Mombasa CityLAB

MOMBASA COUNTY FLOOD MANAGEMENT STRATEGY

2025-2030

Mombasa County, Kenya

Co-funded by:

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Mombasa County Flood Management Strategy

Vision

“A resilient and innovative city in sustainable flood management that safeguards communities, ecosystems and infrastructure”

Mission

“To implement innovative flood management strategies that integrate infrastructure development, ecosystems, community engagement and policies to reduce flood risk”

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D. FOREWORD

Mombasa County covers 229.9 square kilometers comprising both the island and the mainland. Over 1.3 million people live and work in Mombasa County. Some people live in areas at risk of flooding from one source, while others are at risk from multiple sources of flooding. Flood risk presents complex challenges in Mombasa County. It can be unpredictable and dynamic, and the impacts can be devastating on communities, businesses, infrastructure, rural areas, and the environment. With a rapidly changing climate, the need to plan together to improve the overall resilience of the county is more important than ever before.

Partnerships are key. The more we plan together, the more we can deliver together for local people and our environment. As a signatory to the Covenant of Mayors in Sub-Saharan Africa, my administration is committed to addressing the challenges of climate change, together with peer counties and cities across the region. As part of our commitment to CoM SSA and to tackling the issue of flooding, we the Mombasa City LAB, a participatory and inclusive space to tackle complex urban adaptation challenges. Over the last one year, the county has worked together with other government agencies, development partners, various stakeholders and communities to develop this Flood Management Strategy (FMS) through the Mombasa City LAB.

The FMS marks an important contribution towards delivering the National Policy on Disaster Management, by providing policy direction for managing floods and minimising flood risks. The Strategy incorporates important lessons learnt from the past flood events, review into effectiveness of flood warning and response systems, and audit of flood mitigation infrastructure. The strategy will help us to:

1. identify actions that will reduce the likelihood and consequences of flooding
2. work in partnership to explore wider resilience measures, including nature-based solutions for flood and water
3. set longer-term, adaptive approaches to help improve the county's resilience

The Strategy supports flood management by clarifying the roles and responsibilities of government, agencies and authorities involved, as well as making clear the way flood management intersects with emergency response and environmental management. It also focuses on developing and sharing high-quality flood risk information that can be used for improved planning, flood warning and response.
We recognise that there may be areas at risk of flooding outside those detailed in the plan. Be assured that the county and other stakeholders will continue to plan and manage the risk of flooding for all communities. Communities know their areas best, and preventing and mitigating the effects of flooding can be best managed at a local level, but it is a responsibility we all share.

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It is my pleasure to share this FMS for the Mombasa County, an important milestone on our journey. Let's keep looking ahead. We must continue to work in partnership and keep putting communities at the centres of what we do so they can adapt and thrive.

HE. Abdullswamad Sheriff Nassir.

Governor of Mombasa County

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E. LIST OF ACRONYMS

ACRONYM	DEFINITION
BMZ	German Federal Ministry for Economic Cooperation and Development
BWRC	Basin Water Resources Committee
CBD	Central Business District
CBDM	Community Based Disaster Management
CGM	County Government of Mombasa
CIDP	County Integrated Development Plan
CIMES	County Integrated Monitoring and Evaluation System
COG	Council Of Governors
CoK	Constitution of Kenya
CoM SSA	Covenant of Mayors in Sub Saharan Africa
CSOs	Civil Society Organizations
DEMC	Disaster and Emergency Management Committee
DMC	Disaster Management Committee
DOC	Disaster Operations Center
DRM	Disaster Risk Management
EMCA	Environmental Management and Co-ordination Act
EOC	Emergency Operation Centre
EU	European Union
EWS	Early Warning Systems
FEWS	Flood Early Warning Systems
FMS	Flood Management Strategy
FRVA	Flood Risk and Vulnerability Analysis
GIS	Geographical Information System

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ACRONYM	DEFINITION
GIZ	Deutsche Gesellschaft für Internationale Zusammenarbeit - German Development Cooperation
IPCC	Intergovernmental Panel on Climate Change
ISUDP	Integrated Strategic Urban Development Plan
KEFRI	Kenya Forestry Research Institute
KMD	Kenya Meteorological Department
KMFRI	Kenya Marine and Fisheries Research Institute
LAB	Local Adaptation Booster
M&E	Monitoring and Evaluation
MCDM	Multi-Criteria Decision Making
MIF	Multi-Influencing Factor
MWSI	Ministry of Water, Sanitation and Irrigation
NCCAP	National Climate Change Action Plan
NDOC	National Disaster Operations Centre
NEP	National Environment Policy
NWHSA	National Water Harvesting and Storage Authority
NWMP	National Water Master Plan
NWRMS	National Water Resources Management Strategy
RBOs	River Basin organizations
RCGW	Regional Centre on Groundwater resources, Education, training
SCMP	Sub-Catchment Management Plan
SDGs	Sustainable Development Goals
WMO	World Meteorological Organisation
WRA	Water Resources Authority
WRUAs	Water Resource Users Associations
WSPs	Water Service Providers

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ACRONYM	DEFINITION
WSRB	Water Services Regulatory Board
WSTF	Water Sector Trust Fund
WT	Water Tribunal
WWDA	Water Works Development Agencies

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F. EXECUTIVE SUMMARY

Mombasa County, a coastal region covering 229.9 square kilometres, faces significant flood risks due to its low elevation, rapid urbanization, and the effects of climate change, such as rising sea levels and intense rainfall. The **Mombasa County Flood Management Strategy 2024–2030** provides an inclusive framework to mitigate flood risks, ensure sustainable development, and protect communities, ecosystems, and infrastructure.

Vision and Mission

The FMS envisions a resilient and innovative Mombasa that integrates infrastructure, ecosystems, and community engagement in flood management. Its mission is to implement inclusive measures that align infrastructure development with policy and community action to reduce flood risks.

Flood Challenges in Mombasa

Mombasa faces frequent floods from multiple sources, including:

- **Coastal floods** from rising sea levels and storm surges.
- **Pluvial floods** caused by inadequate drainage and extreme rainfall.
- **Riverine floods** due to encroachments on floodplains and blocked waterways.

These floods lead to severe consequences such as loss of life, displacement, infrastructure damage, economic disruption, and environmental degradation.

Objectives

The strategy is built around four core objectives:

1. **Enhance Preparedness**: Equip communities and institutions with knowledge, tools, and resources to mitigate flood risks.
2. **Mitigate Risks**: Implement structural (e.g., storm water systems) and non-structural (e.g., land-use planning) measures.
3. **Improve Response**: Establish effective early warning systems and disaster response mechanisms.
4. **Facilitate Recovery**: Ensure sustainable rebuilding and restoration post-floods.

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Methodology

The FMS was developed through a participatory four-phase approach:

1. **Baseline Assessment**: Identification of priority issues.
2. **Risk Analysis**: GIS-based mapping to identify flood-prone and vulnerable zones.
3. **Strategy Development**: Co-creation of actionable plans with stakeholders.
4. **Implementation and Monitoring**: Execution via a multi-sectoral framework with regular evaluations.

Key Focus Areas

The FMS outlines actionable interventions across short-, medium-, and long-term horizons, including:

- Developing flood risk reduction measures through enabling response and fostering survival during the flood event.
- Developing flood management strategies require a detailed analysis of the flood problem in each locality, identify possible solutions and ultimately select the most suitable solution after evaluating all options.
- Planning to provide immediate assistance to maintain life and improve health of the affected population during an emergency.
- Implementing activities aimed at restoring livelihood and supporting infrastructure, making use of opportunities to reduce future vulnerability by enhancing prevention and increasing preparedness.

Collaborative Governance

The strategy emphasizes partnerships among county agencies, national bodies, and community organizations. Key players include the Water Resources Authority (WRA), Disaster Management Committees (DMC), and other stakeholders.

Expected Outcomes

1. Reduced loss of life and property during floods.
2. Enhanced community resilience through education and capacity-building initiatives.
3. Sustainable infrastructure that integrates environmental conservation and development needs.

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Call to Action

The Mombasa FMS aligns with Kenya's Vision 2030 and international frameworks like the SDGs. Its successful implementation requires urgent action and collaboration from all stakeholders—government, communities, and partners. Together, we can safeguard Mombasa's residents and ecosystems while fostering sustainable economic growth and resilience to climate risks.

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G. DOCUMENT ORGANISATION

The **Mombasa County Flood Management Strategy (FMS) 2024–2030** is organized into seven chapters and supplemented by annexes for detailed reference. The strategy is structured into chapters that cover the county's flood history, risk assessment, and gaps in existing policies and infrastructure. It outlines guiding principles, stakeholder roles, and governance frameworks while detailing objectives around preparedness, mitigation, response, and recovery. Actionable measures are supported by an implementation plan divided into short-, medium-, and long-term actions. Coordination, monitoring, and evaluation frameworks ensure progress through risk management and communication strategies, with references and annexes providing additional resources.

Each chapter systematically addresses key elements of flood management, ensuring a logical flow from context analysis to actionable plans and governance mechanisms:

1. **Introduction**
    - Overview of Mombasa County: geography, climate, and socio-economic features.
    - Analysis of historical flood challenges and the importance of flood management.
    - Objectives, scope, and methodology of the strategy.
    - FMS Development process
    - FMS outputs

2. **Situation Analysis**
    - Review of past flood events and their socio-economic and environmental impacts.
    - Assessment of flood risks, vulnerabilities, and existing response systems.
    - Current flood management practices and gaps.

3. **Flood Policy and Governance**
    - Guiding principles of the FMS.
    - Institutional and legal frameworks at county, national, and stakeholder levels.
    - Roles and responsibilities of key actors in flood management.

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4. **Strategic Objectives and Measures**

    - Flood management strategies
    - Cross cutting issues

5. **Implementation Action Plan**

    - Resource mobilisation plan
    - Coordination mechanisms for FMS implementation

6. **Monitoring, and Evaluation Framework**

    - Monitoring metrics and evaluation criteria for tracking progress.
    - Communication Mechanism for the FMS

7. **References**

    - References

8. **Annex**

    - Glossary of Terminologies
    - Detailed supporting data, methodologies, and case studies.
    - Maps, policy documents, and technical guidelines for further context.

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1 CHAPTER 1: INTRODUCTION

1.1 About Mombasa County

Mombasa County is a coastal county with an approximate geographical area of 229.9 km^2 excluding the water mass which constitutes about 65 km^2 stretching 200 nautical miles into the Indian Ocean (CIDP, 2023). Its elevation rises from below sea level (-10 m) to about 122 m in the mainland. Its main physiographic features can be categorised into three units, namely: coastal plain, which includes the coastal plain found along the shoreline and covering parts of the South Coast, the island, parts of Changamwe and the North Coast. The second category is the hilly areas found in the Western part of the County that are underlain by shells and rise gently from 45 m to 122 m above sea level. This is characterized by poorly drained clay soils which restrict settlement and infrastructural development. The third category is the Indian Ocean, and the shoreline covered with geologically sedimentary rocks of Jurassic to recent age.

Mombasa County enjoys hot tropical weather influenced by monsoon with stable temperatures throughout the year with a low of 22.7 ºC in July and high of 33.1 ºC in February. Precipitation mean values exceed 100 mm in some months; the highest being 235.5 mm in May and the lowest is 14.0 mm in February. Humidity is quite high all year around with minor fluctuations from 59% to 86% depending on time. Average humidity at noon is about 65%. The county experience a bimodal rainfall pattern with long rains occurring in April – June, and short rains coming towards the end of October - December with an annual average of 1040 mm (Ogega et al., 2016).

The city is zoned into Mainland West, the Island (Mvita), Mainland North and Mainland South. Mombasa is a city county and is among the 47 counties in Kenya. It is made up of 6 sub-counties namely Likoni, Mvita, Changamwe, Jomvu, Kisauni and Nyali. The county has a population of about 1.2m people with most populous area being in Mainland North followed closely by Mainland South (KNBS, 2019). The Island and Mainland West are serviced with good infrastructural services while the Mainland North and Mainland South have a poor infrastructural network. The total stormwater infrastructure system covers 221,158 metres by 2015 and is shown per zone in Table 1.1 (Mombasa County Government).

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Table 1.1 Storm water system infrastructure length

Zone	Length in Metres
Mainland North	49,928
Mainland West	64,694
Mainland South	19,139
Island	87,397
Total Length	221,158

Mombasa County has six constituencies: Changamwe, Jomvu, Kisauni, Nyali, Likoni, and Mvita and thirty Electoral Wards. The sub-counties are further sub-divided into thirteen (13) divisions, thirty-three (33) locations and sixty-two (62) sub-locations with area coverage as shown in Table 1 (CIDP, 2023).

Table 1.1 Administration and electoral units aggregated on sub county basis (Source: Mombasa County CIDP 2023-2027).

SUB COUNTY	NO. OF WARDS	NO. OF DIVISIONS	NO. OF LOCATIONS	NO. OF SUB LOCATIONS	AREAS (KM^2)
Changamwe	5	2	4	10	16
Jomvu	3	2	4	10	29
Kisauni	7	3	6	14	106
Nyali	5	2	4	8	23
Likoni	5	2	6	9	14
Mvita	5	2	9	11	14
Totals	30	13	33	62	230

The topography has evolved because of the lowering of the sea level over time leading to severe erosion by the storm water draining into the sea. In addition, the sea, the fringing coral reefs, the cliffs, the island, ports and harbours, creeks and tidal flats, and sandy beaches are the other physiographic features seen in Mombasa County. The fringing coral reefs in North Coast are an important marine conservation area hosting the Mombasa Marine National Park and Reserve. The

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county borders Kilifi County to the North, Kwale County to the Southwest and the Indian ocean to the East (CIDP, 2023).

According to the 2019 census the county had a total of 1,208,333 persons where 610,257 were male and 598,046 were female (CIDP, 2023). The estimated annual population growth rate is about 3.51%. The population is projected to reach 1,577,541 persons in the year 2030. The age distribution structure of Mombasa County shows a common urban feature such that the share of working age population is larger than the other age groups. This shows that the population growth of Mombasa County is sustained not only by natural population growth but also by positive net migration. The county has a youthful population with an average household size of 3.1 (CIDP, 2023).

