

# KNOWLEDGE BRIEF ON URBAN FLOODING AND CLIMATE ADAPTATION ACTION IN SUB-SAHARAN AFRICA



This report was jointly developed by the Climate Change & Environment Division and the Urban Development Practice of the IsDB.

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# Introduction

Climate change is characterized by sustained shifts in temperature and weather patterns, which can be caused by natural phenomena, changes in the sun's activity, or large volcanic eruptions. However, over the past two centuries, human activities have emerged as the primary cause of climate change, largely due to the combustion of fossil fuels such as coal, oil, and gas. Alterations in the climate state can be identified using statistical methods and can persist for extended periods of time, often lasting for several decades or more. Climate change can be attributed to natural internal processes, external forces, or persistent human-induced changes in the atmosphere's composition or land use. (IPCC, 2012). One of the most conspicuous manifestations of climate change is the occurrence of frequent and severe floods, which have significant consequences.

Adaptation in human systems entails adjusting to actual or anticipated climate and its consequences, in order to minimize harm or capitalize on beneficial opportunities. In natural systems, this process refers to adjusting to the actual climate and its effects, with human intervention potentially facilitating adjustment to expected climate conditions.

The Paris Agreement, adopted in 2015, recognized the certainty of climate change and its repercussions, leading to the establishment of a target to limit the temperature rise to 1.5°C by the year 2100 by reducing greenhouse gas emissions. Each country was urged to develop and execute adaptation and mitigation measures through Nationally Determined Contributions (NDCs). These NDCs will outline the specific measures that countries have devised to reduce their greenhouse gas emissions, adapt to the impacts of climate change, and ensure the necessary financing to support these efforts.

The Islamic Development Bank (IsDB), like other development partners, is financing water and flood-related projects in sub-Saharan Africa especially West Africa under the urban sector, whose main objective is to mitigate the effects of floods and their high cost to society through the construction of green, sustainable, and resilient

infrastructure in pursuit of achieving SDG target 11.5 and 13.1. These projects aim to mainstream climate adaptation and mitigation actions in their operations, in line with their Bank's Climate Action Plan (2020-2025). The Bank aims to identify lessons from its ongoing operations that can be used to rectify issues or inform future project objectives, to mitigate the risks and exposure of development projects and cities in the sub-region that are increasing due to the rapidly changing climate.

The goal of this Knowledge Brief is to summarise the findings of studies on international urban flooding management practices and how the Islamic Development Bank's (IsDB) operations have tackled urban flood risks with adaptive and climate-resilient solutions, given that all outputs have yet to be delivered. This Brief focuses on certain implementation difficulties and emphasises the essential aspects of various projects, providing a concise description of the necessary improvements to fully align operations with the IsDB's Climate Change policy objectives of enhancing the overall resilience of the Bank's investments and the communities where these investments are being made, to learn from experiences and compare them to global and context-specific best practices.



# Urban Flooding and Climate Adaptation Action



## A. Flooding: A Serious Risk for African Cities

Floods pose a significant threat to cities in Sub-Saharan Africa. They can be classified into four types: localised urban floods, riverine floods, pluvial floods or flash floods, and coastal floods, based on their sources, characteristics, and mechanisms.

Deficient stormwater drainage systems, poor urban drainage management, and the occupation of flood-prone low-lying areas are among the primary causes of urban flooding. The lack of effective integration of flood management into urban planning makes Sub-Saharan African cities more vulnerable to flooding. Climate change, which causes more frequent extreme weather events such as storms and heavy rainfall, exacerbates the impacts of flooding.

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The consequences of floods are wide-ranging and can severely impede social and economic objectives in the medium to long term. Floods can affect social activities, prosperity, well-being, education and awareness, public health, security, and insurance. The impacts on poverty, health, and gender are particularly noteworthy. Low-income groups, who comprise more than 50% of the urban population, are generally the hardest hit. Floods affect people of all ages and genders, but the most vulnerable are women, the elderly, and children.

