening the bund road	High	4.8	High effectiveness and no uncertainties, urgently required to significantly reduce coastal flood risk.
	1b. Upgrade drainage system + local water storage Banjul City	Medium	4.8	First assess actual need in more detail based on more accurate DTM and engage with local stakeholders.
	1c. Port flood protection	High	5.4	High cost-effectiveness, high economic regional impact. Discuss with port authority, (shared) responsibility with port authority?
	1d. Flood defense northeastern coastal corridor	Medium	10.0	Not urgent for flood risk reduction in the present situation, high potential from a socioeconomic urban development point of view but also highly complex. First assess actual need in more detail based on more accurate DTM, assess space and overlap with other functions in detail, and integrate into urban master plan/future vision for Banjul City.

Area	Measures	Priority	Investment level (US\$, millions)	Explanation/recommendations follow-up
Area 2	2a. Oyster Creek River mouth, area 2A	Low	0.5	Benefits are mainly for industrial owners; they can implement floodproofing/adaptation measures themselves. Discuss with industrial owners. The amount of floodproofing needs to be mapped in detail (by them).
	2b. Oyster Creek warehouses, area 2B	Medium	3.4	Benefits are mainly for industrial owners (shared responsibility) Cost-effectiveness is high. Discuss with industrial owners and first assess future development plan for the industrial area before planning/realizing dike ring.
Area 5	5a. Option 1. Offshore breakwaters	Medium-High	38.1	Erosion problem will likely increase in future years, and interventions are required, taking into account the socioeconomic importance of the tourism sector. Further measurements of waves, nearshore bathymetry, beach profiles, and sediment properties are required first, however, to support the development of detailed predictive models for design and impact assessment (specifically impact on adjacent shorelines for option 1 and required nourishment frequency for option 2). Recommended studies can provide more input for the choice to be made between these two options.
	5b. Option 2. Nourishments	Medium-High	42.8	
Area 6	6a. Restoration/enlargement Kotu Stream, including green river parc	High	5.6	Continue with restoring/enlarging culverts/bridges as already planned (focus on 5 critical structures). Furthermore, start with cleaning floodplains/remove (illegal) structures in floodplains, and find space for enlarging Kotu Stream profile where space is available or can be made (first assess space and effectiveness of maintaining/increasing space at different river locations). Options: <ul style="list-style-type: none"> 1. Natural profile by dredging, to be repeated every few years but maintenance effort is expected to be limited. River dynamics maintained. 2. Concrete channelization, not recommended, less adaptive and less attractive in the context of a green river park/dynamic nature area. Develop plans for an accessible green river park, and engage with stakeholders.
	6b. Implement drainage system catchment area	Low (large-scaled area), Medium (small-scaled pilot)	68.7	Start with small-scale pilots in urban areas (see the example of a similar pilot proposed in Ebo Town in Section 5), if and where nuisance pluvial flooding is experienced by residents (which is not completely clear yet), and/or map pluvial flood risk in more detail based on more accurate DTM and measurements of floor levels.

Area	Measures	Priority	Investment level (US\$, millions)	Explanation/recommendations follow-up
Area 8 (+3)	8a. Implement drainage system urban area	Low (large-scaled area), High (small-scaled pilot)	52.8	Start with small-scale pilots in urban areas (proposed to start in Ebo Town; see Section 5 -), if and where nuisance pluvial flooding is experienced by residents, and/or map pluvial flood risk in more detail based on more accurate DTM and measurements of floor levels.
	8b. Protection and restoration mangrove Tanbi wetlands	High	1.2	Measure ensuring sustainable erosion and flood protection buffer for the future. Set up a community-based program for the protection and restoration of Tanbi wetlands, together with local residents, local oyster, and shrimp farmers. Assess the potential for salt-tolerant agriculture at wetland edges with local farmers.

Given uncertainties in climate projections, urban growth patterns, and future sea-level rise, flood risk management strategies should adopt an adaptive planning approach. This involves prioritizing no-regret interventions that deliver immediate benefits while maintaining flexibility to adjust investments as new climate and risk information becomes available.

Non-structural Measures and Policy Recommendations

The following non-structural measures are recommended:

- Improve land use planning: define coastal setback zone, prevent urban expansion/land reclamations in bund polder without proper assessment of impact on the water management system (decrease in water storage area may lead to increased requirements for pumping), and explore options for green/blue local water storage in Banjul City.
- Implement proper O&M for the drainage system and monitoring of the coastline (including spit development at Oyster Creek which will affect potential erosion at shorelines in Banjul City).
- Improve adaptation to flood risk with improved building codes, early warning systems, and improving awareness.
- Explore options for insurance or social compensation when flooding occurs and implement emergency response systems.
- Improve the regulatory framework by enforcing proper waste management to keep the drains clean, enforce land use planning, prohibit sand mining, and enforce building codes and standards.



5. NBS Opportunities for Risk Reduction

Based on a preliminary analysis of current and planned measures under the 'Flood and Coastal Risk Assessment and Priority Investment Planning for Greater Banjul,' different potential NBS were assessed for each region of the GBA. The key opportunities for NBS considered a review of existing interventions and a preliminary identification of hazard mitigation projects in the areas at highest risk. They are briefly described for each area below:

- **Area 1 - Banjul City.** Coastal protection works were implemented in 2004. The city also has insufficient drainage and an inoperative pumping station. There are plans to elevate the Banjul bund road (from the pumping station to the port area), elevate the port area, and build levees for flood protection in the port (port authority).
- **Area 2 - Oyster Creek.** This coastline has timber groins at the river mouth to reduce coastal erosion (implemented before 2003).
- **Area 3 - Mangrove coastline.** No structures or protection are present.
- **Area 4 - Cliffs Bakau.** Local cliff protection (concrete toe) has been developed by property owners. T-groins were also implemented around 2003 to reinforce the headland to maintain beach width for fishing boat landings at Bakau. From Cape Point to Bakau, there are also revetments and six groins at Cape Point (300 m, 120 m, 100 m; it took approximately half a year to fill in the gaps between the groins by natural progression of sand), which have created wide and attractive beaches for tourists.
- **Area 5 - West Coast beaches.** Hard erosion protection (seawalls, gabions, riprap, sandbags, and so on) was developed by hotel owners but with unsuccessful outcomes. In 2003, a beach nourishment of 1 million m³ was also developed but the sediment disappeared in about five years (reports indicate an incorrect sediment size was the most plausible cause). Rock armoring and sand filling were also installed in 2016 along the section of the coastline with hotel infrastructure. Future plans include offshore breakwaters on the Senegambia coastline (GCCA+ project).