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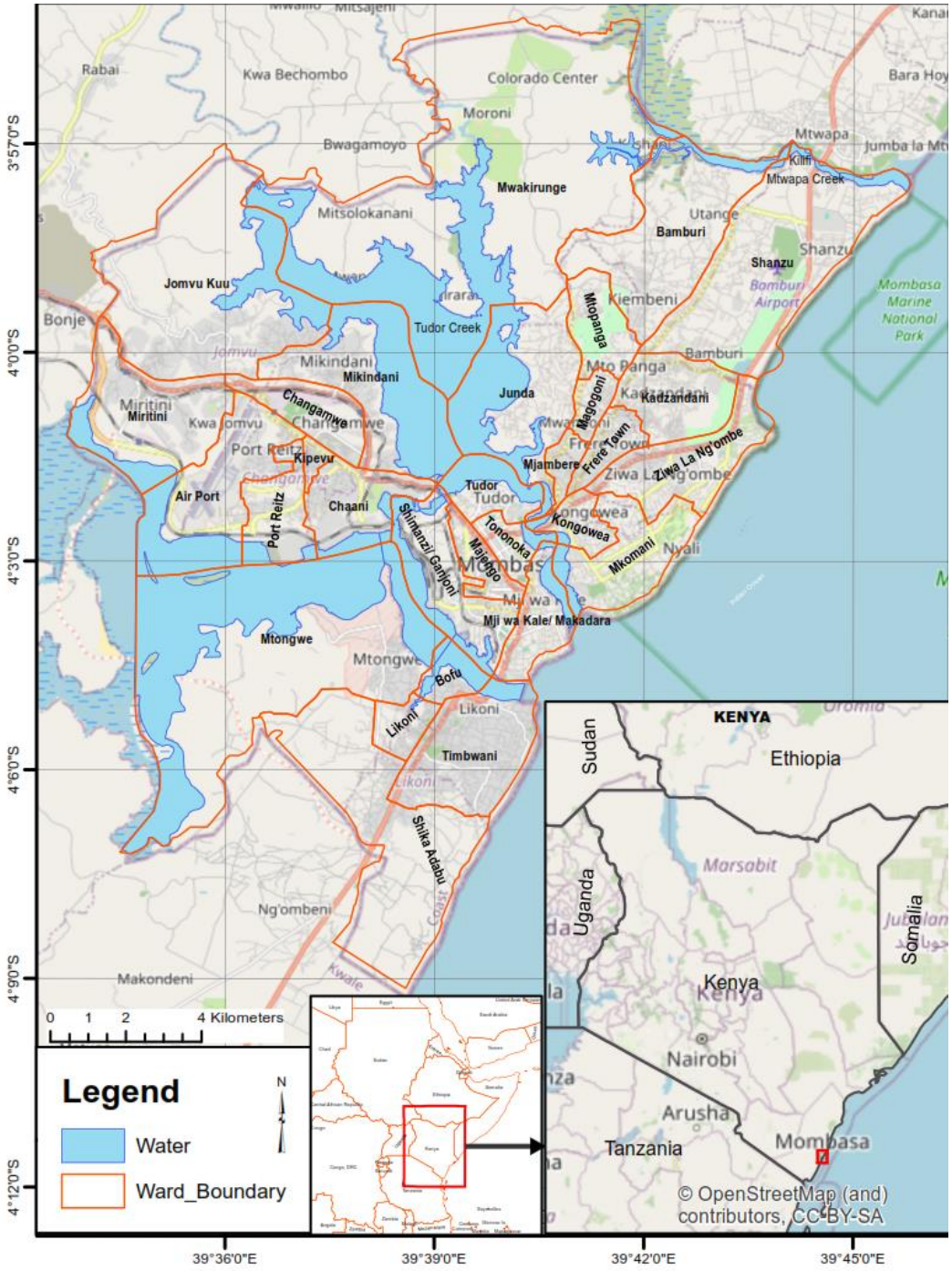

Figure 1.1 Physical map of Mombasa County showing administrative boundaries. Source: CoM SSA 2024

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1.2 Floods in Mombasa County

Mombasa City, like many coastal cities, faces a continued increase in flooding due to a mix of driving factors. These include the rising sea levels, inland flooding due to settlement on the floodplains due to limited land for social economic use, inadequate adaptive infrastructure to mitigate flooding, poor management of solid waste and unregulated construction leading to blockage of waterways. The county is investing in building an extensive network of drainage and flood infrastructure that reduces the risk and impacts of flooding on people, property and the environment. Despite our infrastructure network, flood risks are growing due to increasing rainfall intensity and sea level rise because of climate change and increasing amount of storm water from urban development. There are smaller gardens and less green space to soak up rainfall and our population has been growing faster than ever before, exposing more people to the disruption of flood events. The extent of urbanisation in some areas also prohibits and constrains the opportunities for cost-effective, large scale flood infrastructure. This has brought about flooding hazards in Mombasa leading to landslides, inundation, contamination of water sources and electrocution. Historical flood management approaches within the city of Mombasa have mainly focused on grey infrastructure which remain insufficiently provided across the city. A predisposing factor that underlies the vulnerability of Mombasa is its low elevation that is easily inundated with slight changes in water levels.

1.2.1 Types of floods in Mombasa

There are three common types of flooding in Mombasa County: fluvial floods (river floods); pluvial or flash floods; and coastal floods (Dhiman et al.,2019).

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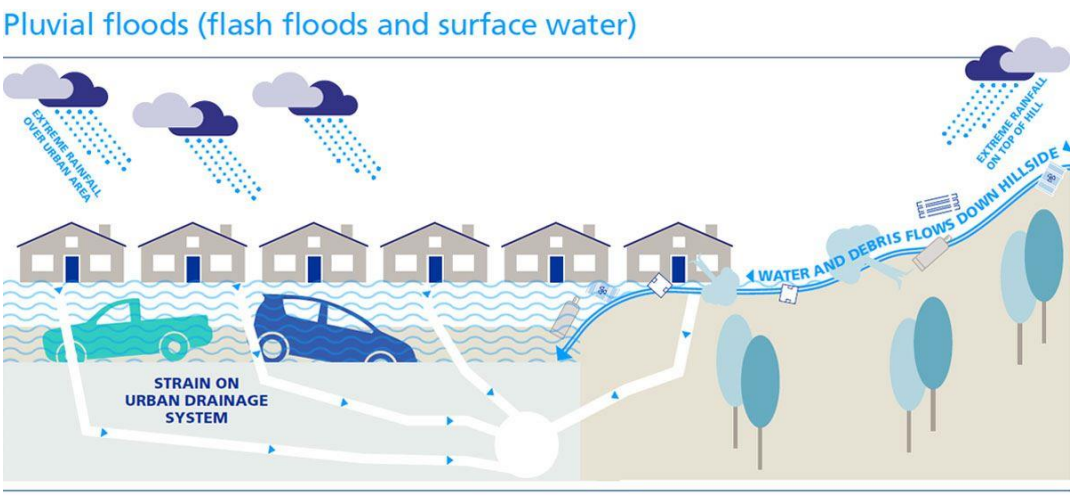

Figure 1.2 Pluvial floods. Source: https://www.zurich.com/

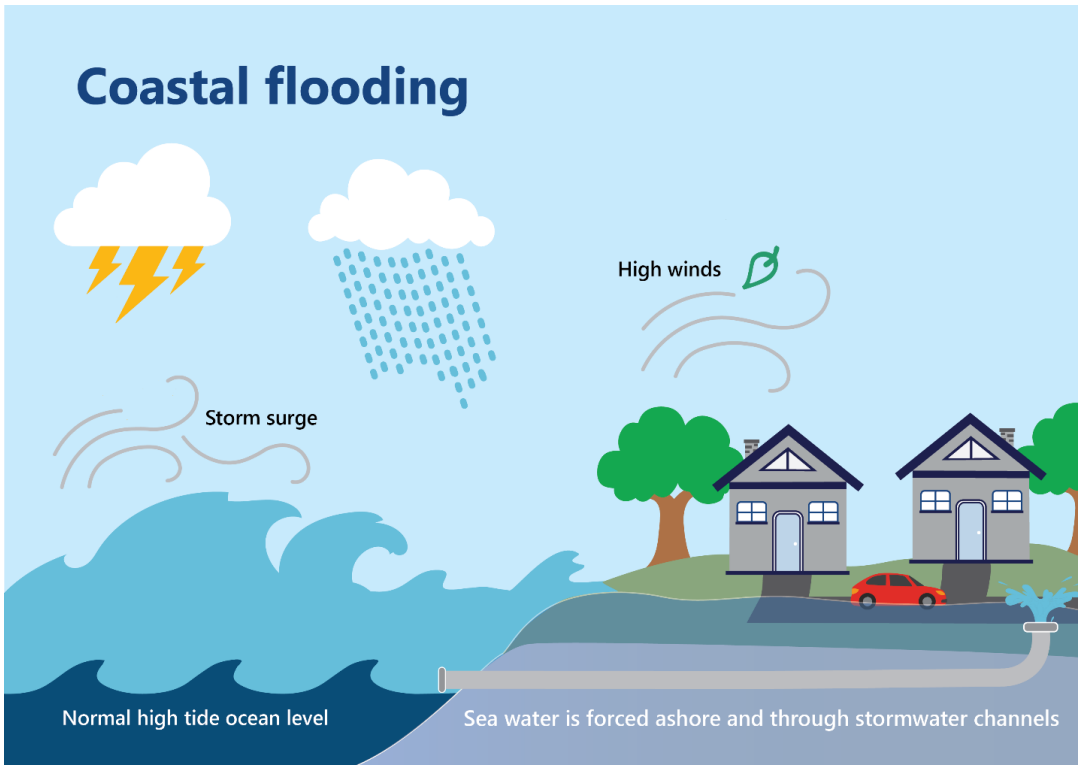

Figure 1.3 Coastal flooding. Source: https://www.zurich.com/

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Figure 1.4 Locals struggle to rescue livestock in the flooded River Nyando that burst its banks on May 5, 2024. /OJWANG JOE

Recently, Mombasa has witnessed all three types of flooding, with pluvial floods and coastal floods being the most prevalent (Hategekimana, et al.,2018). Riverine flooding refers to inundation of normally dry land when water overflows the natural or artificial banks of a stream, river, estuary, lake or dam. Pluvial floods occur when extreme rainfall leads to flooding independent of overflowing water bodies, manifesting through flash floods and surface water floods (Erkens et.al.,2015). The discharge from some of these rivers is also dependent upon tidal conditions, which means the rivers can become tide locked and unable to discharge river water during some high-tide periods.

Flash (stormwater) flooding refers to inundation by local runoff caused by heavier than usual rainfall. Inundation can be caused by local runoff that exceeds the capacity of urban stormwater drainage systems; overland flows that are on the way to waterways; or riverine flooding causing

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urban stormwater drainage systems to back up and overflow. Flash flooding from the stormwater system tends to be rapid and dangerous due to the speed and depth of flows and difficulty in providing a timely warning to people. Flash flooding is particularly evident in areas such as the Central Business District (CBD), Likoni, Kisauni, Changamwe, and Jomvu, where flooding is because of heavy rains for extended periods.

Mombasa also faces fluvial floods, wherein rising water levels in rivers or streams overflow onto adjacent land. Human activities such as improper waste disposal, obstructing water pathways, and encroachment onto watersheds contribute to flood vulnerability. The severity of river floods is influenced by the terrain profile, duration, and intensity of rainfall in catchment areas, soil water saturation, and climate change impacts on rainfall patterns (Okaka & Odhiambo, 2019). In flat terrains like Mombasa, with insufficient drainage systems and impermeable surfaces floodwaters may rise slowly and remain exacerbated for extended periods; as evident in in Nyali, parts of Maweni, Kongowea, 2nd Avenue Nyali, and Links Roads.

The coast is naturally dynamic; it is constantly changing and evolving in response to coastal processes such as waves and, tides. When these processes adversely affect the built and natural assets they are defined as coastal flood hazards and includes flooding from storm surges, tsunamis, or sea level rise. Mombasa County has a few low-lying areas of land adjacent to the coast, often located behind raised sea defences that have in the past been affected resulting in sea defences being overtopped when sea levels are high enough to combine with wind direction and wave heights.

Mombasa Water and Sewerage Company (MOWASCO) is the principal sewer operator in Mombasa County. They manage a network of sewer pipes, pumping stations and drainage systems which play a key role in managing flood risk from sewers and surface water across the County. Sewer flooding in the county occurs because sewerage systems design can't cope with flows from unusually prolonged rainfall or exceptional storm events, which may impact the sewer networks through ingress of surface or groundwater. Frequent blockages or failures within the sewer system have often also increased the risk of flooding.

1.2.2 Impacts of flooding

The consequences of floods are usually serious in affected areas and can have major economic repercussions for businesses and communities. Flooding impacts property, transportation, infrastructure and natural environments. There are three categories of economic impacts: 1) direct damages to residential and commercial buildings, property and roads, 2) indirect damages such as

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disruption to public transport, loss of public services and emergency response and 3) intangible damages which are psychological and physical illness, memorabilia and flora and fauna.
The personal and social costs of flooding can also be significant. Floods can cause loss of life and injury. The long-term stress and disruption arising from damage of properties are among the serious negative consequences. Families can be displaced, and people can experience fear and helplessness during floods leading to physical and mental health concerns.

Some flooding can support natural floodplains by replenishing groundwater and wetlands, moving sediment and nutrients to areas that need them, and triggering fish and bird migration and breeding events. However, significant floods can also damage the environment, causing erosion and pollution, and transporting litter and debris to waterways and wetlands. Damage to the natural environment may take time to repair and in some cases it is permanent. Environmental damage may cause losses in the recreational and fisheries sectors.

1.2.3 Historical flood events in Mombasa County

This section provides a summary of significant flood events and their consequences. Table 2 below provides information on the impacts we are aware of, including: the location of flooding, the approximate number of properties flooded, and communities affected and the source of floodwater.

Table 1.2 Flood history and management timeline

EVENT	IMPACT
1997-98 El-Nino	The 1997-98 El-Nino events in Mombasa led to; a) Shippers, transporters and the business community affected by poor state of roads, causing losses on vehicle maintenance, fuel and working hours. b) Shipping activities almost stopped since no merchandise discharged was being transported, as trucks destined to land-locked countries were held up at various points along the Mombasa Highway. c) A section of Mariakani and Mazeras railway line was washed away by floodwater. The passenger train to Mombasa had to be delayed for several hours at Mariakani while repairs were being done on the damaged line. d) Operations of the at Moi International Airport were disrupted, with aircraft finding it difficult to land or take off e) Over 300 containers full of imported goods submerged in the floodwaters at Kenya Ports Authority container terminal

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	f) Deaths of 5 people due to drowning in Mombasa. g) 12 people reported dead of cholera due to poor sanitation because of widespread flooding.
2004 Indian Ocean Tsunami	Heavy rains led to very large economic losses as major infrastructure and fishing vessels were damaged, and one life was reportedly lost in the tsunami
2006/7	The Kenya Red Cross estimated that approximately 60,000 people were affected by the floods in the coastal part of Kenya, a high proportion of whom were in Mombasa. The Ministry of Health issued a cholera alert after reporting 94 suspected and 13 confirmed positive tested cases of cholera. At least two deaths were reported. In addition, water sources were contaminated, several drainage systems collapsed, and water pipes were washed away.
April/May 2006	Flooding in Mombasa was attributed to poor drainage caused by the rapid growth of slums and land grab. The District Commissioner noted that the construction of perimeter walls and unplanned structures along waterways obstructs water drainage, leading to flooding in many parts of the city.
October 2006	Intense precipitation caused flooding that affected approximately 60,000 people in Mombasa city and damaged critical infrastructure (Kebede et al., 2010).
May 2017	The city received 235 mm of rainfall in a 24-hour period between May 8 and 9, 2017. The heavy rainfall led to flooding that resulted in nine fatalities. Six people were killed when a wall collapsed in Kizingo, two people died in a landslide in Mikindani, and the body of an unidentified man, believed to be a flood victim, was found in Bamburi on a Tuesday morning.
October — December 2020 Rains Season	Heavy rainfall was experienced leading to flooding. During this period, there was also an increase in dengue fever cases in the county.
November 2023	The county received significantly heavy rainfall for three consecutive days across the County that caused widespread flooding, submerging houses, displacing people, and making roads impassable. Ten people were reported dead in Mombasa, Tana River, Kwale, and Kilifi counties, including one person who died when a house collapsed in Mombasa.

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Flooding events are increasing in occurrence and intensity thus affecting properties, businesses, communities' and county infrastructure. Flood management is key in Mombasa County's agenda of building resilience to flooding and making the county safer for our community. This will reduce loss of life and injury, dislocation of people from their homes and their communities, damage to homes and businesses, damage to property and infrastructure, interference with transportation and have flow-on impacts to the economy and damage our natural environment in ways that can be permanent.

1.3 Mombasa City LAB

In 2022, Mombasa County joined Covenant of Mayors Sub-Saharan Africa (CoM SSA) an initiative of cities taking local climate action, with political commitment from 380+ sub-national governments from the region. The County Government of Mombasa in collaboration with CoM SSA identified the dire need for the county to combat impacts of climate change that face urban dwellers and achieve low carbon emissions.

A City Lab is a structured process that brings together stakeholders like government, civil society, and academia to co-create knowledge and solutions for complex urban problems. The aim is to integrate various perspectives, manage conflicts, and develop innovative ideas for tackling urban challenges.