Floods have a significant impact on properties, assets, public utilities, economic production, and agricultural land. The effects of floods can vary widely, affecting urban agricultural lands, roads and infrastructure, bridges, domestic animal

husbandry, residential buildings, and drinking water supply facilities, amongst others. It is estimated that the total economic losses due to floods in Africa amounted to 38.5 billion USD between 1970 and 2019.

While some impacts on ecosystems and the physical environment may be positive, the negative consequences can be catastrophic. These can include driving unplanned distribution of solid waste, disaster debris, contamination of soil and water, loss of environmental infrastructure, including water and sanitation systems, solid waste disposal sites, and waste treatment centers, loss or damage to natural ecosystems, nitrification of coastal waters, impact on biological communities, species, and overall biodiversity of the affected communities.



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## B. A significant Number of Sub-Saharan African Cities are ill-prepared to anticipate or manage Urban Flooding

African cities face a multitude of complex challenges that are compounded by existing structural fragilities.

- a. Urban governance is often inadequate in the face of rapid urbanisation, with shortcomings in enforcing land use regulations, provision and management of urban services, stormwater management planning, and inadequate financial, technological, and HR capacities.
- b. Additionally, there is insufficient coordination between institutional stakeholders, inappropriate governance and institutional arrangements, weak community involvement, and insufficient investment in Research and Development (R&D).
- c. Approaches to managing flood risks are often inefficient in the long run, as they tend to rely excessively on structural measures aimed at controlling floods rather than managing them in an integrated manner. Non-structural measures are either not known or ignored.
- d. Moreover, climate change issues are insufficiently considered in project design and implementation, and there is a lack of skills concerning the scientific disciplines required for flood management and climate action implementation holistically.





### C. Why should SSA Cities adapt their Practices to Current and Anticipated Flooding Challenges?

Cities are highly vulnerable due to the significant stakes involved, such as the concentration of population and their assets, businesses, and public facilities like roads, bridges, potable water networks, education, and health facilities, etc. Unfortunately, these cities lack the necessary resources to cope with rapid urbanization.

The climate outlook is concerning, as continuous changes in temperature trends have been observed over the past 60 years, with most of Sub-Saharan Africa recording temperatures above the 1991-2020 average (WMO, 2023). Additionally, precipitation anomalies were above

the 1991-2020 average in most parts of Sub-Saharan Africa. The predicted effects of rising mean temperature include drought, heat waves, increased precipitation, sea level rise, and extreme weather events like storms. So far, flooding has one of the deadliest impacts of climate change in the Sub-Saharan Africa region.

Sub-Saharan African cities have shown minimal resilience to most types of floods. Developing resilience to flood risks requires a comprehensive approach that considers the local context, community engagement, and long-term sustainability, which has not been the case.

Cities contribute to global warming through environmental pressure, waste production, and carbon emissions. In general, urbanization is associated with environmental degradation and the emission of greenhouse gases (GHGs). Although African cities are the least contributors to emissions compared to other regions, they face systemic risks from climate change impacts.

#### Box 1: The Key Principles of Integrated Flood Management (IFM)

##### **Manage the water cycle as a whole:**

Consider the entire water system, including interactions between land and water resources.

##### **Integrated land and water management:**

Optimize the use of both water and land assets.

##### **Manage risk and uncertainty:**

Recognize that flood risk cannot be completely controlled.

##### **Adopt a best mix of strategies:**

Combine structural and non-structural measures.

##### **Ensure a participatory approach:**

Involve stakeholders transparently.

##### **Adopt integrated risk management approaches:**

Address flood risk holistically.



## D. How can SSA Cities Enhance their Resilience to Flood Risks?

**Transitioning from flood control to flood management through the adoption of “Integrated Flood Management” principles offers several benefits.** Firstly, it promotes increased resilience within affected communities. Secondly, it aims to utilise floodplains efficiently, minimising the loss of life from flooding. Lastly, it seeks to maximise the effective use of flood-prone land to support livelihood security. The value of applying these principles is immense, as it enables communities to adapt to changing conditions and promotes sustainable development.