- **Area 6 - Kotu Stream.** There is one small seawall and revetment at one hotel. Culverts have been installed in the river, with a few more planned. Existing legislation is in place to remove illegal obstructions in Kotu Stream (constructions that encroach on the active river flow area), but its enforcement is not strict. Weeds and solid waste are also blocking the river flow in some areas. Regular maintenance is not yet in place to keep the river flow clear of obstacles. In the present situation, the riverfront is not visible and accessible to the public (bordered by backyards) and not accessible for maintenance or recreation.
- **Area 7 - Tanji River.** Revetments were implemented in 2017 at the river mouth to protect buildings and roads.
- **Area 8 - Eastern urban area.** No drainage or flood protection has been detected. However, there are plans for a new road development.

Based on previous interventions, the flood risk assessment, and the morphology of the different regions, potential NBS for the GBA could include the following:

1. **Sustainable drainage and flow restoration and maintenance.** The use of bioretention areas and stream restoration for pluvial flooding management can help manage part of the flooding along the Kotu Stream²⁵ (Figure 5.1). At present, solid waste is dumped into the riverine areas, which clogs drainage channels and exacerbates the impacts of flash flooding linked to either climate variability or change. Measures should be directed to avoid and remove obstructions to floods, such as river widening, adequately designed and positioned culverts and drainage systems, flood bypasses, removal of obstacles to water flow, or planned open spaces for flood.
2. **Nature-based stormwater management systems.** In the urban area affected by pluvial flooding (area 8), nature-based stormwater flooding approaches can be explored to increase infiltration of runoff into the ground during small rainfall events (for example, rain garden and bioswale approaches; see Figure 5.2).
3. **Nature-based options for road infrastructure.** Road projects continue to be implemented as funds become available to the NRA. These road projects are normally implemented with drainage infrastructure aimed at safeguarding the road infrastructure, and not necessarily aimed at alleviating/preventing flooding for the surrounding area. Integrating green street-side drainage channels as part of the new road developments could be an opportunity for contributing to both flood prevention and preventing damage to the road infrastructure.
4. **Green waterfronts and horizontal levees.** In Banjul City, the identified solutions include creating a protective dike ring by raising the coastal bund road, which is often overtopped by high sea levels at present, and stormwater drainage to evacuate rainfall to the sea. Banjul Port will also have to be raised and protected from flooding. The levee system upgrade may be used to leverage opportunities associated with vegetation buffers, multipurpose waterfront development (in the northern coastal corridor), and multipurpose

²⁵ It should be noted that measures to increase infiltration may not be as effective in the GBA, as clayey and hard consolidated subsoils have been observed at several locations (specifically in Banjul City, for example), which will strongly reduce the effectiveness of infiltration trenches/zones. Instead of infiltration, evaporation ponds may be more effective in these areas, but these will also require more space.

levee systems (Banjul City and road protection), including extending the mangrove system (refer to point 7 below).

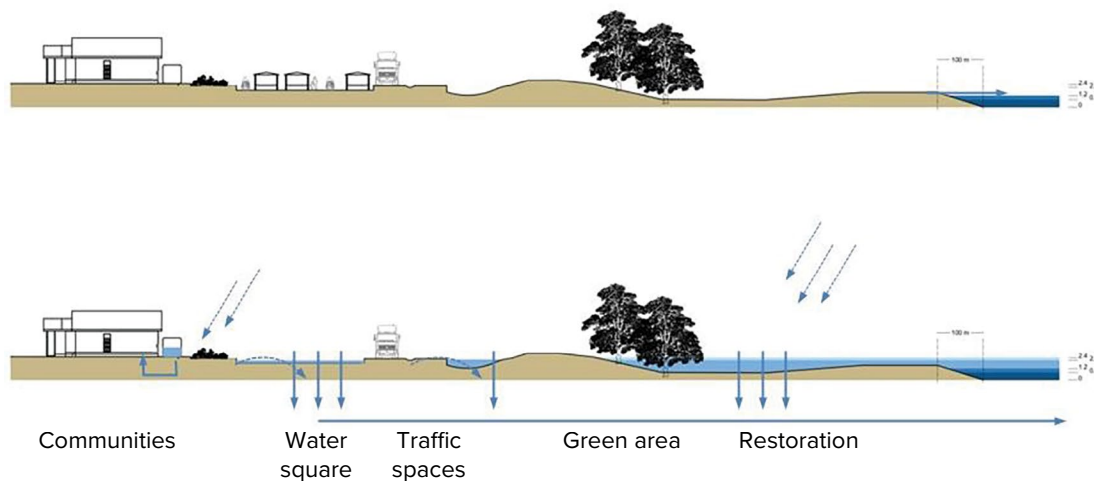
5. **Protecting the tourism corridor from long-term erosion along Kotu Stream and Senegambia.** The beaches from Fajara to Senegambia host a line of hotels and restaurants that represent the main touristic corridor in the region. Erosion risk, however, is high, and recent studies indicate that the erosion could continue in the future at a rate of 0.5 m per year. Although the social vulnerability of this area is low, the national touristic value of this shoreline is key for the region but requires coastal protection. Initial analyses indicate that offshore and detached breakwaters would be a preferred shoreline protection solution, which could also have recreational benefits. However, **beach and dune restoration** could be explored along the coast of Senegambia and may include a beach and dune restoration and revegetation plan, combined with the detached breakwater designs.
6. **A 'green river' belt connection and climate-resilient flood management plan in the western streams and coast.** The 'Kotu' is a region densely populated and built up, at high risk of fluvial and pluvial flooding. The river mouth also presents local erosion issues to individual hotels. One of the main drivers of flooding is the presence of obstructions to water flow in the river that reduces the drainage capacity. The solution requires restoring the floodplain, following a 'room for the river' approach, which will include widening the river and removing water flow obstructions (including replacing five existing bridges and culverts and a storm drainage system). The proposed solution has also defined four different urban zones where green river belt connection of the downstream and river mouth can be combined with sponge city concepts upstream (through different potential SUDS measures such as water storage tanks, multi-functional water squares, infiltration zones alongside roads, green zones, and other measures to facilitate drainage and filtration) (see Figure 5.3). Turning the floodplains into accessible green belt public parks also offers touristic potential, especially in the coastal areas where it could be connected with the touristic West Coast beaches. This solution would represent a significant integral re-urbanization of the region, from streams to the coast.
7. **Opportunities for green corridors, mangrove rehabilitation, ecotourism, and conservation in the eastern shore of the Greater Banjul Region.** This area presents a densely populated urban area adjacent to the Tanbi wetlands. The mangrove area also offers economic activities to the local poor population, such as oyster harvesting and shrimp fishing. Unplanned settlements (for example, Ebo Town) and swamps to cultivate rice are flooded yearly with polluted water due to a lack of drainage and sanitation services that also block the runoff to the Tanbi wetlands. Commercial buildings, critical infrastructure (for example, schools, hospitals), and roads (including the Banjul-Serre-kunda highway) are also affected by flooding. The identified solutions include rehabilitating mangrove areas and implementing drainage systems to facilitate runoff into the wetlands.