The Mombasa City LAB, structured around three core partners and a network of local stakeholders, prioritizes local solutions to local problems. In October 2023, following a study of the main adaptation issues in Mombasa, a technical workshop brought together stakeholders to define the specific climate issue to address. After discussions and analysis, urban flooding was chosen as the primary focus. With this clear objective, the LAB was set to raise awareness and collaborate with stakeholders to develop localized solutions to mitigate urban flooding. This becomes the basis for developing a Flood Management Strategy (FMS).

The outputs for the Mombasa City LAB are 1) Flood Risk and Vulnerability Analysis (FRVA) carried out in March 2023 which identifies flood prone areas and vulnerable communities and 2) development of the Mombasa County Flood Management Strategy (FMS) in a participatory process.

The Mombasa County Flood Management Strategy is a comprehensive plan to address diverse flood risks across the county's island and mainland regions. Developed through a participatory

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process, the FMS identifies priority issues, maps vulnerabilities using GIS, and co-creates solutions with stakeholders. By emphasizing collaboration, sustainability, and community involvement, the strategy aims to enhance resilience and support Mombasa County's development goals.

1.4 Objectives of the Strategy

To build a resilient flood management system through innovation in infrastructure, ecosystem conservation, community engagement, and policy implementation to protect communities and critical infrastructure while minimizing flood risks.

1.5 FMS Development Process

The development of the **Mombasa County Flood Management Strategy (FMS) 2024–2030** followed a structured, participatory, and evidence-based approach to ensure comprehensive and practical outcomes. The process emphasized inclusivity and collaboration, ensuring that the voices of diverse stakeholders, including government entities, civil society organizations, and local communities, were incorporated. This collaborative approach enhanced the relevance, ownership, and practicality of the strategy.

The process involved four key phases:

1) **Project Initiation:** conceptualisation of the climate issues with stakeholders
    I. **Stakeholder identification** and mobilisation for engagement.
2) **Climate risk Baseline Assessment:** the climate risks were identified through stakeholder consultations and through technical analysis based on empirical data and methods.

    I. **Baseline Assessment:** a baseline to profile local climate risks with preference on adaptation challenges was undertaken by resident experts. The Baseline identified four issues considered by stakeholders interviewed to be of priority. They include river management, potable water, solid waste management and urban flooding.

        Objective: Identify the priority issues affecting flood management in Mombasa County.

        Activities:

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- Conducted literature reviews and analysis of existing studies, reports, and historical flood data.
- Engaged stakeholders through consultations to understand local challenges and needs.
- Mapped out priority areas requiring urgent intervention, such as urban flooding and solid waste management.

II. **Adaptation challenge prioritisation:** The issue was prioritised through a stakeholder consultation workshop with urban flooding emerging to be of top priority in needing intervention.

III. **Flood Risk and Vulnerability Mapping:** a detailed technical analysis of the vulnerability, exposure and adaptation capacity of the residents and assets across the entire county was undertaken using GIS multi influencing factor analysis method coupled with participatory approaches.

Objective: Assess the county's flood risk and identify vulnerable zones and communities.

Activities:

- Utilized GIS-based mapping techniques to analyze flood-prone areas and assess hazard levels.
- Conducted surveys to evaluate the socio-economic and environmental vulnerabilities of affected populations.
- Identified contributing factors such as inadequate drainage, rising sea levels, and unregulated land use.

IV. **Flood Risk and Vulnerability Mapping validation:** the flood risk maps were validated using alternative data and through stakeholder participatory input based on local knowledge and experiences.

3) **Action prioritisation:** They agreed on developing a Flood management strategy to guide the short-mid- and long-term interventions from all stakeholders.

4) **Flood Management Strategy formulation:** the strategy was formulated through stakeholder engagements to pick their opinions and input from sector specialists.

I. **Basic sensitisation of the stakeholders about FMS and its development process:** A short physical structured step by step high level training was offered

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starting to help and enable synergising the understanding and focus of the groups involved. The following are some of the topics that were covered during capacity building among others.

- FMS Process
- Legislative framework to capture provisions and functions of various state players
- Institutional framework to understand the linkages to functions
- Water resources management in the perspective of flood management
- Scope of FMS strategies covering the full cycle of the flood disaster
- Developing good strategies
- Right based Approach & inclusivity in flood management
- Categories of Flood management measures
- Concepts of Incorporating flood management in development

II. **Strategy development:** The Flood management Strategies were co-formulated through interactive multi-stakeholder sessions entailing the following.

- Identification and analysis of flood causes and challenges,
- Identification and analysis of possible intervention measures,
- Development of strategies, and validation
- Development of implementation plan

Objective: Formulate actionable strategies and plans to address identified challenges.

Activities:

- Organized multi-stakeholder workshops to co-create solutions, incorporating input from local communities, government agencies, and technical experts.
- Developed strategies around four thematic areas: preparedness, mitigation, response, and recovery.
- Incorporated both structural (e.g., drainage infrastructure) and non-structural (e.g., policies and regulations) solutions.

III. **FMS Compilation:** a draft FMS was put together and shared within the lab for commenting.

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IV. **FMS Draft commenting and Validation**: the draft FMS was presented to stakeholder for comments and validation. The validation entailed checking the accuracy of representing the identified strategies, implementation plan, and budgets. This was also undertaken through focus group cross checking and plenary summary presentations through a collective workshop.

V. **Adoption:** the validated FMS was adopted by Stakeholders in a public event.

VI. **Dissemination and Handover:** The county and other stakeholders were served a hardcopy and digital copy of the finalised FMS for implementation and dissemination to their stakeholders.

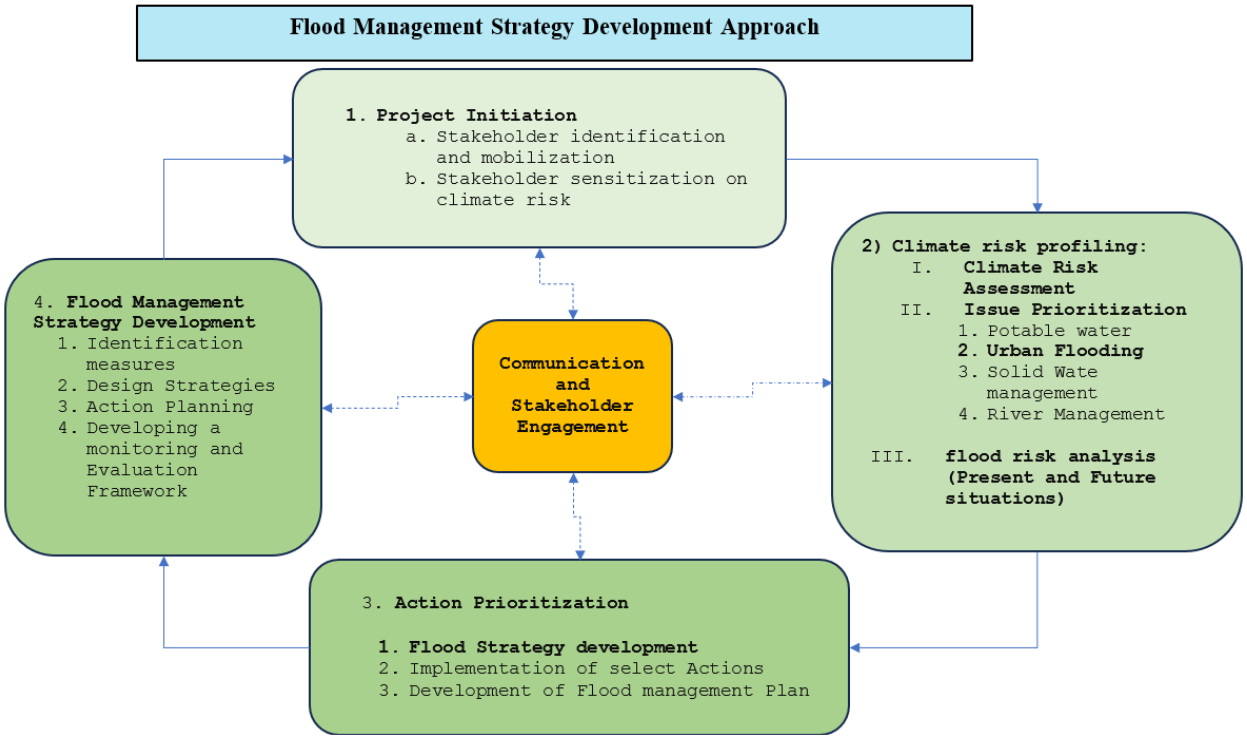

Figure 1.2 Flood Management Strategy Development workflow. Source: CoM SSA 2024

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1.6 FMS Development Process outputs

1. **Flood Risk and Vulnerability Analysis Report:** Detailed mapping and profiling of flood-prone areas and vulnerable communities.
2. **Flood Management Strategy:** A comprehensive guide outlining objectives, strategies, and implementation plans.
3. **Stakeholder Engagement Plan and Report:** Documentation of consultations and workshops that informed the strategy.

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2 CHAPTER 2: SITUATION ANALYSIS

2.1 Disaster management Challenges and emerging issues

The challenges and emerging issues discussed in this section have been documented in the CIDP 2022-2027 with additional information from discussions during bilateral meetings with stakeholders. Kenya's institutional framework for disaster response management includes a multi-tiered vertical system of authorities and other organizations from the community disaster committees/response teams, sub county, County with Emergency Operation Centre (EOC) and the headquarters at national government in Nairobi.

While there exist a national policy for disaster management, the current institutional arrangement for disaster management in Kenya is not harmonised (CoG web Admin). While Kenya has undertaken considerable efforts towards disaster mitigation, management and response to cushion communities against the vulnerabilities associated with these risks, it has been noted that disaster risk reduction should be mainstreamed in the development process at both the National and sub-national level. The CoG further argues that the disaster management function should be devolved to the County Governments to enable them effectively to prepare for and execute disaster management strategies.

Inadequate institutional mechanism and capacities for DRM has been highlighted in the Mombasa CIDP 2022-2027. In the case of Mombasa County there is limited county early warning system for prompt disaster response. Lack of adequate disaster response tools and equipment; Some of the common types of emergency response equipment include fire protection equipment, personal protective equipment, and emergency communications equipment. Some basic disaster supplies included in a kit are Water, Non-perishable food, Battery-powered or hand crank radio, Flashlight, First aid kit, Extra batteries and Whistle. In Mombasa County there is lack of adequate disaster response tools and equipment (CIDP, 2023).

Counties in Kenya are establishing Command Centres to improve disaster risk management. Counties are facing challenges such as limited resources, weak institutional capacity, policy gap, and limited capacity of disaster rescue centres and command centres (Menya & K'Akumu, 2016).

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2.2 Flood Risk Assessment

According to a recent risk assessment done by the Mombasa City lab (2024), the North-western region of the county has more areas with low to very low flood hazard levels while the South-western region and the rest of the county is faced with more moderate to very high flood hazard threats with scattered low and very low flood hazard threat zones.

Generally, the areas with low to very low flood hazard threat make up 18.9% and 7% respectively of the county's land mass. Jomvu Kuu, Miritini, Airport, Mtongwe, and Port Reitz have the highest concentration of low flood hazard threat areas. Moderate flood hazard zones constitute 30.7% of the county area and they are widely distributed especially in the central, Southern and Eastern regions of the county.

Low to very low flood hazard vulnerable areas constitute 40.6% and 12.8% of the county's land mass while moderate, high to very high vulnerability makes up 30.4%, 9.2% and 6.9% of the county area. This makes the county more vulnerable to hazard as most of its' landmass is facing moderate to high flood risk.

The county dwellings depict a high level of adaptation to floods hazard, a factor associated with the distribution of the coping support infrastructure. Very high, high, moderate, low, and very low adaptation capacity constitute 41%, 22.8%, 18.4%, 13.4%, and 4.3% respectively.

The county's flood Risk assessment indicates that 9.5% of the county area is under very high flood risk. High risk, moderate, low risk and very low risk constitute 21.3%, 28.7%, 27.3% and 13.2% respectively. Generally, all the ward areas face varying levels of flood risk. It is evident that high flood risk is faced by over 30% of the county area (Omanga, 2024).

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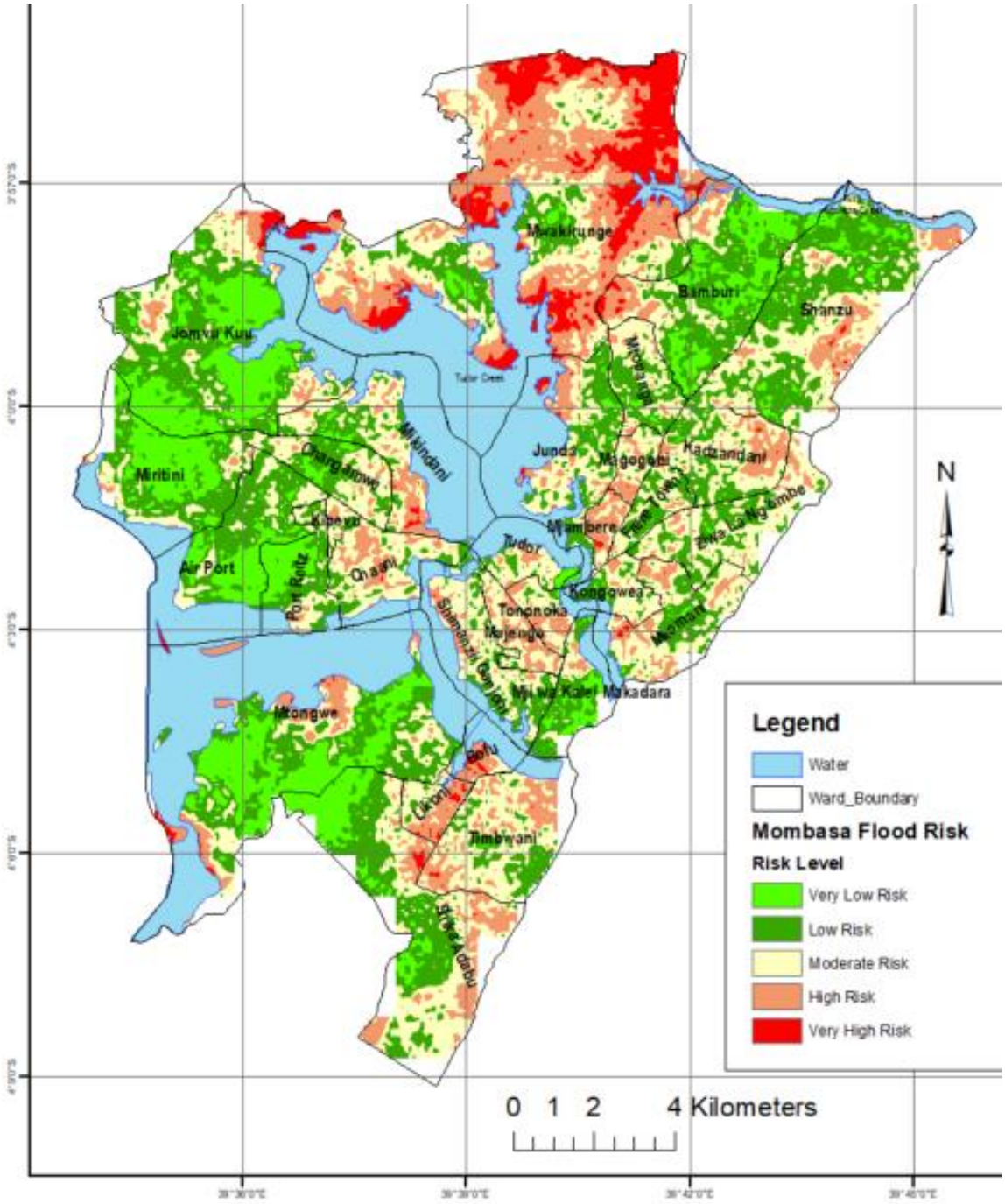

Figure 2.1 Flood risk Map developed using Multi-influencing Factor Analysis Criteria. Source: CoM SSA 2024)

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2.3 Flood Vulnerability Assessment

The vulnerability assessment examines the county's susceptibility and its adaptive capacity to flood hazards. Areas with low to very low flood hazard vulnerability constitute 40.6% and 12.8% of the county's landmass, respectively. Moderate, high, and very high vulnerability zones cover 30.4%, 9.2%, and 6.9% of the county area, indicating that a significant portion of the county is moderately to highly vulnerable to flood risks.