Undertaking climate change mitigation and adaptation measures is crucial for enhancing the resilience of urban areas. By incorporating climate mitigation and adaptation into flood projects, cities can achieve this goal. One key strategy is to develop and implement Urban Climate Adaptation Plans.

It is imperative that cities take proactive steps to address the challenges posed by climate change. Some climate-related objectives that cities can pursue while developing their plans include:

- a. Reduce the susceptibility of urban areas to extreme weather events, such as heatwaves and floods, in order to safeguard the well-being of the population and enhance their quality of life.
- b. Strengthen the capacity of urban infrastructure, including roads, bridges, water supply systems, and sanitation facilities, to withstand the impact of climatic hazards.
- c. Promote sustainable urban development and minimize economic losses by implementing measures to reduce vulnerability and improve resilience.

The implementation of urban climate action plans poses a considerable challenge for numerous African cities that are struggling to cope with the consequences of climate change. These plans are intended to mitigate the impacts of altered weather patterns and extreme events, but they frequently lack the necessary integrated and resilient features to withstand the rapid changes brought on by climate change, which has resulted in inadequate design and implementation.





## Box 2: The key components of an Urban Climate Action Plan



### **Risk Assessment and Vulnerability Analysis:**

Cities assess their vulnerabilities to climate hazards such as flooding, heatwaves, sea-level rise, and storms. Identifying critical infrastructure, sensitive populations, and areas at high risk helps prioritise adaptation efforts.



### **Green Infrastructure and Urban Design:**

Incorporating green spaces, permeable surfaces, and natural features helps manage stormwater and reduce heat island effects. Urban design can enhance resilience by integrating climate-responsive architecture and sustainable transportation.



### **Early Warning Systems and Emergency Preparedness:**

Developing systems to monitor climate-related risks and provide timely alerts. Preparedness plans for emergencies, evacuation routes, and shelter locations.



### **Capacity Building and Education:**

Training local officials, community leaders, and residents on climate adaptation. Public awareness campaigns to promote sustainable practices.



### **Monitoring and Evaluation:**

Regularly assessing the effectiveness of adaptation measures. Adjusting strategies based on new data and changing climate conditions.



### **Stakeholder Engagement:**

Collaboration with local communities, businesses, NGOs, and government agencies is crucial. Engaging diverse stakeholders ensures that adaptation plans are inclusive and address various needs.



### **Infrastructure Upgrades and Retrofits:**

Strengthening existing infrastructure (e.g., drainage systems, bridges, and buildings) to withstand extreme weather events. Retrofitting buildings for energy efficiency and climate resilience.



### **Climate-Resilient Land Use Planning:**

Zoning regulations that limit construction in flood-prone areas or near coastlines. Encouraging mixed land uses to reduce vulnerability and enhance adaptability.



### **Financial Mechanisms and Funding:**

Allocating resources for adaptation projects. Exploring public-private partnerships and international funding opportunities.



## E. Mainstreaming Climate Adaptation and Resilience in Urban Flood Projects

Mainstreaming climate adaptation and resilience in urban flood investments and projects requires stakeholders to consider key strategic actions at different implementation phases: planning and design, implementation and management, monitoring and evaluation, and learning and sharing. The recommendations below have been compiled based on the international best practices of multilateral development banks, project developers, and urban administration and developers.

### a) Project Planning and Design Phase

The planning and design phase of urban flood projects is of paramount importance in ensuring that the project's objectives, activities, and

outcomes align with the climate adaptation and resilience goals and needs of the urban context. The following are some of the crucial actions that can be undertaken during this phase:

- *Conduct a comprehensive climate risk and vulnerability assessment* to identify the urban area's current and future climate hazards, exposure, sensitivity, and adaptive capacity, as well as the potential impacts and opportunities for adaptation and resilience.
- *Engage with relevant stakeholders*, including local governments, communities, civil society, the private sector, and academia, to ensure that the project is responsive to the local context, priorities, and preferences and fosters ownership, participation, and collaboration.
- *Integrate climate adaptation and resilience into the project objectives, indicators, and budget* to ensure that the project contributes





to reducing climate risk and enhancing the resilience of the urban area and that the project performance and resources are aligned with the adaptation and resilience outcomes.