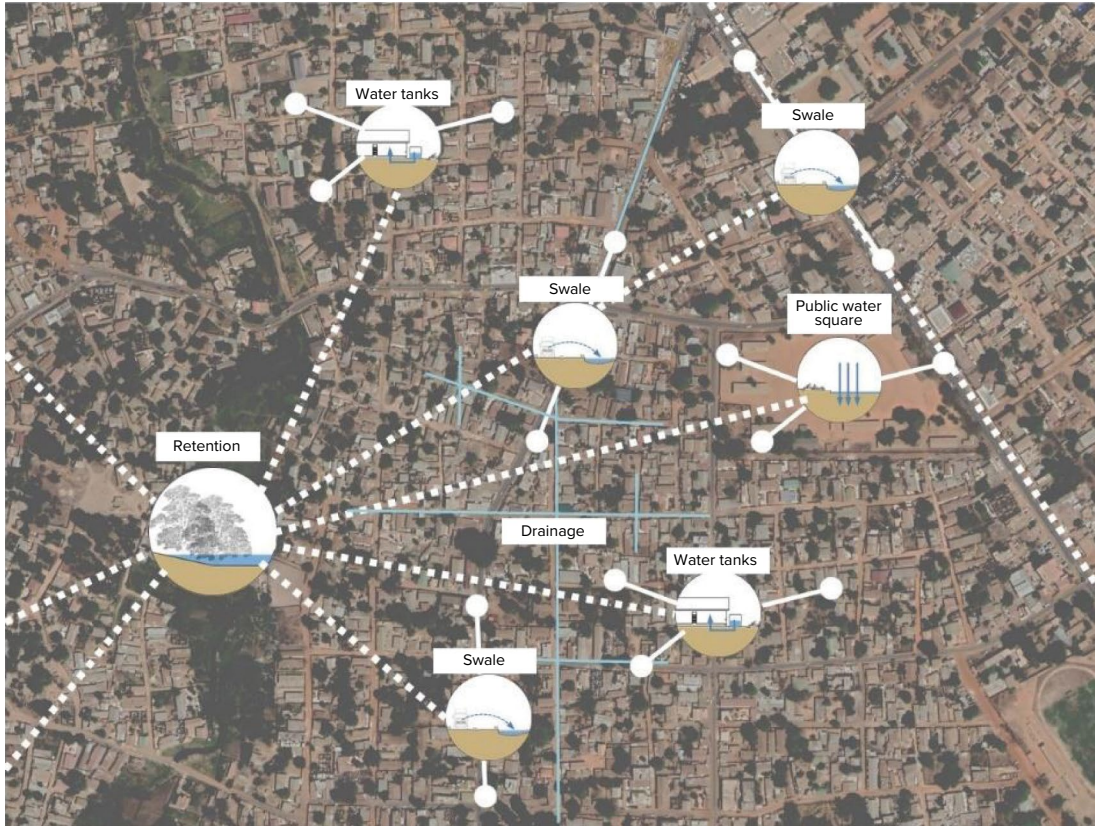
Figure 5.1 Planned road developments in the Greater Banjul Region with potential for nature-based drainage



Source: Flood and Coastal Risk Assessment and Priority Investment Planning for Greater Banjul: Investment Options Report (2021)

Figure 5.2 Sketch of nature-based options for rainwater management and sponge city concept