The county's adaptive capacity to flood hazards also varies significantly. Very high adaptive capacity is observed in 41% of the county, followed by high (22.8%), moderate (18.4%), low (13.4%), and very low (4.3%) capacities. This suggests that a considerable proportion of the population benefits from coping infrastructure, enhancing resilience to flood hazards.

By combining risk and vulnerability data, it becomes evident that Mombasa County faces substantial challenges in flood management. Over 30% of the county's area is at high risk, and significant vulnerability persists across many regions, emphasizing the need for comprehensive flood mitigation strategies.

2.4 Current Approach to Flood Management

Mombasa County manages floods through a combination of infrastructure development, policy frameworks, and community-based strategies. Key measures include the enactment of the Mombasa County Disaster Preparedness and Emergency Management Act, 2017 (No. 8 of 2017), constructing and repairing stormwater drainage systems, maintaining waste management practices to prevent blockages, and implementing zoning and drainage policies to regulate urban development. Flood mitigation is also incorporated into the County Spatial Plan through integrated urban planning. Additionally, public awareness campaigns and capacity-building initiatives engage communities in both prevention and response efforts. Climate adaptation measures and disaster risk management frameworks are in place to address challenges like rising sea levels and extreme weather events.

The county also follows a structured approach defined by disaster preparedness and emergency management frameworks. The county government coordinates the actions of various departments, non-governmental organizations, and other stakeholders to handle emergencies effectively. This includes collaborating with research and training institutions focused on disaster management and helping other affected counties or individuals.

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Flood response is activated when the Governor declares a disaster or emergency, which is communicated to the public. The Governor has the authority to issue orders to mitigate flood effects, such as evacuations, controlling travel, and utilizing resources to combat the disaster. Once the flood situation is under control, the Governor can terminate the disaster period and communicate its resolution to the public.

Mombasa's current flood management also includes preventive actions. The disaster management committee issues notices to property owners to address potential hazards within a specified time, and failure to comply may result in penalties or direct intervention. Furthermore, the County Disaster and Emergency Management Fund finances flood management activities, replenished through grants, donations, loans, and other sources. The county allocates part of its annual budget to disaster management, including funding for training, research, and emergency preparedness.

In times of immediate need, the county utilizes emergency procurement procedures to acquire resources for disaster response, adhering to public procurement laws. Mombasa County continues to rely on emergency interventions to mitigate flood impacts. This includes clearing blocked drainage channels, repairing damaged infrastructure, and providing relief services such as food, water, and shelter to affected populations. Community mobilization plays a vital role, with disaster response teams activated for evacuations and early warning dissemination. Collaborations with national bodies and NGOs enhance the county's capacity for flood response.

During and after floods, the county focuses on relief and recovery efforts, distributing food, water, and shelter to affected populations. Recovery activities also prioritize restoring critical services like water supply and electricity. Mombasa collaborates with national bodies and non-governmental organizations to enhance its flood response capacity, securing additional resources and technical support for relief operations.

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3 CHAPTER 3: FLOOD POLICY & GOVERNANCE

3.1 FMS Principles

Flood Management policy is developed with consideration of the following primary concepts (World Meteorological Organisation, 2017).

1) **Integrated planning and resource management:**

   The strategy recognizes that planning of water sector activities should take a transboundary, national, cross-county, county and community approach towards the development of national integrated investment and financing plans. The management and development of flood and associated infrastructure shall consider different and competing interests of groups, sectors and the needs of the environment. Planning for flood management and economic development should be integrated.

   - Planning while perceiving flood as a resource that can be exploited to develop economies through multi-beneficial benefits.
   - Water harvesting directly changes the available water to cause flooding but also solves water scarcity challenges in given localities.
   - Avoiding waterways/Floodways is the safest measure to prevent/mitigating flood disasters. Controlled, regulated and enforced development is vital to minimize development and lives getting exposed to flooding.
   - Land, natural resources on land and land uses should be managed together to allow alignment, coordination and clear allocation of land use to the competing uses while exploiting measures that minimize risk.
   - Flood management and Urban planning should be closely collaborated in policy and implementation of actions through a multistakeholder approach.
   - The flood risk of assets and people living in flood plains need immediate, medium and long-term measures in an integrated approach that is centered around water catchment management approaches.
   - Standards, manuals, procedures and guidelines should embrace solution integration.

2) **Intergovernmental and participatory:**

   The strategy recognizes distinctiveness and interdependence of the two levels of government in line with Kenya's Constitution and the Intergovernmental Relations Act,

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2013. It has adopted a cross-sectorial approach which takes advantage of potential synergies.

3) **Good governance:**

Effective Disaster Risk Management requires an elaborate and well-structured strong governance framework with clear policies and legislation, accountability, institutional and organizational arrangements and linkages across and within levels of government, sectors and communities (Goverment of Kenya, 2009).

The development and implementation of the Flood management Strategy for Mombasa County shall respect the national principle of governance as recognised under article 10(2) of the Constitution of Kenya 2010 and include participation, inclusiveness, rule of law, respect for human rights, transparency and accountability. Promoting participation and inclusive approaches.

- Planning and strategizing for flood action needs elaborate involvement of all stakeholders in each locality. This includes planners, community and resource users, policy makers etc.
- Flood management decisions need to be decentralised to allow public involvement in the entire flood management process
- Special need groups such as women, youth, the sick, disabled and the elderly must be included in the process.
- A balance between "top-down" and "bottom up" flood management approaches is healthy for effective interventions.
- Well-structured coordination between government, community and other groups must be well managed to ensure flow of information and wide cooperation and consultation.

4) **Sustainable development:**

Disaster Risk Management is a sustainable development issue which requires a coordinated and collaborative approach in addressing social, economic, and environmental goals, and fundamentally involves supporting communities in understanding and managing the hazards and disasters affecting them. The strategy recognizes the need to nurture healthy ecosystems and support sustainable management of land, social environment, socio-economic, water and natural resources. This is in line with the United Nations Sustainable Development Goals (SDGs).

- Preventive solutions, especially soft measures, are sustainable and resource efficient with minimal damage to the state of the environment.

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- Adaptation measures are effective when developed based on the level of risk.
- Early warning and forecasting of flood disaster reduces flood impact
- Preparing to act and efficient response mechanism is the major enabler of mitigating the impact of flooding

5) **Subsidiarity and Tiered Response System:**

The basic principle of "Subsidiarity" requires that functions and actions should be undertaken at the lowest or least centralized competent level possible. The concept of "Tiered Response" suggests that disaster response is by default always handled first by the directly impacted community and families, then the local governments and organizations. When response-needs exceed local capacity, then the next highest level assumes responsibility for response up to the level of international support.

3.2 Institutional Arrangements & governance

Table 3.1 Key Public Sector Institutions and their mandates related to flood management

ROLE	AGENCY	KEY FUNCTIONS (S)
Policy	1) Ministry of Water, Sanitation and Irrigation. 2) Parliament 3) County Assemblies	• Overall, Policy formulation of the Water Sector in Kenya, mobilisation of resources, capacity development and creating enabling environment (Ministry of Water, Sanitation and Irrigation, 2021).
Water Availability, management, Control and Water Infrastructure development and management (National Agencies)	National Water Harvesting and Storage Authority (NWHSA).	• Development and management of national public Water Works for the water resources management and flood Control • Collect and provide information for the formulation by the Cabinet Secretary of the National Water resources Storage and flood control strategies • Advise on any matter concerning national public Water Works for Water Storage and flood control

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ROLE	AGENCY	KEY FUNCTIONS (S)
	Water Tribunal (WT)	• Resolution of appeals of parties directly affected by decisions of Water Sector Agencies and other water resources and service concerns (Ministry of Water, Sanitation and Irrigation, 2021).
	Water Sector Trust Fund (WSTF)	• Provision of conditional and unconditional grants to counties to support the financing of the development and management of water services in marginalised areas. These include community level initiatives on sustainable management of water resources, development of water services in underserved poor urban areas and support research activities in areas of water resources management, water services, sewerage and sanitation (Goverment of Kenya, 2016).
	Regional Centre on Groundwater resources, Education, training (RCGW)	• Research, Capacity building, education in Groundwater resource management and promote regional cooperation in the management of groundwater resources (Ministry of Water, Sanitation and Irrigation, 2021).
	Water Resources Authority (WRA)	• Set standards, procedures and regulations for the management and use of water resources and flood mitigation. Enforce and regulate the use of water resources. • Provide information and advice to the cabinet Secretary for formulation of policy on national Water Resource management, Water Storage and Flood Control Strategies.

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ROLE	AGENCY	KEY FUNCTIONS (S)
	Water Works Development Agencies (WWDA)	• Undertake the development, maintenance and management of the national public water works within its area of jurisdiction. • Provide technical services and capacity building to county as requested
Water Availability, management, Control and Water Infrastructure development and management (Sub-National Agencies)	Basin Water Resources Committee (BWRC)	• Collection, analysis and management including sharing of water resources information system • Flood mitigation Activities • Review basin Area Water resource management Strategies
	Water resource Users Association (WRUA)	• Collaborate in the management of Water resources and resolution of Water resources conflicts
	Water Service Providers (WSPs)	• Provision of Water and sanitation services within a specified service area • Development of county assets for water service provision
Disaster management	Disaster Operations Center (DOC)	• Responsible for management of all disasters through the Disaster Management Committees (DMC) at the county levels. The role of the DOC is coordination of post disaster related activities of various Ministries up to the county level.
	Disaster Management Committees (DMC)	• Coordinate and monitor the implementation of the County Policy on Disaster and Emergency Management and the County Disaster and Emergency Management Plan;

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ROLE	AGENCY	KEY FUNCTIONS (S)
		• Examine the vulnerability of different parts of the county to different disasters and identify specific prevention, reduction or mitigation measures; • Lay down guidelines to be followed for preparation of disaster and emergency management plans by the county departments. • Evaluate preparedness at all governmental or non-governmental levels in the county to respond to disaster and emergencies and to enhance preparedness. • Co-ordinate response in the event of disaster or emergency; • Give directions to any county department or authority regarding actions to be taken in response to disaster or emergency; • Promote general education, awareness and community training in this regard; • Promote the recruitment, training and participation of volunteers in disaster and emergency management in the county; • Advise the county government on matters relating to disaster and emergency management; • Promote education, training and capacity building on disaster and emergency management in the county including in schools; • Advise the county government regarding all financial matters in relation to disaster and emergency management; • Promote an integrated and co-ordinated approach to disaster and emergency management in the county, with special emphasis on prevention,

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ROLE	AGENCY	KEY FUNCTIONS (S)
		mitigation and disaster risk reduction by other role players involved in disaster and emergency management in the county; • Collaborate with the national government and relevant agencies on matters relating to disaster and emergency management; act as a repository of, and channel for information concerning disasters; emergencies; impending and potential disasters; and disaster and emergency management; • Act as an advisory and consultative body on issues concerning disasters and emergency management in the county to state organs; the private sector and non-governmental organisations; and communities and individuals; • Initiate and facilitate efforts to make funding of disaster and emergency management in the county available; • Promote research into the aspects of disaster and emergency management in the county; and • Give advice and guidance by disseminating information regarding disaster and emergency management in the county, especially to communities that are vulnerable to disasters or emergencies. (County Government of Mombasa, 2017)
Research, Innovation and integration of technologies	1) Ministry of Water, Sanitation and Irrigation. 2) Kenya Water Institute 3) Regional Centre on Groundwater resources,	• Undertake and support research and studies for the water sector domain • Build capacity of sector beneficiaries

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ROLE	AGENCY	KEY FUNCTIONS (S)
	Education, training (RCGW) 4) Universities 5) Kenya Marine and Fisheries Research Institute (KMFRI) 6) Kenya Forestry Research Institute (KEFRI)	
Monitoring and Assessment	1) Water Resources Authority 2) Kenya Meteorological Department (KMD) 3) County Governments	• Data collection • Data processing and analysis • Data exchange • Early warnings • Monitoring and assessing programs and projects

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3.3 Policy Framework

Table 3.2 Key policy and regulatory instruments related to flood management

POLICY	PROVISIONS FOR WATER REGULATION & MANAGEMENT
The Constitution of Kenya, 2010	Water resources management has been specifically addressed by **Article 42** of the Constitution of Kenya (CoK), confers on every person a right to **a clean and healthy environment** which includes the right to have the environment protected for the benefit of present and future generations. The **Fourth Schedule Part ii (10)** of the CoK confers to the county governments the function of implementing specific national policies pertaining to natural resource and environment conservation (Government of Kenya, GoK, 2022). CoK, 2010 schedule 4 **Part 1** outlines national goverment functions. The major ones related to flood management include • Section 2, **The use of international waters and water resources**- control and regulation of water use in the republic from whatever source. Decisions on the appropriation of flood water into any beneficial or mitgative use will need approval of the national goverment. • Section 11, **National statistics and data on population, the economy and society generally.** WRA and Kenya Meteorological department will provide Water Resources information for National Development on behalf of national goverment. • Section 19, **National public works**- Water resources Development permitting and compliance to permit conditions. This is a major enabler and role for structural flood mitigation measures. The design, construction and maintainance will benefit from the role of national goverment and its agencies. • Section 22, **Protection of the environment and natural resources** with a view to establishing a durable and sustainable system of development, including, in particular. (c) water protection, securing sufficient residual water, hydraulic engineering and the safety of dams **.** • Section 24. **Disaster management**- Water Related disasters like floooding , drought and landslides. The national government is a major player in the

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POLICY	PROVISIONS FOR WATER REGULATION & MANAGEMENT
	management of disasters with a clear organisational and policy structure guiding the implementation of this function. • Section 32, **Capacity building and technical assistance to the counties**. The national and sub national collaboration to build capacities for counties to act against the impacts of flood and other disasters is fundamental.
Kenya's Vision 2030	The Kenya Vision 2030, published in 2007, provides the national development blueprint. Implication of targets set in Vision 2030 for the water sector include: • **Water and sanitation** – to ensure that improved water and sanitation are available and accessible to all by 2030. Flooding affects access to safe water and good sanitation, mostly in the urban areas. The contamination of water sources is often a result of flooding that transports pollutants across the land, contaminating water points. • **Environment** – to be a nation that has a clean, secure and sustainable environment by 2030. Flooding is a driver of environmental quality degradation especially when it is destructive or transporting chemical or scenic pollutants and depositing them where they are undesired.
The Water Act, 2016	The **Water Act, 2016** outlines the institutional mandates of key water sector institutions and sets out the role of counties in the water sector. It also defines a clear role for the WRA in the regulation of water resources, which provides a potential strengthening in the way that water resource development is regulated and managed. **Section 6**, of the Act directs the regulation of use and management of water resources to be a responsibility of the WRA as an agent of the national government. **Section 29(1)** of the Act provides for the possibility of establishing a Water resource users association (WRUA), a community-based association for collaborative management of water resources and conflict resolution. A **Sub-Catchment Management Plan (SCMP)** is a tool that has been adopted by the government and implemented through the WRUA to facilitate the lowest public participatory implementation of the mandate of managing and regulating water resources. The SCMP has a chapter that focuses on flood management and

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POLICY	PROVISIONS FOR WATER REGULATION & MANAGEMENT
	its associated disasters and residual effects. The community assesses their flood risk and contributes to the actions being planned. A Sub-Catchment Management Plan (SCMP) is a tool that has been adopted by the government and implemented through the WRUA to facilitate the lowest public participatory implementation of the mandate of managing water resources. More essential to the structure is the establishment of WRUA which has now been widely adopted across the country, and many have developed SCMPs. The SCMP has a whole chapter on Floods and water related disasters. Some of the strategies proposed in this strategy will find their way into a SCMP for implementation. **Section 29(1)** of the Act provides for the establishment of Water resource users association (WRUA) which is a community-based association for collaborative management of water resources and conflict resolution. More essential to the structure is the establishment of WRUA which has now been widely adopted across the country. It is within this clarity that this strategy is developed and implemented for the benefit of implementing national and sub national plans for the benefit of all citizens. In Kenya, WRA has **Basin area offices** that are established around regulation of the use of water resources and generation and dissemination of information on matters relating to water. The establishment of monitoring systems for water and gathering such data is the responsibility of the Authority. Managing floods is a process that needs organised groups at community level with clear communication and enabling infrastructure. The Act has recognised the existence of the Water Resources Users Association as the lowest group at community level that can act in water resources related actions. This is where flood management can be actualised through a well-structured institutional arrangement which can link up with the disaster management groups for efficiency and ensure long term readiness to act against flooding (Goverment of Kenya, 2016).