- *Apply a multi-hazard, multi-sectoral, and multi-scalar approach* to address the complex and interrelated nature of urban flooding and climate change and consider the interactions and synergies among different hazards, sectors, and scales.
- *Adopt a flexible and adaptive design* to allow for adjustments and modifications of the project activities and outputs in response to the changing and uncertain climate conditions, as well as the feedback and learning from the implementation and management phase.

## b) Project Implementation and Management Phase

The implementation and management phase of urban flood projects is critical for ensuring that project activities and outputs are delivered effectively, efficiently, and in alignment with the climate adaptation and resilience objectives and indicators. Here are some key recommendations for this phase:

- *Implement a mix of structural and non-structural measures* to address the multiple dimensions and drivers of urban flooding and climate change and balance the trade-offs and co-benefits among different measures.
- *Strengthen the institutional and governance arrangements* to ensure the project is coordinated and integrated with the relevant policies, plans, and programs and supported by the appropriate legal, regulatory, and financial frameworks.
- *Build the capacity and awareness of the project staff and stakeholders* to enhance their knowledge, skills, and attitudes on urban flooding and climate change and foster their engagement and empowerment in the project implementation and management.
- *Establish a robust and participatory monitoring and evaluation system* to track the progress and performance of the project activities and outputs and assess their effectiveness and efficiency in achieving climate adaptation and resilience outcomes.
- *Apply a learning-by-doing and adaptive management approach* to enable the project to respond to emerging challenges and opportunities and incorporate the feedback and learning from the monitoring and evaluation system into the project design and implementation.

## c) Project Monitoring and Evaluation Phase

The monitoring and evaluation phase of urban flood projects is essential for ensuring that the project outcomes and impacts are measured,

reported, and aligned with the climate adaptation and resilience goals and indicators. The following are some of the key recommendations for this phase:

- *Define and operationalise the climate adaptation and resilience indicators* to measure the changes and improvements in the urban area's climate risk and resilience and the project's contribution and attribution to these changes and improvements.
- *Collect and analyse relevant and reliable data to provide evidence and information* on the project outcomes and impacts and to support the decision-making and learning processes.
- *Use a combination of quantitative and qualitative methods* to capture the diverse and complex aspects and dimensions of urban flooding and climate change and to reflect the different perspectives and experiences of the project staff and stakeholders.
- *Conduct a participatory and inclusive evaluation*, involving the project staff and stakeholders in the evaluation design, data collection, analysis, and reporting and ensuring that the evaluation is responsive to their needs, expectations, and feedback.

- *Communicate and disseminate the evaluation results* to share the project's findings, lessons, and recommendations with the relevant audiences and platforms, and inform and influence the policy and practice on urban flooding and climate change.

#### d) Project Learning and Sharing

The learning and sharing phase of urban flood projects is important for ensuring that the project generates and disseminates knowledge and experience on urban flooding and climate change and that it fosters learning and innovation among the project staff and stakeholders. The following are some of the key recommendations for this phase:

- *Document and synthesise the project knowledge and experience* to capture and consolidate the project's key findings, lessons, and recommendations and identify the good practices and challenges of mainstreaming climate adaptation and resilience in urban flood projects.
- *Create and maintain a knowledge management system* to store and organise the project knowledge and experience and to facilitate the access and use of the project information and data.
- *Develop and deliver a knowledge-sharing strategy* to define the objectives, audiences, messages, and channels of the project knowledge and experience and to plan and implement the knowledge-sharing activities and products.
- *Engage and network with the relevant communities of practice* to exchange and learn from the project knowledge and experience and to foster collaboration and innovation on urban flooding and climate change.
- *Integrate and apply the project knowledge and experience* to inform and improve the design and implementation of current and future urban flood projects and enhance the urban area's climate adaptation and resilience.