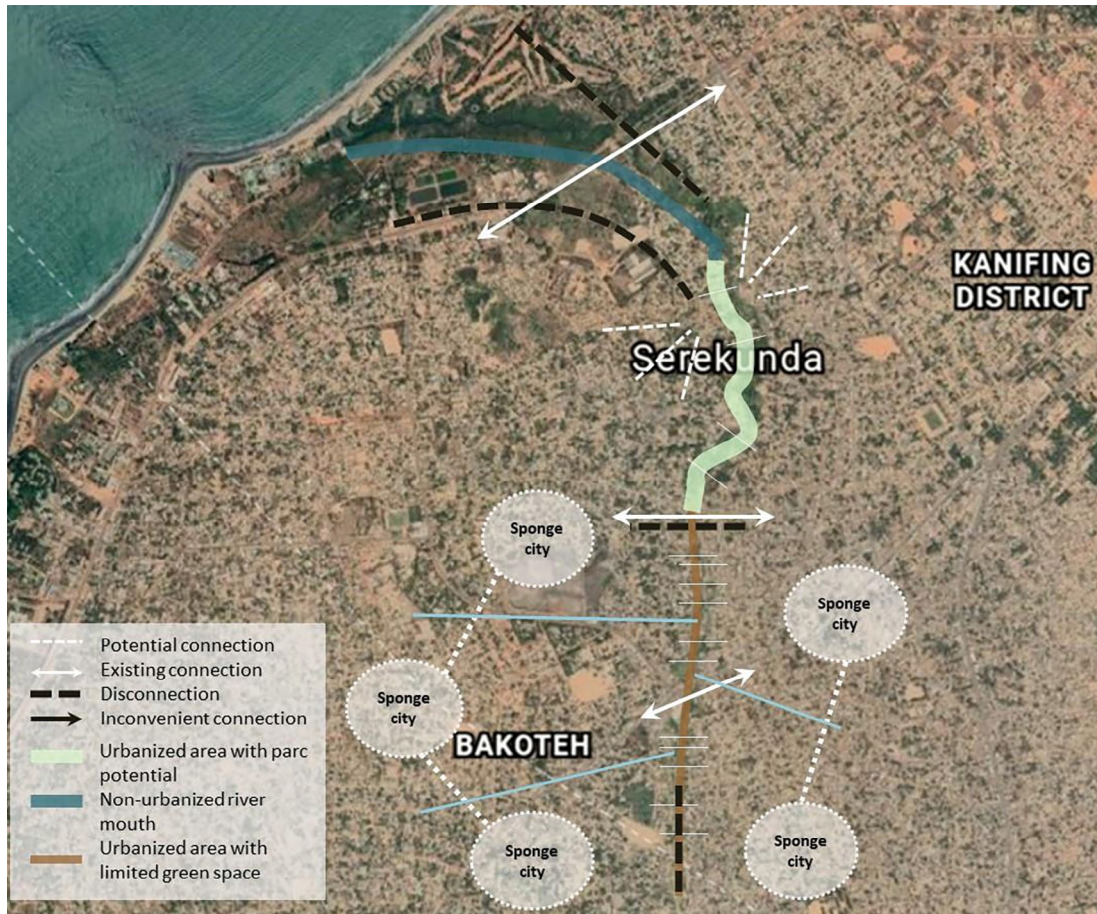


Source: Flood and Coastal Risk Assessment and Priority Investment Planning for Greater Banjul: Investment Options Report (2021).

One opportunity is the creation of access corridors to provide ecological context for a sustainable living environment and promote nature for livelihood (see concepts in the technical extended version of the report), including the potential for nature-based tourism (also upstream from Banjul). The SPCR also identified that the forestry subsector could arrest and reverse degradation of lands along riverbanks and mangrove areas and protect others at risk of degradation from erosion and, in the process, expand land availability for increased rice production from tidal irrigation and short cycle cash crops from uplands.

As part of the mangrove rehabilitation program, the wetland area could also be extended to the southern bund road of Banjul City (to Banjul Port) to provide an additional buffer zone and stimulate the settlement of fine sediments. A mangrove rehabilitation program also offers opportunities to develop an ecotourism corridor, for example, using viewpoints and access to the wetland system at specific locations and a corridor through the system. Other mangrove restoration programs have also been discussed along the Gambia River.

Figure 5.3 Main challenges and concept options for green river belt connection in Kotu Stream



Source: Flood and Coastal Risk Assessment and Priority Investment Planning for Greater Banjul: Investment Options Report (2021).



6. Gender Aspects in Flood Risk and Opportunities

In The Gambia, the most vulnerable populations during floods are young children under five years old, adolescent girls, and women of childbearing age (15–49 years).²⁶ These groups, which also include the elderly, people with disabilities, injured individuals, displaced persons, pregnant and breastfeeding women, widows, and female-headed households, require special attention and care due to their unique reproductive, child health, and economic needs. According to the International Federation of Red Cross and Red Crescent Societies (IFRC) Emergency Plan of Action (EPoA) for The Gambia: Flash Floods, trauma is common among these vulnerable groups.²⁷ Access to water, sanitation, and hygiene (WASH) facilities is a significant challenge in The Gambia, particularly for women and girls. The collapse of latrines and water points has exacerbated this issue. Ensuring safe and dignified access to WASH facilities is crucial for all individuals, especially women and girls. However, the lack of functional sources means that many women must travel long distances to fetch water, increasing their risk of harassment and abuse. Displaced women and children are also at greater risk of gender-based violence (GBV) and security threats.²⁸

Globally, disasters have far-reaching economic consequences that affect everyone, but women are disproportionately affected. In The Gambia, the devastating impact of flooding extends to the agricultural sector, where available land for cereal and rice fields is significantly reduced.²⁹ This has severe economic implications for rural communities, particularly for households headed by women who rely heavily on these fields as a primary source of income. The decline in agricultural productivity and income opportunities disproportionately affects women, exacerbating their economic vulnerability and compromising their overall well-being.