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POLICY	PROVISIONS FOR WATER REGULATION & MANAGEMENT
National Water Resources Management Strategy, 2020-2025	The Kenya **National Water Resources Management Strategy 2020-2025** provides the overarching policy framework for water resource management and development in Kenya, despite several successive adjustments in the core water legislation. This consistency in policy intent has been critical in guiding the water sector, with legislative amendments being progressively utilized to improve and strengthen the way that policy is affected (Ministry of Water, Sanitation and Irrigation, 2021).
National Water Master Plan (2030)	The National water master Plan flood protection plan was formulated giving focus on structural and non-structural measures (Japan Inetrnational Cooperation Agency, 2013). The major proposals are as follows: • Protection using structural and non-structural measures • Integration of no settlement policy in regulation and regional programs. • Community Based Disaster Management (CBDM). Support Community capacity building on early flood warning and disaster management.
National Climate Change Action Plan (NCCAP), 2023-2027	The National Climate Change Action Plan (NCCAP) identifies seven priority action areas, including disaster risk reduction. Flood disasters have increased in frequency and intensity in recent decades. This being a priority is a good step towards mitigating its impacts (Ministry of Climate Change and Forestry, 2023).
National Disaster Risk Management Policy, 2017	National Disaster Risk Management Policy, 2017 - Calls for establishment and strengthening of institutional mechanisms and capacities for Disaster Risk Management. Calls for reduction of disaster risk and vulnerabilities at local, county, and national level. Advocates for mainstreaming disaster risk management (DRM) into sustainable development policies, strategies, and plans at all levels and within and across all sectors (Goverment of Kenya, 2009).
The Physical and Land Use Planning Act, 2019	An Act of Parliament to make provision for the planning, use, regulation and development of land and for connected purposes. The act also provides a framework for the coordination of physical and land use planning by county governments.

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POLICY	PROVISIONS FOR WATER REGULATION & MANAGEMENT
Mombasa County Integrated Development Plans (CIDP)	A 5-year term blueprint that guides development (including environment and disaster related issues) in Mombasa County. • To repair and construct storm water drains along all roads and flood prone areas • Implementing climate change adaptation and mitigation measures • Establish vulnerability areas for proper development • Enhancing municipal solid waste management: Solid waste management act, Solid waste management policy and a climate change policy and their implementation • Enhance natural resource management and climate resilience • To improve land management practices
Mombasa County Climate Action Plan 2023 – 2050	A 25-year framework aimed at addressing climate change adaptation and mitigation. It prioritizes actions to strengthen the county's resilience to the impacts of climate change, recognizing the urgent need for response. The plan provides a strategic pathway for creating more sustainable and resilient institutions and communities, helping Mombasa navigate the challenges posed by climate change and ensuring long-term environmental, social, and economic stability.
The Mombasa County Disaster Preparedness and Emergency Management, 2017.	Mombasa County Disaster Preparedness and Emergency Management Act, 2017. – defines stakeholder roles and responsibilities, provides for the implementation of actions and roles and responsibilities of various county organs in the event of disaster. This is the enabling platform for developing a flood management Strategy that is implementable with the backing of the policy (County Goverment of Mombasa, 2017). The Act establishes the Disaster and Emergency Management Committee chaired by the Governor
Mombasa Vision 2035 - ISUDP	• Prioritizes the development and maintenance of a comprehensive drainage network involving constructing new drains along existing roads, developing primary and secondary drains, aligning and maintaining existing drainage systems, and desilting and covering major stormwater drains.

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POLICY	PROVISIONS FOR WATER REGULATION & MANAGEMENT
	• Removal of encroachments on drainage areas to reduce flooding incidences, and regular cleaning of drains is emphasized during the rainy season • Integrates drainage network into urban planning. • Strengthens formal waste disposal practices to mitigate flood risks and clean-up efforts in flood-prone areas • Enhances the resilience of drainage and waste management systems and ensuring continuous monitoring and enforcement of urban development policies to align with flood mitigation objectives.
Mombasa County Climate Change Action Plan 2020-2024	• Supporting afforestation, reforestation, and sustainable land management practices • Developing infrastructure that is resilient to climate impacts, such as flooding and rising sea levels • Raising awareness about climate change impacts and solutions • Supporting vulnerable populations with targeted interventions to reduce risks • Mainstreaming climate change considerations into county development plans • Conducting vulnerability assessments and climate risk mapping • Establishing systems for monitoring and evaluating the progress of climate actions •

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4 CHAPTER 4: FMS OBJECTIVES & STRATEGIES

4.1 Introduction

Flood Disasters are largely unsystematic and had to accurately predict their magnitude. Protection measures are put in place with an anticipation of some level of risk prevailing. A single measure is not always guaranteed to offer full protection, needing complementary measures in place.

The capacity of the community to respond to flood is often a product of their preparation which heavily depend on their education and awareness level on floods, health, age, occupation, access to data and information and economic resources to invest in adaptive measures that will reduce the chances of flood hazards turning disastrous. Increased education and awareness with strategic technical capacity establishment increases the ability of a given community to be resilient to flood hazards. Improved living standards include the ability of people to access better health care, infrastructure such as housing, transportation, evacuation centres etc. Better resourced communities control floods, respond and recover better from flood events (Thieken et al., 2007).

The strategic flood management actions are organised around four (4) thematic areas: (1) Preparedness, (2) Mitigation, (3) Response and (4) Recovery. A mix of strategies and actions applied differ between the analysed localities facing flooding. There is no one solution that can solve all flood challenges. An optimal mix must be tailored to the physical and societal context and needs to be based on societal and political priorities regarding the objectives and priority of need. Considering the uncertainty about the future, flood-management strategies must be flexible, resilient and adaptable to changing conditions.

Flood strategies are evaluated against three ultimate aims of flood risk management. First, resilience includes developing the capacity to resist floods, ability to absorb and recover from floods and adaptive capacity among the affected. The second aim is for the strategies to be legally and socially accepted with very efficient economic returns Thirdly, flood risk management should be legitimate: the input, process and output should be societally acceptable (G. T. Raadgever et al., 2018).

4.2 Flood Management Strategic Objectives

The flood disaster management cycle is a process that involves a series of activities to help manage a disaster and reduce the risk of loss. The cycle is often represented as a series of four phases:
Preparedness: – Activities to prepare for a disaster

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Mitigation: – Activities that are intended to significantly reduce or even eliminate the risk of flooding before it occurs.

Response: - Activities to respond to a disaster when it has happened

Recovery: - Activities to help communities return to normal life

The activities in the disaster management cycle are interlinked and can be classified as pre-disaster (preparedness and mitigation), during-disaster (response), and post-disaster (recovery) activities. Implementation time scales are:

- Short term: 0 – 1years
- Medium term: 1 – 3 years
- Long term: >3 years

4.3 Pre-Disaster: Flood Preparedness and Risk Reduction

Disaster preparedness is a package of precautionary measures, taken in advance of an imminent threat to help people and institutions respond to and cope with the effects of a disaster. The aim of preparedness programmes is to reach an appropriate level of readiness to respond to any emergency that might arise, through programmes and actions that strengthen the technical and governance capacity of governments, organizations and communities to respond (Goverment of Kenya, 2009).

1) **Strategic Objective 1:** To reduce the flood risk of the residents and assets through multisectoral integrated approach in building the readiness among the community to control, respond and recover from a flood disaster.

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General Strategic Objective 1:	To establish an enabling environment for optimal flood action in all sectors to reduce the impacts of flood		
Strategy	**Specific Objectives and Actions**	**Duration**	**Responsible**
S1. Develop policies, regulations and implementation plans that will enable flood management	**Specific Objective 1:** Strengthen the Policy and institutional framework Enabling environment for Flood Action in Mombasa County ▪ **Develop flood management focused Policies** 1. Develop Flood management Policy ▪ **Develop strategic implementation plans to support implementation of flood action** – *Mainstream Nature-based Actions in County development plans* – *Embrace inclusivity in flood policies* 1. Integrated Flood Management Plan (IFMP) that includes Flood Emergency Evacuation, Flood Emergency Response and Recovery, procedures and guidelines for aid handling, supply of recovery resources, etc – *Community Based Flood Action Plans* 2. Spatial plan 3. Support the Water resource Users Associations in development of Sub catchment Management Plans 4. Develop emergency response plans – Family emergency response plans – institutional emergency response plans – business continuity response plans – Critical infrastructure response plans – Evacuation plans – Communications plans	**Short-term**	**CGM/ WRA**

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General Strategic Objective 1:	To establish an enabling environment for optimal flood action in all sectors to reduce the impacts of flood		
Strategy	**Specific Objectives and Actions**	**Duration**	**Responsible**
	– Resettlement plans		
S2. Undertaking a detailed flood **r**isk profiling	**Specific Objective 1:** Undertake countywide Vulnerability, exposure, and risk mapping Identify and map settlements, social groups, natural and man-made assets vulnerable, exposed and at risk to flooding	**Short-term**	**CGM**
S3. Improve Awareness, monitoring and planning framework within the county for optimal decision making	**Specific Objective 1**: Improve monitoring network through adoption of proven accessible technologies, ensuring reliable data collection, processing, interpretation and dissemination 1. Establish a comprehensive flood disaster information system and an early warning situation room for emergency and communication, real time data integration to facilitate early warning to trigger timely actions ahead of the disaster 2. Map the hydrological units in the county to understand water flows 3. Inventorise current infrastructure, land use and building codes 4. Evaluate the adequacy and efficiency of the existing hydrometeorological monitoring Network and update designs 5. Undertake awareness creation campaigns among affected communities 6. Assess capacity development needs among county staff and its stakeholders in relation to flood management and support development of required capacities	**Medium-term**	**CGM**
S4. Promote and encourage partnerships for flood action	**Specific Objective 1**: Enhance stakeholder collaboration and inclusivity in reducing impacts of Flooding 1. Develop a Stakeholder engagement and Communication network for flood management	**Short-term**	**CGM**

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General Strategic Objective 1:	To establish an enabling environment for optimal flood action in all sectors to reduce the impacts of flood		
Strategy	**Specific Objectives and Actions**	**Duration**	**Responsible**
	2. Incorporate community participation at various levels of planning, implementation and management of floods with special provisions for enabling participation of women, youth, PWDs and minority groups. 3. Encourage Non-governmental Organizations to motivate and facilitate community participation at various stages including relief and rescue operations and capacity building at community level		
S5. Improve infrastructure management to optimize performance reducing risk of failure	**Specific Objective 1**: Upgrade and improve the storm water drainage system and maintain waterway channels 1. Cleaning, clearing and maintenance of storm water drainages and natural water ways	**Short-term**	**CGM**
	Specific Objective 2: Integrate nature-based solutions in flood management measures **1.** Design and integrate Nature-based solutions	**Medium-term**	**CGM**
	Specific Objective 3: Development of Flood proofing infrastructure 1. Identify suitable Evacuation and rescue centres 2. Design and maintain adaptable and resilient infrastructure for drainage and residential areas, with specific consideration towards vulnerable informal settlements	**Medium-term**	**CGM**
	Specific Objective 4: Establish all-inclusive shelters in all the affected areas	**Short-term**	**Red Cross/ CGM**

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General Strategic Objective 1:	To establish an enabling environment for optimal flood action in all sectors to reduce the impacts of flood		
Strategy	**Specific Objectives and Actions**	**Duration**	**Responsible**
	1. Identify and plan temporary shelters and relief centres across the affected areas with priority to facilities compliant to the needs of special groups in society such as the elderly and those living with disability.		
S6. Improve waste management to limit the intrusion of waste into stormwater management system	**Specific Objective 1**: Strengthen waste management compliance with legislation 1. Disconnect illegal sewer connections to the stormwater drains **2.** Expand the sewer network infrastructure coverage 3. Install screens at the stormwater inlets **4.**	**Short-term**	**CGM**
	1.	**Medium-term**	**CGM**

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4.4 Pre-Disaster: Flood Mitigation

Flood Mitigation activities are intended to significantly reduce or even eliminate the risk of flooding before it occurs.