## F. Results achieved by IsDB's Operations in West SSA

### The rationale for IsDB's Interventions in Urban Flooding

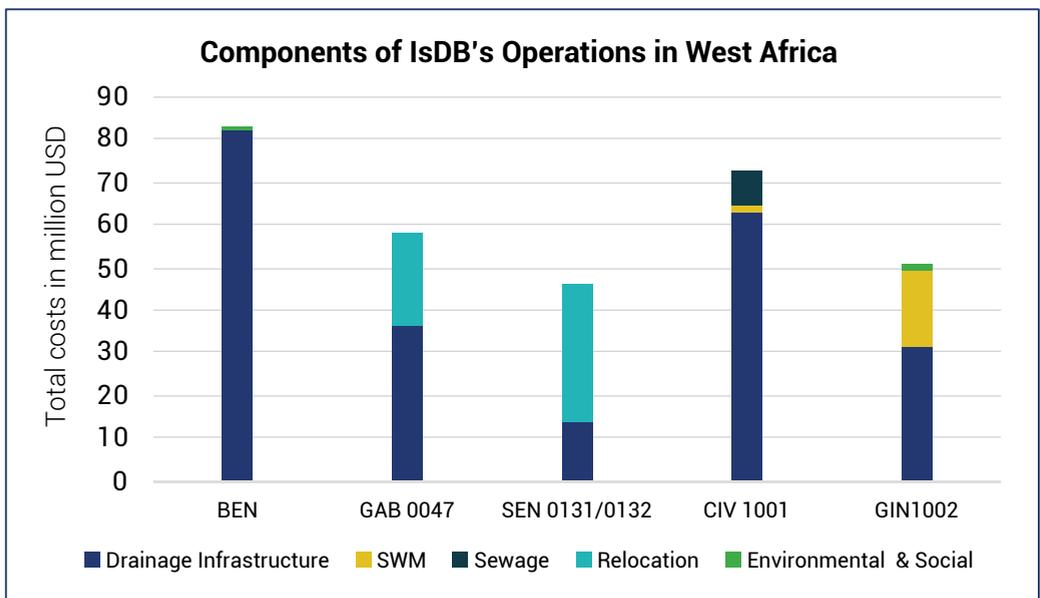
The Islamic Development Bank (IsDB) has financed six projects through their regional hubs in West Africa since the start of the 2010s to mitigate the impact of floods in six cities. Five of these projects are located in Abidjan, Conakry, Cotonou, Dakar, and Libreville, all of which are experiencing rapid urbanisation, which presents numerous challenges related to poor urban governance that complicate the management of these risks.

These projects are compliant with the Bank's (i) Urban Sector Policy, which includes its urban water sanitation and urban mobility pillars, (ii) Fragility and Resilience Policy, (iii) Disaster Risks Management and Resilience Policy, and (iv) Civil Society Engagement Policy, all of which provide strategic directions for addressing fragility and building resilience.

### Broad Objectives of IsDB's interventions to address urban flood risks

The main objective of IsDB interventions has been protecting populations against floods. Climate objectives were not set in the Project Appraisal Documents (PADs) for most projects, except for the BEN 1002 project. For this, the project will contribute to "strengthening the resilience and adaptive capacity to climate-related hazards and natural disasters" (SDG target 13.1). The project considered the country's high vulnerability to the effects of climate change and intends to address this vulnerability by enhancing resilience to climate change and geophysical hazards.

The solutions for flood response offered by the operations of the IsDB are primarily structural. The components were developed with a proportional allocation based on the location.: Drainage infrastructure, solid waste management, sewage, relocation and environmental and social management.