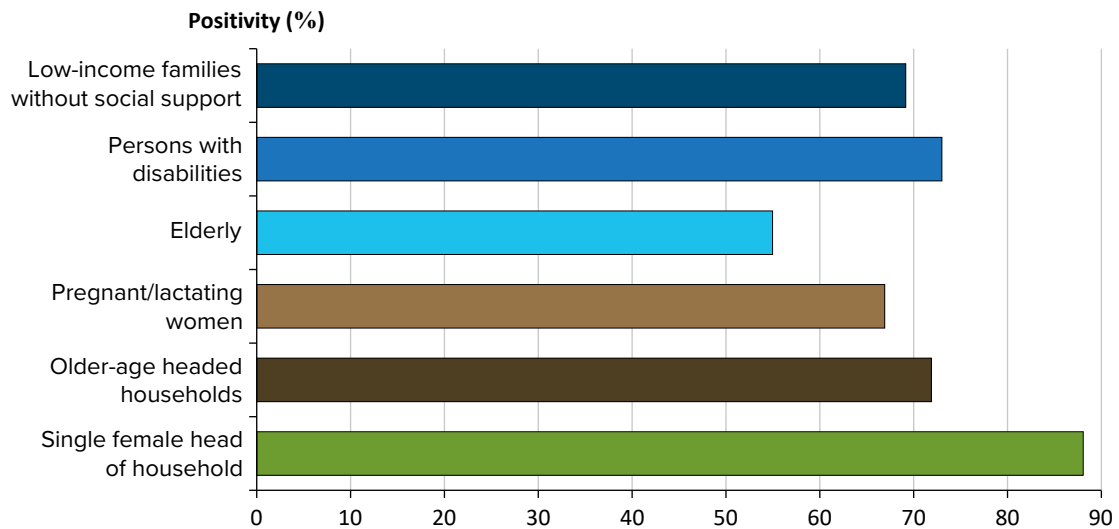
26 UNDAC 2022.

27 <https://reliefweb.int/report/gambia/gambia-flash-floods-emergency-plan-action-epoa-dref-operation-ndeg-mdrqm016>.

28 UNDAC 2022.

29 Ibid.

Figure 6.1 Groups in the community most affected by extreme weather events



Source: 2022 The Gambia Floods Rapid Needs Assessment.

Disasters disproportionately affect women and children, who are 14 times more likely to die than men, largely due to limited access to resources, inadequate communication, and in some cases, a lack of swimming skills.³⁰ In the aftermath of extreme weather events, women account for a staggering 80 percent of those displaced.³¹ While disasters may appear to affect everyone equally, the evidence reveals that they often exacerbate existing social inequalities. Women and girls are particularly vulnerable, facing increased risks of displacement, migration, and exploitation.³² In the wake of flooding, women and girls may be forced to flee their homes and live in displacement camps, where they struggle to meet their basic needs, including managing their menstrual cycles without access to toilets and running water.³³ The risk of early and forced marriages also increases in the aftermath of climate-related disasters, leading to girls being forced out of school and taking on unpaid care and domestic responsibilities at home.³⁴

In the aftermath of natural disasters like floods, GBV is amplified, occurring at every stage of an emergency. Women and adolescents are disproportionately affected, their vulnerability heightened by the chaos and uncertainty of a crisis. Before flooding events in The Gambia, GBV was already a pervasive issue, often hidden behind a culture of silence that viewed it as a private family matter outside the purview of law enforcement.³⁵

30 <https://www.ohchr.org/en/stories/2022/07/climate-change-exacerbates-violence-against-women-and-girls>.

31 <https://link.springer.com/book/10.1007/978-981-15-4382-1>.

32 <https://www.actionaid.org.uk/our-work/emergencies-disasters-humanitarian-response/refugee-displacement-crises>.

33 <https://www.acclimatise.uk.com/2017/09/19/floods-spearhead-disaster-related-displacement-worldwide/>.

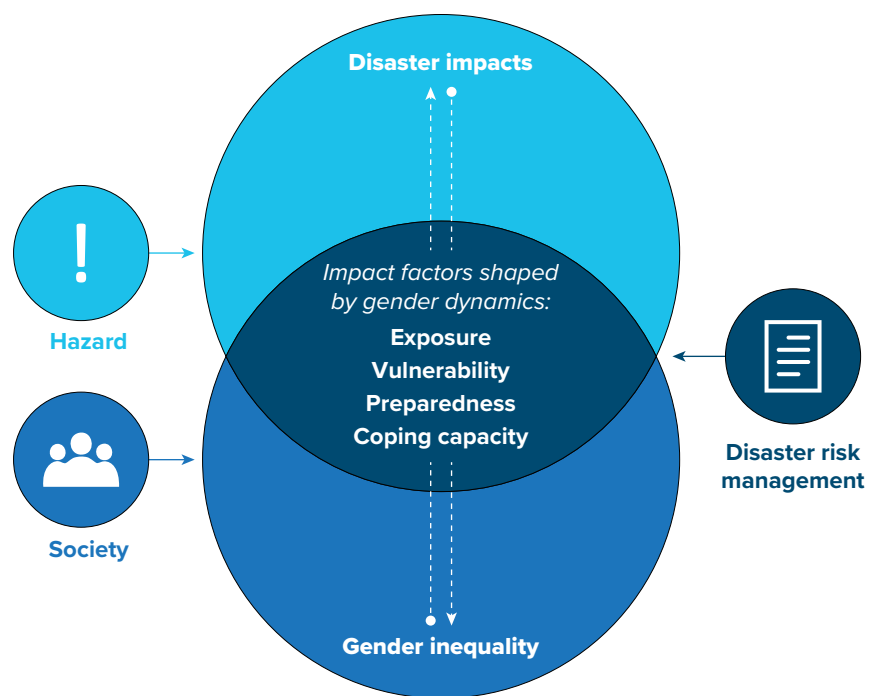
34 <https://www.actionaid.org.uk/our-work/womens-rights/child-marriage>; <https://www.actionaid.org.uk/our-work/womens-economic-rights/unpaid-care-and-domestic-work>

35 UNDAC 2022.

The report ‘Gender Dimensions of Disaster Risk and Resilience – Existing Evidence’ highlights women’s significant barriers in accessing crucial information and resources needed to prepare for, respond to, and recover from disasters. These barriers include limited access to early warning systems, safe shelter, and financial services such as bank accounts to protect their savings and ensure a stable income.³⁶ Despite these challenges, the report also underscores the vital role that women play in disaster preparedness, response, and recovery efforts. By acknowledging and formalizing women’s participation in The Gambia, the WACA ResIP2 project can not only improve outcomes but also create positive ripple effects on women’s social status within their communities, ultimately leading to greater resilience and equality.