1) **Strategic Objective 2:** To Integrate the use of structural and non-structural solutions for flood mitigation

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Strategic Objective 2: Mitigation	Integrate the use of structural and non-structural solution for flood mitigation		
Strategy	**Actions**	**Duration**	**Responsible**
S1. **Implement and enforce policies that support flood management**	**Specific Objective 1:** Strengthen the Policy and institutional framework Enabling environment for Flood Action in Mombasa County 1. Undertake policy analysis, economic evaluation, 2. Develop a policy brief on flood management 3. develop a costed Nature-based Solutions (NbS) Investment Plan for flood management 4. Implement Institutional Structures and policy implementation instruments required to operationalize Flood Fund, Mombasa Flood Advisory Board, Disaster Management Committee, village response teams etc. 5. Identify and institutionalize required organisation structures especially at community level i. Establish Mombasa Advisory Board ii. Identify early Warning monitors/Agents at Village level iii. Form community flood management committees i.e. at sub-county level. 6. Implement Integrated Flood Management Plan (IFMP) Activities in priority areas. 7. Sensitize stakeholders on every policy document 8. Invest in the implementation of Sub Catchment Management plans to manage catchments for reducing soil erosion, surface run off and protection of riparian land preventing settlements exposing to floods 9. Mainstreaming functions of the Disaster management Committee in all sectors	**Medium-term**	**CGM**

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Strategic Objective 2: Mitigation	Integrate the use of structural and non-structural solution for flood mitigation		
Strategy	**Actions**	**Duration**	**Responsible**
	10. Ensure equal representation of special groups including women, youth and people with disability are included in the governance of flood action as provided for in the constitution. 11. Enforce Land use zoning guidelines especially for riparian and low-lying areas. **12.** Strengthen Environmental Social Governance tools; ESIAs, EIAs etc.		
	Specific Objective 2: Strengthen waste management compliance with legislation 1. Undertake Community education and awareness on wastewater management – through chief barazas (village elders), learning institutions, all-inclusive workshops, the media i.e. social media, radio stations and tv stations. 2. Enforce compliance – through policy formulations, monitoring and Evaluation, development control and regular inspections. 3. Enforce municipal solid Waste segregation to enhance material recovery reducing waste ending up in the environment.	**Medium-term**	**CGM/WRA**
S2**. Improve information and make data more accessible, accurate, understandable and accurate for public consumption**	**Specific Objective 1:** Improve monitoring network through installation of modern equipment, ensuring data collection and security for the installations 1. Establish a comprehensive communication and information system to provide advanced flood warning to the village level communities. 2. Rehabilitate/Install/Update hydro-meteorological database in KMD and WRA making the data accessible to the county and other stakeholders.	**Long-term**	**WRA/KMD/ CGM**

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Strategic Objective 2: Mitigation	Integrate the use of structural and non-structural solution for flood mitigation		
Strategy	**Actions**	**Duration**	**Responsible**
	3. Undertake Sensitization and awareness on Early Warning and Flood Prediction through use of media i.e. tv, radio, social media, 4. Build Capacity of mandated county entities, non-government involved groups, community agents 5. Plan Community Level education on Early warning, and undertake Drills on evacuation and relocation 6. Create awareness and basic skills on consuming weather/climate information products 7. Generate seasonal weather forecasts and disseminate through an agreed channel of communication		
S3. **Implement flood impact mitigation measures**	**Specific Objective 1:** Enhance stakeholder collaboration in reducing impacts of Flooding 1. Enhance stakeholder collaboration through use of a common information sharing platform 2. Strengthen existing community level disaster response teams **3.** Capacity build flood management teams	**Medium-term**	**CGM**
	Specific Objective 2: Upgrade and improve the storm water drainage system and maintain waterway channels 1. Construction/Upgrade/Rehabilitate storm water drains in affected areas 2. Install Solid waste screen interceptors on the waterways and drainage systems	**Medium-term**	**CGM**

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Strategic Objective 2: Mitigation	Integrate the use of structural and non-structural solution for flood mitigation		
Strategy	**Actions**	**Duration**	**Responsible**
	Specific Objective 3: Mobilize Resources for implementation 1. Seek financial assistance from local and international partners 2. Establish and implement Public-Private partnership in flood mitigation. 3. Establish and operationalize a flood fund in the county in its 5yr County plans **4.** Educate the public on the available resources for flood action 5. Ring fence disaster response fund in county budgetary allocation	**Long-term**	**CGM**
	Specific Objective 4: Implement catchment management measures to regulate surface flow 1. map and assess of key ecosystems 2. Clear and protect developed water ways 3. Invest in the implementation of Sub Catchment Management plans to manage catchments for reducing soil erosion, surface run off and protection of riparian land preventing settlements exposing to floods 4. Implement water conservation measures in close collaboration with the ministry of Water, Irrigation and Sanitation and Preservations of water ways for water conveyance 5. Implement Soil conservation measures in collaboration with the ministry of Agriculture 6. Increase tree and green cover in the catchment upstream and on water ways/riparian land through sensitization and awareness.	**Long-term**	**CGM/ WRA**

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Strategic Objective 2: Mitigation	Integrate the use of structural and non-structural solution for flood mitigation		
Strategy	**Actions**	**Duration**	**Responsible**
	7. Rehabilitation/restoration of degraded ecosystems such as mangroves and near shore areas to help in breaking storm surges and soil loss.		
	Specific Objective 5: Sustain Livelihood opportunities among affected areas 1. Promote diversification of livelihood options to reduce impact of flooding **2.** Partner and support with Water Resources Users Associations for potential water harvesting for economic use after flooding	**Medium-term**	**CGM**
	Specific Objective 6: Development and maintenance of stormwater infrastructure and Flood proofing infrastructure 1. Construction of soil erosion control measures to stabilize landforms and prevent soil loss 2. Construction of new drainage systems including vertical drains and storm water drains 3. Construct retention areas in flooding 4. 5. Mainstream flood proof building technology in reconstruction and new infrastructure development	**Long-term**	**CGM**

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4.5 During Disaster: Flood Response

Response involves interventions taken during or immediately after a disaster. Such actions are directed towards saving lives and livelihoods and dealing with the immediate damage caused by disaster. The focus in this phase is on meeting the basic needs of people until permanent and more sustainable solutions are in place. The capacity of a system to respond to floods is dependent on its stakeholders, environment, communities and required infrastructure (Marfai et al., 2015). Public Response to warnings such as disaster alerts is a social psychological process that involve (1) hearing the warning, (2) forming a personal understanding of the warning, (3) developing a personal belief in the information conveyed by the warning, (4) personalise the risk or take it to be someone else's risk and (5) making the decision on the action to take (Mileti, 1995).

Strategic Objective 3: To Provide immediate assistance that ensures survival and well-being of affected populations

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Strategic Objective 3: Response	To provide immediate assistance that ensures survival and well-being of affected populations		
Strategy	**Actions**	**Duration**	**Responsible**
S1. Document flood events for planning and accountability	**Specific Objective 1:** Collect incident data to inform current and future action 1. Form task force groups to monitor hotspots needing emergency measures. e.g. Wastewater likely to pollute water points used for domestic use 2. Inventorise incidents of wastewater mixing with floodwater causing hazardous condition 3. Capturing reports on loss and damaged properties 4. Gathering social media reports 5. Map the hotspots based on the current disaster 6. Develop recording tools to capture loss and damages **7.** Document basic statistics on the loss and damage, exposure elements etc.	**Short-term**	**CGM**

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Strategic Objective 3: Response	To provide immediate assistance that ensures survival and well-being of affected populations		
Strategy	**Actions**	**Duration**	**Responsible**
S2. Coordinate and communicate to facilitate response	**Specific Objective 1:** Issue timely accurate early warnings and coordinate response action 1. Disseminate Early Warnings information and updates between response teams and affected communities through mass media and village level Agents 2. Perform head count of the affected population 3. Coordinate safe evacuation of affected populations to designated shelters 4. Deploy specialized teams and equipment to rescue stranded individuals and animals 5. Set up medical camps to address injuries, prevent disease outbreaks, and provide psychological support 6. Keep affected populations informed about flood conditions, safety protocols, and relief efforts 7. Organize and supervising community volunteers to assist with local relief efforts. 8. Gather input from communities to identify unmet needs and adjust response strategies 9. Use of GIS, drones, Artificial Intelligence (AI) and machine learning in coordinating flood response **10.**	**Short-term**	**WRA/Red Cross**

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Strategic Objective 3: Response	To provide immediate assistance that ensures survival and well-being of affected populations		
Strategy	**Actions**	**Duration**	**Responsible**
S3. Monitor and evaluate the efficiency of the flood management policies	**Specific Objective 1:** Execute policy provisions and monitor their adequacy in enabling action 1. Identify challenges and gaps and implement policy provisions guiding response	**Short-term**	**CGM/ Red Cross**
	Specific Objective 2: Ensure relief is equitably accessed 1. Operationalize evacuation centres ensuring all supplies are availed	**Short-term**	**CGM/ Red Cross**
	Specific Objective 3: Enhance preventive measures during flooding **1.** Undertake Public health flood assessment and generate reports at ward level	**Short-term**	**CGM**
S8. Implement emergency mitigation measures	**Specific Objective 1:** Prevent secondary impacts of flood 1. Enhance water quality surveillance and treatment through Chlorination of wells to prevent possible water borne diseases 2. Provide psychological support 3. Evacuate the affected communities to safer grounds	**Short-term**	**CGM**
	Specific Objective 2: Improve drainage system performance **1.** Form Task teams that monitor stormwater network functionality and address system failures e.g. blockages	**Short-term**	**CGM**

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4.6 Post Disaster: Flood Impact Recovery

Rehabilitation is the restoration of the socio-economic institutions and structures of the affected society/community in readiness for reconstruction. It may be preceded by repatriation, followed by rehabilitation and reconstruction providing a bridge between a satisfaction of immediate needs and the implementation of comprehensive vulnerability reduction programmes.

At the same time the recovery phase entails programmes designed to help communities to return to normalcy. The insurance industry will play a crucial role in reducing the impact of disasters on the communities in both rural and urban areas (Goverment of Kenya, 2009). Activities aimed at restoring livelihood and supporting infrastructure, making use of opportunities to reduce vulnerability by enhancing prevention and increasing preparedness for future disasters. The cycle of flooding that affects communities longer and in diverse effects on multiple sectors of the economy is the post disaster stage. In the process of building back after a disaster, it is important to ensure the newly constructed infrastructures are built to be more resilient and able to withstand a certain level of disaster recurrence. The livelihoods of communities need to be supported to bounce back better and socio-psychological support to be availed to the affected (Rani et al., 2017).

Strategic Objective 4: To Restore livelihoods, strengthen critical infrastructure and ecosystems in flood-affected areas

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Strategic Objective 4: Recovery	Restore livelihoods, strengthen critical infrastructure and ecosystems in flood-affected areas		
Strategy	**Actions**	**Duration**	**Responsible**
S1. Evaluate/Rehabilitate/ Upgrade the Flood management System after flood event	**Specific Objective 1:** Rehabilitate flood Management system breaches during the flood event 1. Rehabilitate damaged public utility and stormwater drainage systems breached 2. Enforce compliance and educate the public 3. Review Drainage Network performance and restore or upgrade the network where needed	**Medium-term**	**CGM**
	Specific Objective 2: Improve monitoring network through installation of modern equipment, ensuring data collection and security for the installations 1. Evaluate Efficiency of the Flood Early Warning System in Place **2.** Update and fill identified gaps in technology and other resources 3. Establish a centralized flood inventory database	**Medium-term**	**WRA/KMD/ Red Cross**
	Specific Objective 3: Policy update informed by the lessons and experience form a flood event 1. Update Policy and educate the public and stakeholders 2. Implement recovery plan and Document gaps and Challenges to inform periodic update	**Medium-term**	**CGM**

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S2. Support reconstruction and building back from the flood event	**Specific Objective 1:** Offer monetary support to the communities to support building back their livelihoods and assets. 1. Support resettlement and deter resettlement on riparian areas 2. Coordinate compensations on insured assets 3. Subsidize reconstruction efforts by community 4. Provide technological and equipment support to facilitate reconstruction 5. Implement relocation plans through agreed framework 6.	**Long-term**	**CGM**

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4.7 Cross cutting Strategies

4.7.1 Low-Income Households

1. **Affordable Housing and Infrastructure**: Integrate flood-resilient housing solutions and develop drainage systems in informal settlements.
2. **Community-Based Solutions**: Empower communities with localized flood management strategies like waste control and rainwater harvesting.
3. **Subsidies and Assistance**: Provide financial or material support for flood mitigation and recovery.

4.8 Vulnerable Groups, PWDs and the Elderly

1. **Accessible Shelters**: Establish flood shelters with mobility features and health facilities.
2. **Health Preparedness**: Equip medical facilities for flood-related health issues and deploy mobile health units.
3. **Targeted Communication**: Use accessible channels to provide early warnings and preparedness information.

4.9 Women and Youth engagement

1. **Leadership**: Involve women and youth in disaster planning committees for inclusive decision-making.
2. **Capacity Building**: Train women and youth in disaster management and resource mobilization.
3. **Economic Empowerment**: Support income-generating activities tied to flood resilience (e.g., eco-friendly solutions).

4.9.1 Cross-Cutting Measures

1. **Community Education**: Raise awareness about flood preparedness through workshops and local engagement.
2. **Inclusive Policies**: Develop and enforce policies tailored to the needs of vulnerable populations.
3. **Stakeholder Collaboration**: Partner with NGOs, private entities, and local authorities to strengthen flood management efforts.

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4. **Technological innovations**: Explore emerging technologies in communication, mapping, artificial intelligence and internet of things.

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5 CHAPTER 5: IMPLEMENTATION ROLES AND COORDINATION

5.1 Introduction

The implementation plan provides a step-by-step guide for accomplishing those objectives. This details the way resources will be mobilized, coordination and role definition among stakeholders.

5.2 Resource Mobilisation

Resource mobilization for flood management involves identifying, organizing, and allocating resources to deliver on the identified objectives and strategies from the FMS. Key strategies include developing a resource mobilization plan that identifies the specific needs and gaps within the community; and establishing a coordinated approach with potential resource partners to ensure streamlined efforts. Clear communication with resource partners is essential to prevent confusion, while avoiding competition for resources within the organization helps maintain focus and collaboration. Resources should be allocated wisely, prioritizing areas of greatest need, and ongoing monitoring and evaluation are necessary to track usage and assess outcomes. Various methods to mobilize resources include submitting proposals to donor agencies, organizing fundraising events, setting up donation boxes, collecting in-kind donations, enlisting volunteers.

5.3 Coordination Mechanism for FMS Implementation

Kenya's disaster management framework integrates national and county governments to ensure an effective, coordinated approach to managing disasters like floods. The national government is responsible for policy formulation, such as the Climate Change Act (2016) and Water Act (2016), and provides overarching frameworks like the National Climate Change Action Plan. It coordinates stakeholders through bodies like the National Disaster Operations Centre (NDOC), facilitates capacity building with technical expertise, early warning systems, and training, and mobilizes resources for disaster response.

The National Adaptation Plan for Kenya 2015-2030 recommends the establishment of institutional frameworks and development of capacity to enable coordination to enhance coordination and mainstreaming of climate action on sector level. The plan further requires counties to establish

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mechanisms linking climate change data and information with national and county planning processes (Government of Kenya, 2016).

This policy, legislative and institutional arrangements for Disaster management in Kenya are largely aligned between the national government and the sub national governments. The institutional framework includes the operationalisation of the Disaster and Emergency Management Committee (the county Disaster Management Agency), its roles and responsibilities and its relationship with other institutions with its structures up to the national Disaster Management Unit and down to the community level. This institutional framework should facilitate coordination and collaborative relationships among stakeholders.

The disaster management coordination hierarchy in Kenya is structured to ensure a comprehensive, multi-sectoral response to emergencies and disasters. It integrates national, county, and local levels of governance. Below is an overview of the typical hierarchy:

5.3.1 National Level

At the national level, the President/Executive Office serves as the ultimate authority, providing oversight and national directives during major disasters. In cases of national emergencies, the President may declare a state of emergency to mobilize additional resources.

The **National Disaster Operations Centre (NDOC)** coordinates disaster response at the national level. It collects, analyzes, and disseminates information on disasters and operates under the Ministry of Interior and Coordination of National Government.

The **Kenya Defence Forces (KDF)** and **National Police Service (NPS)** are mobilized for search, rescue, and humanitarian assistance during major disasters. Additionally, specific ministries such as Health, Environment, and Agriculture play roles based on the disaster type, such as pandemics, environmental crises, or food security. The Kenya Red Cross Society is a key partner in humanitarian response.

5.3.2 County Level

At the county level, **County Governors and County Disaster Risk Management Committees** lead disaster preparedness, response, and recovery efforts. Each county develops its disaster management plans aligned with national policies. The committee advises the county government on disaster risk management and serves as the central agency for implementing related activities.

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It formulates county disaster risk management plans and policies aligned with national standards, promotes civic education, public awareness, and capacity building, including in schools. The Committee makes financial recommendations, promotes a coordinated approach to disaster management, and collaborates with national authorities and agencies. It oversees relief distribution, acts as an information hub for disaster-related data, and provides advisory services to various stakeholders. The Committee also initiates funding efforts, promotes research, devolves disaster management structures to lower levels, submits reports to the Authority, and performs any other necessary functions.

The Mombasa County Disaster and Emergency Management Act 2017 established the **Mombasa Disaster and Emergency Management Committee**, wish is chaired by the governor. It plays a critical role in coordinating and monitoring the implementation of county policies and plans related to disaster management. It ensures that preparedness and response strategies are in place and evaluated across all government and non-government levels. Additionally, the committee serves as an advisory body to various stakeholders, including the county government, state organs, private sector, NGOs, and communities.