The intersection of disaster impacts, gender inequality, and their overlap (Figure 6.2) highlights the critical need for including gender aspects in DRM policies and interventions to operate in this confluence. Leveraging available tools to mitigate disaster impacts and strengthen resilience can help close the gender gap in disaster risk outcomes.³⁷ According to the global evidence, effective DRM requires considering the complex ways in which gender dynamics shape disaster risks and impacts in each area before designing policies or projects. By doing so, the WACA ResIP2 project can ensure that World Bank-funded responses are tailored to address the unique needs and vulnerabilities of women and girls, ultimately promoting more equitable and resilient outcomes.

Figure 6.2 Intersection between disaster impacts and gender inequality



Source: Adapted from Hallegatte et al. (2017) and World Bank (2012).

36 Erman et al. 2021.

37 Erman et al. 2021.

Although it may not be as evident, programs and projects addressing flood risk, drought, and coastal erosion have entry points and opportunities to address key gender gaps. Proposed actions are as follows:

- 1. Addressing effective planning and gender-responsive implementation strategies and policies.** Programs can support policies, strategies, and action plans with concrete strategies and interventions for women, men, and children to prepare for and respond to flooding and DRR. This can include providing technical assistance and capacity building to Kanifing Municipal Council (KMC), NDMA, and the Brikama Area Council (BAC) in updating their contingency plans, early warning systems strategy, and local development plans with developing gender-inclusive guidelines and tools. Entry points can also include technical assistance and capacity building to equip council planners, policy makers, implementers with regional and global knowledge on tools to develop more inclusive policies and programs that address flooding, DRR, and management.
For example, The Gambia Integrated Urban and Coastal Resilience Program has provided technical assistance to the following: The Gambia's DRM Regulation and Policy (2023–2032), Climate Change Act, Gambia's Disaster Strategy and Action Plan, 5-Year Gender and Climate Change Action Plan, and the National Land Policy to ensure strategies that address the needs, realities, and decision-making entry points of women in times of environmental emergencies, such as flooding.
- 2. Addressing gender-inclusive green infrastructure.** Programs addressing flood risk, drought, and coastal erosion can bring additional social and economic benefits for women and children. Entry points include safely designing and building accessible green communal spaces. This can also include equipping the communal spaces with adequate handwashing stations, space for prayer, and information on how to prepare for flood emergencies, what to do/where to go, and the importance of recycling and SWM to climate change mitigation and community resilience. Programs could also invest in eco-sensitive solar-powered street lighting along the newly constructed footpaths and green parks. The communal spaces could also be used as childcare facilities for children of women who are working on urban farming.
- 3. Addressing women's economic consequences caused by flooding, coastal erosion, and drought.** Programs can conduct studies on the market potential for economic activities in the project area and, as a result, support a livelihoods program focusing on SWM, waste sorting, tree planting, mangrove restoration, and urban farming. Entry points include enhancing technical skills and other capacities to help both men and women participate more effectively, including NBS. The livelihoods program can also focus on waste pickers and farmers who are the most affected by flooding events that will directly affect their SWM, tree planting, mangrove restoration, urban farming, and horticulture activities.
- 4. Addressing inadequate communication and knowledge on flood risk and disaster risk reduction.** Programs can provide community sensitization and training to transform negative and/or establish new attitudes and practices on waste management, climate change, pollution, recycling, and emergency preparedness and response to flooding. Entry points can include working with local organizations to disseminate information and

educate the local communities through ICT-based communication strategies (for example, using social media, radio, TV, theater, presentations) or brochures, leaflets, and coloring books for children. Entry points also include swimming lessons and protection from rapid currents.

The new World Bank Gender Strategy (2024–2030) highlights that climate investments viewed through a gender lens can contribute to investor revenues and gender equality.³⁸

The new strategy emphasizes the importance of introducing initiatives incorporating women’s voices and leadership into green and just transition development; management of natural resources and biodiversity; climate change governance, including multilateral climate dialogue; and local, national, and private sector DRM dialogues. Therefore, programs that directly respond to these focus areas like The Gambia must continue to support the climate, gender equality, urban, resilience, and land (GPURL) goals.

³⁸ World Bank Group Gender Strategy 2024–2030: Accelerate Gender Equality to End Poverty on a Livable Planet. <https://www.worldbank.org/en/topic/gender/brief/gender-strategy-update-2024-30-accelerating-equality-and-empowerment-for-all>.



7. Conclusions, Lesson Learned, and Recommendations for Similar Studies in Other Regions

This report assessed flood and coastal erosion risks in the Greater Banjul Area (GBA) and examined the institutional, policy, and investment landscape for strengthening climate resilience in The Gambia. Through hazard modeling, exposure mapping, and vulnerability analysis, the study identified priority risk hotspots and evaluated potential structural and nature-based interventions to reduce flood and coastal risks.

Despite data limitations, the analysis provided a robust foundation for understanding flood and coastal risk dynamics in the GBA and identifying priority investment areas for disaster risk reduction and climate resilience. The results highlight the increasing exposure of coastal urban areas to flooding and erosion, driven by rapid urbanization, environmental degradation, and climate change.

The findings are consistent with broader evidence presented in The Gambia's Country Climate and Development Report (CCDR), which emphasizes the growing vulnerability of coastal urban systems, tourism infrastructure, and critical economic assets to sea-level rise, extreme rainfall, and coastal erosion.

Key Findings

Increasing Urban and Coastal Climate Risks

The Greater Banjul Area represents the economic and demographic center of The Gambia and contains a large concentration of critical infrastructure, tourism assets, and residential settlements. Rapid urban expansion and development along the coast have increased exposure to multiple climate hazards, particularly pluvial flooding, coastal erosion, and sea-level rise.

Flood risk modeling conducted for this study confirms that several urban districts, including Banjul City, Jeshwang, and Kombo North, face significant flood exposure due to a combination of high population density, limited drainage infrastructure, and increasing impervious surfaces. These risks are further amplified by environmental factors such as wetland encroachment, drainage blockage from waste accumulation, and loss of natural flood buffers.

Recent CCDR analysis further indicates that coastal infrastructure exposure could increase substantially under future sea-level rise scenarios. A large share of national economic assets, including tourism facilities, transport infrastructure, and residential developments, are located within vulnerable coastal zones. In particular, the Tourism Development Area (TDA) contains a high concentration of hotels, businesses, and public infrastructure that are increasingly exposed to shoreline retreat and storm impacts.

Urban climate risks are compounded by broader environmental pressures, including land degradation, loss of mangroves and wetlands, and expanding informal settlements in low-lying areas. These dynamics highlight the urgent need for integrated coastal and urban planning approaches that address both current flood risks and long-term climate impacts.

Institutional and Policy Challenges

The institutional analysis shows that The Gambia has established several policy frameworks addressing climate change, disaster risk management, water governance, and environmental protection. However, implementation remains constrained by fragmented responsibilities across institutions and limited technical and financial capacity. Flood and coastal risk management responsibilities are distributed among multiple institutions, including MECCNAR, NDMA, NEA, the Department of Water Resources, and municipal authorities. While these institutions play important roles in climate governance and disaster management, coordination challenges and overlapping mandates have often limited the effectiveness of policy implementation.

Weak enforcement of land-use regulations and environmental management policies has also contributed to increased exposure to flood risks. Informal settlements, construction in wetlands and drainage corridors, and limited enforcement of zoning regulations have exacerbated urban flood vulnerabilities in several parts of the GBA.

Recent policy initiatives, including the Climate Change Bill, the proposed Integrated Coastal Zone Management bill, and the National Land Policy—provide opportunities to strengthen institutional coordination and improve governance for climate resilience. However, effective implementation will require enhanced institutional capacity, improved data systems, and sustained financing.

Importance of Data and Risk Modeling

The flood and coastal erosion risk assessments highlighted the critical importance of reliable datasets and modeling approaches in developing robust disaster risk management strategies. Accurate elevation data, hydrological monitoring systems, and detailed exposure maps are essential for identifying flood-prone areas and prioritizing investments. In many cases, data limitations required the use of simplified assumptions and global datasets, highlighting the need for improved national data systems and monitoring networks.

Participatory validation of modeling results with government institutions and local stakeholders proved valuable for improving the accuracy of risk assessments and building institutional ownership of the results. This approach also helped raise awareness of climate risks among key decision-makers and stakeholders.

The analytical framework used in this study demonstrates that meaningful risk assessments can be conducted even in data-constrained environments by combining open datasets, modeling tools, and stakeholder engagement. These methods can be replicated in other regions facing similar data limitations.

Opportunities for Nature-Based Solutions

Nature-based solutions (NBS) emerged as promising options for addressing flood and coastal risks while delivering broader environmental and socio-economic co-benefits. In the Greater Banjul Area (GBA), ecosystem degradation, including mangrove loss, wetland encroachment, and reduction of urban green spaces—has increased exposure to flooding, coastal erosion, and urban heat stress. Restoring and protecting these natural systems therefore represents an important component of long-term climate resilience.

Several ecosystem-based interventions could help reduce flood exposure and coastal erosion in the GBA. These include mangrove restoration in coastal wetlands such as the Tanbi Wetland Complex and Oyster Creek, sustainable drainage systems in flood-prone urban districts, stream and river restoration along waterways such as Kotu Stream, and the development of urban green infrastructure including retention ponds, bioswales, and urban tree corridors. Such measures can complement conventional grey infrastructure by slowing stormwater runoff, improving infiltration, and restoring natural flood buffers.

Mangrove ecosystems play a particularly important role in coastal protection. The CCDR estimates that mangroves in coastal Gambia provide coastal protection services valued at approximately **US\$34 million**, while restoration of mangrove systems in the Greater Banjul Area could generate additional protection benefits estimated at **nearly US\$30 million (about 1.3 percent of GDP)** by reducing tidal flooding and coastal erosion. Mangroves also support fisheries productivity, biodiversity conservation, and carbon sequestration, making them among the most cost-effective climate adaptation investments available to the country.

Urban nature also plays an important role in reducing climate risks. The CCDR analysis highlights that rapid urbanization, and the loss of vegetation cover have intensified urban heat island effects and reduced natural flood buffering capacity, particularly in densely built areas of Kanifing Municipality and Serrekunda. Expanding urban green spaces, restoring wetlands, and integrating nature-based drainage systems into urban planning can therefore help reduce flood exposure while improving urban environmental quality and public health.

Despite these benefits, while ecosystem-based adaptation is recognized in national climate policies, including the National Climate Change Policy (2016; updated 2025) and the Strategic Program for Climate Resilience (SPCR)—there is currently no comprehensive national strategy or regulatory framework specifically dedicated to scaling up nature-based solutions for flood risk management. **Developing a comprehensive national NbS strategy could help mainstream ecosystem-based approaches** into urban planning, coastal management, and disaster risk reduction initiatives.

Economic and Sectoral Vulnerabilities

The coastal economy of The Gambia, particularly tourism and fisheries—is highly exposed to climate risks. Tourism alone contributes approximately 12–16 percent of national GDP and supports more than 75,000 jobs, while a large share of tourism infrastructure is concentrated along the coastal corridor of the Greater Banjul Area.

Many tourism assets are located within the Tourism Development Area (TDA), which contains hotels, restaurants, and supporting infrastructure along beaches such as Senegambia, Kololi, and Kotu. CCDR analysis estimates that over US\$2.1 billion in assets—equivalent to more than 90 percent of national GDP—are located within 800 meters of the coastline, making them highly vulnerable to sea-level rise, coastal erosion, and storm impacts.