The **Mombasa County Disaster and Emergency Management Committee** is responsible for coordinating and managing disaster preparedness, response, and recovery efforts within the county. Its key functions include:

1. **Coordinating Disaster Plans**: Overseeing the implementation of the county's disaster policy and emergency plans.
2. **Collaboration**: Partnering with national and international agencies, private sectors, and non-governmental organizations to enhance disaster management efforts.
3. **Resource Management**: Managing funding, conducting research, and facilitating the efficient use of resources during emergencies.
4. **Response Activation**: Implementing emergency response plans once a disaster is declared by the Governor.

Additionally, the committee has the power to request and allocate resources, enforce safety measures, and issue orders to mitigate disaster impacts. It also works closely with local, regional, and national bodies to ensure comprehensive disaster management in Mombasa County.

A. Coordinating roles of DEMC

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The **Mombasa Disaster and Emergency Management Committee** has a well-defined structure and set of rules designed to coordinate and oversee disaster and emergency management within the county. Below is a summary of its key coordinating roles as outlined in the document:

1. **Coordination and Monitoring:**
   - The committee monitors and coordinates the implementation of county policies and plans related to disaster and emergency management.
   - It ensures preparedness and response strategies are evaluated at all governmental and non-governmental levels.
2. **Guidelines and Planning:**
   - It lays down guidelines for disaster and emergency management plans for county departments.
   - The committee develops and reviews the County Disaster and Emergency Management Plan, which includes vulnerability assessments, disaster mitigation measures, and preparedness actions.
3. **Education, Awareness, and Capacity Building:**
   - Promotes community training, volunteer recruitment, and education on disaster management.
   - Ensures that the public, including vulnerable communities, receives guidance and training on disaster preparedness.
4. **Advisory and Consultative Role:**
   - Acts as an advisory body to the county government, state organs, private sector, NGOs, and communities regarding disaster management.
   - Provides policy advice and guidance to improve disaster management practices in the county.
5. **Research and Information Dissemination:**
   - Promotes research on disaster management and plays a key role in disseminating disaster-related information.
   - Serves as the central repository for disaster and emergency management data.
6. **Collaboration with Other Entities:**
   - Works in collaboration with national government bodies and relevant agencies to ensure an integrated approach to disaster response and mitigation.
   - Facilitates partnerships with other organizations for better disaster management.
7. **Resource Mobilization and Funding:**
   - The committee is involved in securing funding for disaster management and facilitating financial support for emergency response efforts.
8. **Disaster Response Coordination:**
   - In the event of a disaster or emergency, the committee coordinates the county's response, ensuring effective deployment of resources and services to mitigate the effects.

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B. Implementation roles

The **Mombasa County Disaster and Emergency Management Committee** (under the provisions outlined in Article II and subsequent sections) has specific roles and responsibilities related to disaster and emergency management. Here is the key implementation roles based on the provided text:

1. **Coordination and Monitoring:**
   - The committee is responsible for coordinating and monitoring the implementation of the **County Policy on Disaster and Emergency Management** and the **County Disaster and Emergency Management Plan**. This includes ensuring that disaster preparedness and response plans are followed.
2. **Vulnerability Assessment and Mitigation:**
   - The committee examines the **vulnerability** of different parts of the county to disasters and develops specific **prevention, reduction, or mitigation** measures.
3. **Guideline Development:**
   - It lays down guidelines for the preparation of disaster and emergency management plans by county departments to ensure consistency and effectiveness.
4. **Evaluating Preparedness:**
   - The committee evaluates preparedness levels at both governmental and non-governmental levels and works to enhance readiness across the county.
5. **Coordinating Disaster Response:**
   - In the event of a disaster or emergency, the committee coordinates the response, ensuring all departments are aligned and working effectively.
6. **Advising County Government:**
   - It advises the county government on matters related to disaster and emergency management, including financial matters.
7. **Promoting Education and Training:**
   - The committee promotes **general education, awareness, and community training** about disaster preparedness. It also supports the recruitment, training, and involvement of volunteers.
8. **Policy Formulation:**
   - It formulates the **County Disaster and Emergency Management Policy**, ensuring it aligns with best practices for disaster management.
9. **Research and Collaboration:**
   - The committee promotes research into disaster management and collaborates with the national government and other relevant agencies to improve disaster preparedness.
10. **Resource Management and Funding:**

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- The committee works to **secure funding** for disaster management activities and facilitates resource management during an emergency.

11. **Certification of Agencies:**
    - It certifies agencies within the county that specialize in disaster prediction and risk assessment, enhancing the county's disaster warning system.
12. **Partnerships and Collaborations:**
    - The committee may enter partnerships with organizations aimed at improving disaster and emergency management efforts.
13. **Emergency Response Actions:**
    - In case of a disaster or emergency, the committee helps implement emergency plans and provides guidance on **evacuation**, **essential resource distribution**, and **restoration of facilities**.
14. **Regulation of Potential Threats:**
    - The committee is empowered to act against potential disaster threats, instructing property owners on required measures to abate risks and ensuring compliance.
15. **Emergency Declaration and Management:**
    - Upon the declaration of a disaster or emergency, the committee supports the **implementation of emergency response plans**, including issuing necessary orders, coordinating services, and controlling access to affected areas.
16. **Research and Community Information:**
    - The committee serves as a **repository for disaster-related information**, keeping the community informed about current and potential threats.

These roles reflect the comprehensive responsibilities of the committee in preparing for, responding to, and managing disasters and emergencies at the county level.

County Disaster Management Units implement disaster response strategies within counties. They coordinate with local emergency services, community groups, and national agencies to ensure effective disaster management at the grassroots level.

5.3.3 Local Level (Sub- County, Ward, and Community)

At the local level, **Sub- County and Ward Disaster Committees** mobilize resources and coordinate grassroots responses. They serve as the link between communities and county governments.

Community-based Organizations (CBOs) and **Volunteer Groups** play a critical role as first responders during disasters. These groups, often supported by NGOs, focus on immediate relief efforts, early warning systems, and community-based risk education.

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5.3.4 Non-Governmental and Private Sector

The **Kenya Red Cross Society (KRCS)** plays a pivotal role in disaster response and recovery, often partnering with government bodies.

International and local NGOs provide humanitarian aid, technical expertise, and resources in collaboration with government agencies. The **private sector** contributes to disaster response through corporate social responsibility initiatives, donations, and logistics support.

5.3.5 Regional and International Coordination

Kenya collaborates regionally through the **East African Community (EAC)** and **IGAD**, which manage transboundary disasters such as droughts and pandemics.

United Nations Agencies like UNHCR, WHO, and WFP offer technical assistance, funding, and resources for large-scale emergencies. **Donors and international partners** provide financial and material support to bolster disaster management efforts in Kenya.

This hierarchy enables Kenya to address disasters through a multi-layered approach, ensuring coordination across all governance levels and collaboration with external partners.

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6 CHAPTER 6: MONITORING & EVALUATION FRAMEWORK

6.1 Introduction

A monitoring and evaluation (M&E) framework for flood management provides a structured approach to track and assess the effectiveness of flood-related projects or programs. It defines key indicators, verification methods, and acknowledges risks and assumptions, ensuring that activities align with intended outcomes. The framework is essential for guiding flood management initiatives and identifying areas for improvement.

When developing an M&E framework, it is crucial to use simple, understandable indicators and targets to facilitate clear communication and practical implementation. Quantitative measures should be prioritized wherever feasible to provide objective assessments of progress. Monitoring efforts should be closely aligned with project activities to ensure relevance and efficiency, and overall progress can be classified into broad categories to streamline reporting requirements.

Key data components in an M&E framework include the accuracy of activities, their implementation schedules, status, assigned coordinators, data sources, and methods for data collection. Regular monitoring is critical for identifying achievements and addressing insufficiencies. This enables the development of additional strategies to adapt to emerging challenges.

Additionally, studies, independent audits, and monitoring can be employed to verify achievements against predefined numerical targets in project documentation. It is important to acknowledge assumptions and risks that may affect outcomes and ensure M&E tools are accessible for both project activities and program management. By maintaining a dynamic and well-integrated M&E framework, flood management initiatives can achieve greater accountability and adaptability.

6.2 Monitoring & Evaluation Framework

Monitoring and evaluation (M&E) play a crucial role in the flood mitigation strategy of the County of Mombasa. The primary goal of monitoring is to provide stakeholders with feedback on the implementation process, identifying challenges and successes early on to allow for timely adjustments. The M&E plan consists of three key elements:

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1. **Internal Monitoring** – Ongoing tracking of the implementation process.
2. **Evaluation** – Assessing the overall effectiveness of the strategy.
3. **Reporting** – Communicating progress and findings to stakeholders.

6.3 Communication Mechanisms for the FMS

Communication plays a crucial role in flood management, as it can significantly reduce flood risks by minimizing people's exposure. Key communication mechanisms include **public dialogue**, which helps individuals and communities understand the specific flood risks in their area, and **tailored messages**, where visual interpretations improve public adherence to flood risk communication. Additionally, **communication frameworks** offer recommendations on how to convey flood warnings effectively, considering factors such as the flood's criticality level, the resources of the warning institution, and the advantages of various communication mediums.

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7 CHAPTER 7: REFERENCES

CHANGE, O. C. (2007). Intergovernmental panel on climate change. *World Meteorological Organization*, *52*, 1–43.

Green, C. H., Parker, D. J., & Tunstall, S. M. (2000). Assessment of flood control and management options. *WCD Thematic Reviews. World Commission on Dams Secretariat, South Africa*. https://citeseerx.ist.psu.edu/document?repid=rep1&type=pdf&doi=4dc46bb21cde02a58213f2adba2d1216216a7529

Marfai, M. A., Sekaranom, A. B., & Ward, P. (2015). Community responses and adaptation strategies toward flood hazard in Jakarta, Indonesia. *Natural Hazards*, *75*(2), 1127–1144. https://doi.org/10.1007/s11069-014-1365-3

Menya, A. A., & K'Akumu, O. A. (2016). Inter-agency collaboration for fire disaster management in Nairobi City. *Journal of Urban Management*, *5*(1), 32–38.

Mileti, D. S. (1995). Factors related to flood warning response. *US-Italy Research Workshop on the Hydrometeorology, Impacts, and Management of Extreme Floods*, 1–17. https://citeseerx.ist.psu.edu/document?repid=rep1&type=pdf&doi=4fa7217881768b6e8d79e076001c32b70615abc0

Ogega, O. M., Oludhe, C., Ojwang, L., & Mbugua, J. (2016). Localized knowledge for local climate change adaptation: A focus on coastal smallholder farmers in Kenya. *International Journal of Agriculture, Environment and Biotechnology*, *1*(1), 69–88.

Raadgever, G. T., Booister, N., & Steenstra, M. K. (2018). Flood Risk Management Strategies. In T. Raadgever & D. Hegger (Eds.), *Flood Risk Management Strategies and Governance* (pp. 93–100). Springer International Publishing. https://doi.org/10.1007/978-3-319-67699-9_8

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Rani, W. N. M. W. M., Nifa, F. A. A., Ismail, M. N., & Khalid, K. N. (2017). Planning for post disaster recovery: Lesson learnt from flood events in Kelantan Malaysia. *AIP Conference Proceedings*, *1891*(1). https://pubs.aip.org/aip/acp/article-abstract/1891/1/020143/887470

Sutton, J., & Tierney, K. (2006). Disaster preparedness: Concepts, guidance, and research. *Colorado: University of Colorado*, *3*(1), 3–12.

Thieken, A. H., Kreibich, H., MüLLER, M., & Merz, B. (2007). Coping with floods: Preparedness, response and recovery of flood-affected residents in Germany in 2002. *Hydrological Sciences Journal*, *52*(5), 1016–1037. https://doi.org/10.1623/hysj.52.5.1016

Twigg, J. (2004). *Disaster risk reduction: Mitigation and preparedness in development and emergency programming*. Overseas Development Institute (ODI). http://humanitarianlibrary.org/sites/default/files/2014/06/Disaster%20risk%20reduction%20Mitigation%20and%20preparedness%20in%20development%20and%20emergency%20planning.pdf

CIDP, C. G. (2023). *Third county integrated development plan 2023-2027.* Naiobi: Kenya institute for public policy research and analysis.

(n.d.). *Constitution of Kenya 2010.* Nairobi: National Council for Law Reporting with the Authority of the Attorney-General.

County Goverment of Mombasa. (2017). *Mombasa County Disaster Preparedness and Emergency Management.* Nairobi: Goverment Printer. Retrieved from https://www.mombasaassembly.go.ke/wp-content/uploads/2018/10/THE-

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MOMBASA-COUNTY-DISASTER-PREPAREDNESS-AND-EMERGENCY-MANAGEME.pdf

County Government of Mombasa. (2017). *The Mombasa County Disaster Preparedness and Emergency Management Act, 2017.* Nairobi: Government Printer. Retrieved from https://faolex.fao.org/docs/pdf/ken184535.pdf

Goverment of Kenya. (2009). *National Disaster Management Policy.* Nairobi. Retrieved from https://repository.kippra.or.ke/xmlui/handle/123456789/559

Goverment of Kenya. (2009). *National Policy for disaster management in Kenya, 2009.* Retrieved from https://www.google.com/url?sa=t&rct=j&q=&esrc=s&source=web&cd=&cad=rja&uact=8&ved=2ahUKEwjO74P_tvmJAxVTzQIHHSSmOmkQFnoECEsQAQ&url=https%3A%2F%2Fwww.ifrc.org%2Fdocs%2Fidrl%2F1058en.pdf&usg=AOvVaw0kcE63OE7Xc3p2pmMMV_YL&opi=89978449

Goverment of Kenya. (2016). *National Adaptation Plan 2015-2030.* Nairobi.

Goverment of Kenya. (2016). *The Water Act.* Nairobi: Government Printer.

Goverment of Kenya. (2016). *Water Act.* Nairobi: Goverment Printer. Retrieved from https://wra.go.ke/download/the-water-act-2016/

Goverment of kenya, G. (2013). *National Environment Policy, 2013.* Nairobi: Ministry of Environment, Water and Natural resources. Retrieved from https://faolex.fao.org/docs/pdf/ken147906.pdf

Government of Kenya, G. (1999). *Sessional paper no. 1 of 1999.* Nairobi: Ministry of Water Resources. Retrieved from https://repository.kippra.or.ke/handle/123456789/1392

Co-funded by: European Union, german cooperation DEUTSCHE ZUSAMMENARBEIT

Co-developed by: Mombasa CityLAB

Government of Kenya, GoK. (2022). *The Constitution of Kenya, 2010.* Nairobi: Government Printer. Retrieved from https://kenyalaw.org/kl/fileadmin/pdfdownloads/TheConstitutionOfKenya.pdf

Japan Inetrnational Cooperation Agency. (2013). *National Water master Plan 2030.* Retrieved from https://wasreb.go.ke/wp-content/uploads/2023/08/National-Water-Master-Plan-2030-Exec.-Summary-Vol.-1-Main-1.pdf

KNBS, K. N. (2019). *Population by county and Sub county.* Nairobi: KNBS.

Ministry of Climate Change and Forestry. (2023). *The National Climate Change Action III, 2023-2027.* Ministry of Climate Change and Forestry. Retrieved from https://emsi.co.ke/other-publications/national-climate-change-action-plan-nccap-iii-2023-2027/

Ministry of Water and Irrigation. (2009). *Flood Mitigation Strategy.* Nairobi: Ministry of Water and Irrigation.

Ministry of Water, Sanitation and Irrigation. (2021). *The National Water Resources Strategy 2020-2025.* Ministry of Water, Sanitation and Irrigation. Retrieved from https://waterfund.go.ke/watersource/Downloads/006.%20Water%20Resources%20Management%20Strategy.pdf

Ministry of Water, Sanitation and Irrigation. (2021). *The National Water Resources Strategy 2020-2025.* Ministry of Water, Sanitation and Irrigation. Retrieved from https://faolex.fao.org/docs/pdf/ken214249.pdf

Omanga, A. (2024). *Mombasa City Lab: Flood risk assessment using multi-influencing factors technique coupled with community participatory mapping.* Covenant of

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Mayors for Sub-Saharan Africa (CoM SSA) c/o Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH.