Shoreline retreat has already affected several tourism areas. Coastal erosion rates along parts of the tourism corridor have been estimated at up to 4.7 meters per year, contributing to damage to coastal infrastructure and increasing the need for protective measures such as beach nourishment, revetments, and shoreline stabilization projects.

Flooding and coastal erosion therefore pose risks not only to communities but also to key economic sectors that support national growth and employment. Strengthening climate resilience in these sectors will require improved coastal planning, sustainable tourism management, and investments in protective infrastructure and ecosystem restoration.

Urban environmental challenges also exacerbate flood risks in the Greater Banjul Area. Poor solid waste management and drainage blockage, particularly in Kanifing Municipality, Banjul, and settlements along Kotu Stream—frequently obstruct drainage channels and waterways, increasing the severity of pluvial flooding during heavy rainfall events. Waste accumulation along drainage corridors and informal dumping sites can significantly reduce the capacity of stormwater systems.

Strengthening waste management systems and promoting circular economy approaches, including improved collection systems, recycling initiatives, composting of organic waste, and formalization of waste management services—could therefore contribute both to improved urban environmental quality and reduced flood risks. Addressing these challenges will require stronger enforcement of environmental regulations, improved coordination between municipal authorities and national agencies, and investments in waste management infrastructure.

Gender and Social Vulnerability

Flooding and coastal hazards in The Gambia disproportionately affect vulnerable populations, particularly women, children, youth, and persons with disabilities, as well as households living in informal or low-income settlements located in flood-prone areas. In the Greater Banjul Area, these groups often face heightened exposure to flooding due to limited access to resilient housing, drainage infrastructure, sanitation services, and early warning systems. Climate shocks can also disrupt livelihoods and access to essential services, including education and healthcare, affecting children and youth in particular. Women are especially vulnerable because many depend on climate-sensitive livelihoods such as fisheries, tourism services, small-scale trading, and informal enterprises.

Flooding, coastal erosion, and storm events can therefore lead to disproportionate income losses for women and female-headed households. At the same time, gender inequalities in access to finance, land ownership, insurance, and formal employment can limit women's ability to recover from disasters and participate fully in resilience-building initiatives.

Strengthening gender-responsive disaster risk management and climate adaptation is therefore essential. This includes promoting women's participation in resilience planning and decision-making, improving access to climate finance and livelihood diversification opportunities, and ensuring that flood management infrastructure and emergency preparedness systems are inclusive and accessible to vulnerable populations.

Community-based adaptation approaches that actively engage women, youth, and marginalized groups can also strengthen local ownership of resilience measures and improve the effectiveness of disaster preparedness and response. Ensuring that urban and coastal resilience investments are socially inclusive and gender-responsive will be critical for reducing climate vulnerabilities while promoting equitable and sustainable development in The Gambia.

Lessons Learned

Several key lessons emerged from the implementation of the flood and coastal erosion risk assessment in The Gambia.

- 1. First, high-quality spatial data are essential for reliable risk assessments.** Investments in high-resolution digital elevation models, hydrological monitoring networks, and updated land-use datasets would significantly improve future modeling efforts.
- 2. Second, stakeholder engagement is critical for validating risk assessments and ensuring institutional ownership of results.** Participatory validation workshops helped improve the quality of the analysis while strengthening collaboration between institutions.
- 3. Third, integrating economic analysis into risk assessments helps prioritize interventions.** The use of cost-benefit analysis and multicriteria analysis allowed the study to evaluate potential interventions based on both economic efficiency and broader environmental and social considerations.
- 4. Fourth, integrated approaches are needed to address the interconnected drivers of flood risk.** Urban planning, coastal management, waste management, and ecosystem conservation all play important roles in shaping flood risk outcomes.

Recommendations for Strengthening Urban and Coastal Resilience

Based on the findings of this report, several priority actions can help strengthen climate resilience in the Greater Banjul Area.

- 1. Strengthen regulatory frameworks and policy implementation:** Revising and strengthening flood risk regulations, coastal management frameworks, and land-use planning policies can help reduce exposure to climate hazards. Strengthening enforcement of zoning regulations and environmental protections will also be critical for preventing development in high-risk areas.
- 2. Increase investment in flood risk reduction:** Greater financial support is needed to strengthen flood risk reduction efforts, including investments in drainage infrastructure, coastal protection, disaster preparedness, and post-disaster recovery mechanisms.
- 3. Scale up nature-based solutions:** Developing a national strategy for nature-based solutions could support ecosystem restoration, wetland protection, and urban green infrastructure initiatives that help mitigate flood risks while delivering ecosystem benefits.
- 4. Strengthen institutional coordination:** Improved coordination among national and local government institutions is essential for effective flood risk management. Strengthening collaboration between climate policy agencies, disaster management institutions, and municipal authorities can improve planning and implementation.
- 5. Support local governments and infrastructure development:** Municipal authorities play a critical role in managing drainage systems, land-use planning, and local infrastructure. Strengthening the technical and financial capacity of local governments will be essential for implementing climate-resilient urban development strategies.
- 6. Promote gender-responsive resilience planning:** Integrating gender considerations into disaster risk management and climate adaptation programs can help ensure that resilience investments benefit all members of society, particularly vulnerable groups.

Way Forward

The findings of this report provide a foundation for strengthening urban and coastal resilience in The Gambia. Addressing flood and coastal risks will require coordinated efforts across national institutions, local governments, development partners, and local communities.

Improving governance frameworks, investing in resilient infrastructure, and scaling up nature-based solutions, could enable The Gambia to reduce climate risks while protecting critical ecosystems and economic assets.

Continued collaboration between government institutions, development partners, and research organizations will be essential for translating these findings into effective policies and investments that support sustainable and resilient development in coastal urban areas.



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