Queensland Government. (2024, November). *Flood risk and resilience*. Retrieved from Flood terms and definitions: https://www.qra.qld.gov.au/flood-risk/flood-terms-and-definitions

Water Services Regulatory Board. (2013). *Disaster preparedness and Mitigation Guidelines.* Retrieved from https://wasreb.go.ke/wp-content/uploads/2023/08/Disaster-Management-Guidelines_Final.pdf

World Meteorological Organisation. (2017). *Selecting measures and designing strategies for Integrated Flood Management.* Global Water Partnership.

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8 ANNEX:

A. Glossary of Terms

B. List of Acronyms

C. Detailed Methodologies

D. Additional Data and Maps

E. References and Further Reading

F. Stakeholder Engagement Plan

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8.1 Glossary of Terms

FLOOD TERM	DEFINITION
Catchment	The area of land draining to a common pour point related to a specific location including the catchment of the main waterway as well as the tributary streams.
Catchment Flooding	Flooding due to prolonged or intense rainfall (e.g. severe thunderstorms, monsoonal rains in the tropics, tropical cyclones). Types of catchment flooding include riverine, local overland and groundwater flooding.
Coastal Flooding	Flooding due to tidal or storm-driven coastal events, including storm surges in lower coastal waterways. This can be exacerbated by wind-wave generation from storm events.
Defined flood event (DFE)	The flood event selected for management of flood hazard to new development. This is generally determined in floodplain management studies and incorporated in floodplain management plans.
Defined Flood Level	Defined flood level (DFL) is the level to which it is reasonably expected flood waters may rise.
Effective Warning Time	The effective warning time available to flood-prone community is equal to the time between the delivery of an official warning to prepare for imminent flooding and the loss of evacuation routes due to flooding. The effective warning time is typically used for people to self-evacuate, to move farm equipment, move stock, raise furniture, and transport their possessions.
Existing Flood Risk	The risk an existing community is exposed to because of its location on the floodplain.
Flash Flood	A flood that is sudden and occurs with little warning. It is often caused by sudden local or nearby heavy rainfall. It is generally not possible to issue detailed flood warnings for flash flooding. However, generalised warnings may be possible.
Flood	Flooding is a natural phenomenon that occurs when water covers land that is normally dry. It may result from coastal or catchment flooding, or a combination of both.
Flood awareness	An appreciation of the likely effects of flooding, and a knowledge of the relevant flood warning, response and evacuation procedures.
Flood Behaviour	A term used to describe the pattern, and nature of a flood in terms of characteristics such as levels, velocities and flows.
Flood Classifications	The classification scheme that defines flooding as minor, moderate, or major defined by water level that causes certain impacts upstream and downstream of the station.
Flood conveyance	Areas where a significant flow of flood water occurs. These areas typically flow continuously from the upper reaches of waterways and flow paths within the catchment to the outlet during a flood. These flows often align with naturally defined channels and are areas that, even if only partially blocked by changes in topography or development,

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FLOOD TERM	DEFINITION
	cause a significant redistribution of flood flow or a significant increase in flood levels. They are often, but not necessarily, areas of deeper flow or areas where higher velocities occur.
Flood damage	The tangible (direct and indirect) and intangible costs (financial, opportunity costs, clean-up) of flooding. Tangible costs are quantified in monetary terms (e.g. damage to goods and possessions, loss of income or services in the flood aftermath). Intangible damages are difficult to quantify in monetary terms and include the increased level of physical, emotional and psychological health problems suffered by flood-affected people that are attributed to a flooding episode.
Flood Edukation	The ducation that raises awareness of the flood problem, to help individuals understand how to manage themselves and their property in response to flood warnings and in a flood event. It invokes a state of flood readiness.
Flood emergency management	Emergency management is a range of measures to manage risks to communities and the environment. In the flood context, it may include measures to **prevent, prepare for, respond to and recover** from flooding.
Flood emergency management plan	A step-by-step sequence of previously **agreed roles, responsibilities, functions, actions and management arrangements** for the conduct of a single or series of connected emergency operations. The objective is to ensure a coordinated response by all agencies having responsibilities and functions in emergencies.
Flood emergency response planning	The process to inform the development of flood emergency response plans by providing advice on the variation of hazardous conditions to people, vehicles and buildings within the floodplain.
Flood fringe	The remainder of the flood extent for the event once flood conveyance and storage areas are accounted for. Developing flood-fringe areas is unlikely to significantly alter flood behaviour, beyond the broader impact of changes to run-off because of urbanisation within the catchment. However, other flood-related constraints may exist in flood-fringe areas.
Flood hazard	Potential loss of life, injury and economic loss cause by future flood events. The degree of hazard varies with the severity of flooding and affected by flood behaviour (**extent, depth, velocity, isolation, rate of rise of floodwaters, duration**), topography and emergency management.
Flood maps	A practical **tool for identifying most at risk to flooding**. They provide a visual representation of possible flood consequences (i.e. extent, depth, and velocity of flood waters at different gauge heights) and can be used to raise flood awareness in a community by delineating the areas at risk of flooding.

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FLOOD TERM	DEFINITION
Flood planning area	The area of land below the flood planning level and is thus subject to flood-related development controls.
Flood proofing of buildings	A combination of measures incorporated in the **design, construction and alteration of individual buildings or structures** that are subject to flooding, to reduce structural damage and potentially, in some cases, reduce contents damage.
Flood readiness	An ability **to react** within the effective warning time
Flood risk	The potential risk of flooding **to people, their social setting, and their built and natural environment**. The degree of risk varies with circumstances across the full range of floods. Flood risk is divided into three types – existing, future and residual. It is assessed considering both likelihood of flooding and the consequences of floods.
Flood risk management	The process applied to enable a community to become as resilient as practicable to floods. This is achieved through **planning and preparing** for, r**esponding** to and **recovering** from flooding. It requires a coordinated, multi-disciplinary approach across all levels of government and between agencies with different responsibilities. It also requires the support of a range of non-government organisations and industry professionals in a wide range of activities and fields, and the active engagement of the community.
Flood severity	A qualitative indication of the 'size' of a flood and its hazard potential. Severity varies inversely with likelihood of occurrence (i.e. the greater the likelihood of occurrence, the more frequently an event will occur, but the less severe it will be).
Flood storage areas	The parts of the floodplain that are important for temporary storage of floodwaters during a flood passage. The extent and behaviour of flood storage areas may change with flood severity, and loss of flood storage can increase the severity of flood impacts by reducing natural flood attenuation. Hence, it is necessary to investigate a range of flood sizes before defining flood storage areas.
Flood warnings	Messaging distributed **to potential at-risk communities** to inform of an **emerging flood threat**. Effective warning is crucial to support a community's ability to respond to a flood event. Effective flood warnings require effective messages disseminated via an effective system.
Floodplain	An area of land this is **subject to inundation** by floods up to and including the probable maximum flood event – that is flood-prone land.
Floodplain management plan	A management plan developed in accordance with the principles and guidelines usually includes both written and diagrammatic information describing how particular areas of flood-prone land are to be used and managed to achieve defined objectives. It outlines the recommended **ways to manage the flood risk** associated with the use of the floodplain for various purposes. It represents the considered **opinion of the local community** and **the floodplain management entity** on how best to manage the

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FLOOD TERM	DEFINITION
	floodplain, including consideration of flood risk in strategic land-use planning to facilitate development of the community.
Flood-prone land	Land susceptible of flooding by the probably maximum flood event. Flood-prone land is synonymous with the floodplain. Floodplain management plans should encompass all flood-prone land rather than being restricted to areas affected by defined flood events.
Flow	The rate of flow of water measured in volumes per unit time.
Future flood risk	The risk that new development within a community is exposed to because of developing on the floodplain.
Hazard	A source of potential harm or situation with a potential to cause loss.
Historical Flood	A flood that has occurred in the past.
Hydrology	The term given to the study of the rainfall and runoff process, in particular the evaluation of peak flows, flow volumes and the derivation of hydrographs for a range of floods.
Intolerable Risk	A risk that, following understanding of the likelihood and consequences of flooding, is so high that it requires consideration of implementation of treatments or actions to improve understanding, avoid, transfer or reduce the risk.
Isolation	Flooding can isolate parts of the landscape and cut-off evacuation routes to flood-free land. This can result in dangerous situations, because people may see the need to cross floodwaters to access services, employment or family members. Many flood fatalities result for the interactions of people, often in vehicles with floodwaters.
Land-use planning	The process by which the use and land is managed for the benefit of the whole community. Land use planning approaches that anticipate likely risk and vulnerability of the population can reduce the potential impact of future disaster events. Land-use planning decisions need to adequately consider the availability of existing infrastructure and any impacts on it, along with potential costs and locations for infrastructure to service future needs.
Local overland flooding/Pluvial	Inundation by local runoff on its way to a waterway, rather than overbank flow from a stream, river, estuary, lake or dam. Can be considered synonymous with stormwater flooding.
Minor Flood (gauge classification)	Causes inconvenience and low-lying areas next to watercourses are inundated. Minor roads may be closed, and low-level bridges submerged. In urban areas inundation may affect some backyards and buildings below the floor level as well as bicycle and pedestrian paths. In rural areas removal of stock and equipment may be required.
Moderate Flooding (gauge classification)	In addition to the above, the area of inundation is more substantial. Main traffic routes may be affected. Some buildings may be affected above the floor level. Evacuation of flood-affected areas may be required. In rural areas removal of stock is required.
Major Flooding (gauge classification)	In addition to the above, extensive rural areas and/or urban areas are inundated. Many buildings may be affected above the floor level. Properties and towns are likely to be

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FLOOD TERM	DEFINITION
	isolated and major rail and traffic routes closed. Evacuation of flood-affected areas may be required. Utility services may be impacted.
Residual flood risk	The risk a community is exposed to is not being remedied through establishment risk treatment processes. In simple terms, for a community, it is the total risk to that community, less any measure in place to reduce that risk.
Risk analysis	The systematic use of available information to determine how often specified (flood) events occur and the magnitude of their likely consequences. Flood risk analysis is normally undertaken as part of a floodplain management plan. The floodplain management plan reflects the adopted means of managing flood risk.
Risk management	The systematic application of management policies, procedures and practices to the tasks of identifying analysing, assessing, mitigating and monitoring risk.
Riverine flooding	Inundation of normally dry land occurring when water overflows the natural or artificial banks of a stream, river, estuary, lake or dam. Riverine flooding generally excludes watercourses constructed with pipes or artificial channels considered as stormwater channels.
Runoff	During a flood, rainfall is converted to runoff and is transferred through a network of flow paths to the catchment outlet. These flow paths include overland flow on hill slopes, down tributaries, across floodplains, through natural and artificial storages and along main streams.
Storm surge	The increase in coastal water levels above predicted astronomical tide level (i.e. tidal anomaly) resulting from a range of location dependent factors including the invested barometer effect, wind and water set-up and astronomical tidal waves, together with any other factors that increase tidal water level.
Stormwater flooding	Is the inundation by local runoff caused by heavier than usual rainfall. It can be caused by local runoff exceeding the capacity of an urban stormwater drainage systems, flow overland on the way to waterways or by the backwater effects of mainstream flooding causing urban stormwater drainage systems to overflow.
Treatment options	The measures that might be feasible for the treatment of existing, future and residual flood risk at locations within the floodplain. Preparation of a treatment plan requires a detailed evaluation of floodplain management options.
Velocity of floodwater	The speed of floodwaters, measured in metres per second (m/s).
Vulnerability	The characteristics and circumstances of a community, system or asset that make it susceptible to the damaging effects of a hazard.

*Source: Handbook 7: Managing the Floodplain: A Guide to Best Practice in Flood Risk Management in Australia (Australian Disaster Resilience) Pg 50-89 (Queensland Government, 2024)

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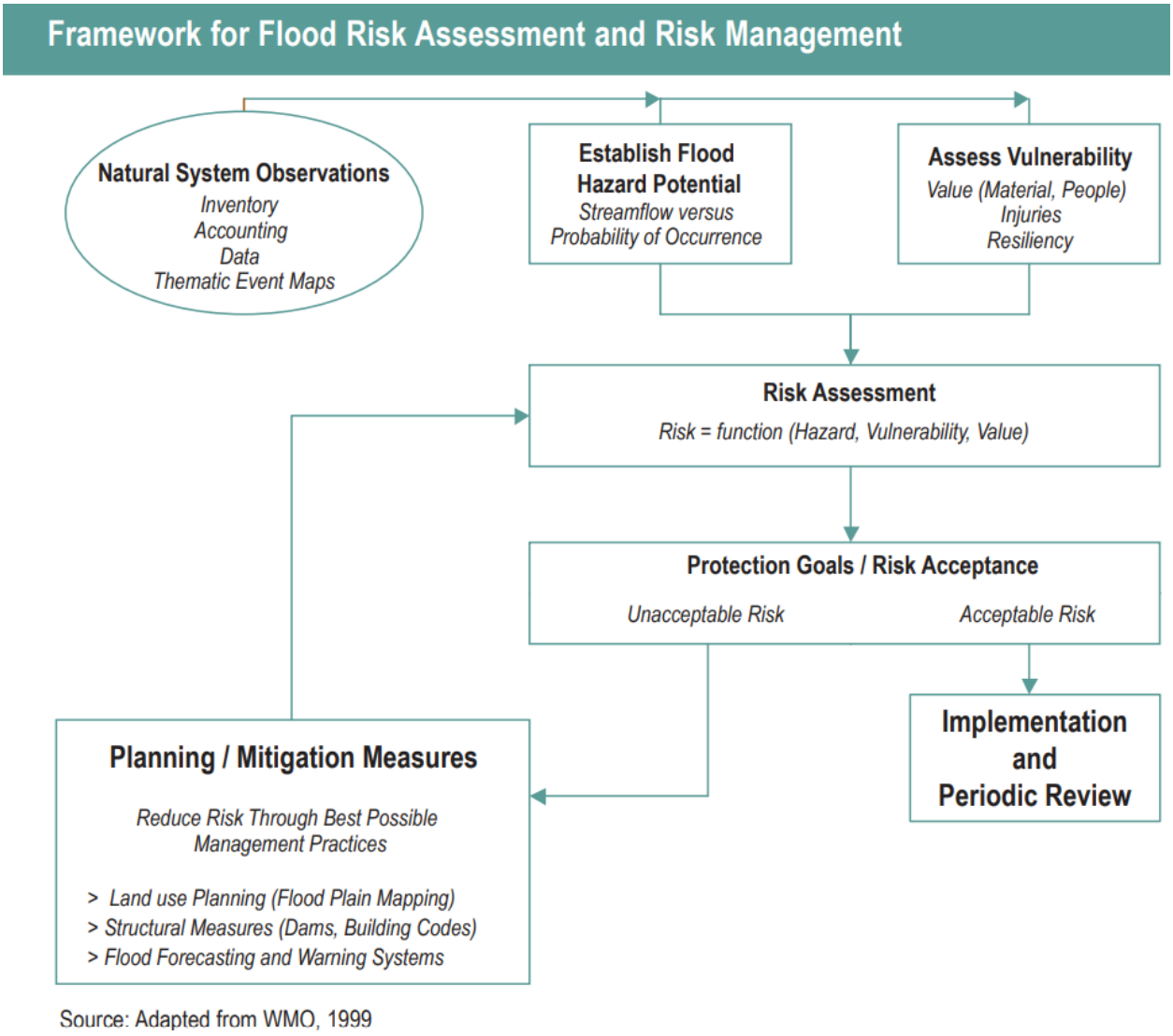
8.2 Framework for Flood Risk assessment and Management



Source: Adapted from WMO, 1999

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