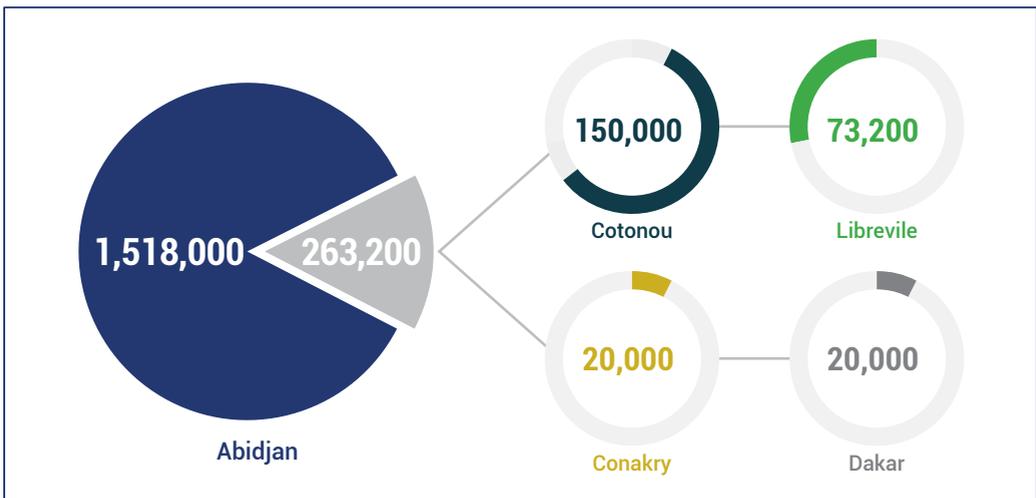




### Preliminary and Expected Results and Impacts

All projects are expected to have a significant impact on their beneficiaries with numbers amounting to 1,518,000 in Abidjan, 20,000 in Conakry, 150,000 in Cotonou, 20,000 in Dakar, and 73,200 in Libreville. The primary aim of these projects is to mitigate the risk of flooding, thereby preserving the means of livelihood of the beneficiaries, such as their homes, farmlands, and crops, and improving their living conditions.

Therefore, these projects align with SDG target 11.5.2, which aims to significantly reduce the number of deaths and people affected by disasters, including water-related disasters, and substantially decrease the direct economic losses caused by disasters by 2030, with a focus on protecting the poor and vulnerable. Additionally, the projects contribute to SDG 13 with a focus on climate change adaptation by enhancing the resilience of infrastructure and indirectly supporting mitigation efforts through solid waste management that reduces overall GHG emissions.





## G. Main Lessons Learned

Based on the projects assessed, there is a continuous trend towards fully implementing the relevant strategies of the IsDB in the financed operations. The most recent projects financed in the sector tend to mainstream climate considerations into their components, such as the Cotonou Stormwater Drainage Project. However, it was revealed that there is still an urgent need for IsDB Member Countries to strengthen their capacities in climate risk assessment and resilience building to increase the climate performance of their projects.

- a. Regarding the Abidjan Storm Water drainage project, it partially implements Integrated Water Resource Management (IWRM) as it combines drainage operations, sewage, and solid waste management. However, the project primarily focuses on structural solutions to address the underlying challenges in the project communities, which is not entirely in line with IFM strategies that suggest a mix of structural and non-structural solutions.
- b. The scope of the Abidjan Stormwater Project indicates a more complex issue involving urban

planning objectives to achieve better living conditions. Achieving such a goal requires integrating water resource management into urban planning, which entails strengthening capacities to delineate flood risk zones, define the use of these risky zones, and implement flood-sensitive land use plans through regulation, incentives, knowledge enhancement, and public investments. Including urban governance aspects as project components could have also further helped overcome the challenges in fostering such integration.

- c. The Dakar Flood Mitigation Project seeks to implement Coastal Zone Management, involving the establishment of setback lines and the relocation of individuals. The Libreville stormwater drainage and sanitation infrastructure project, as well as the Conakry Sanitation project, partially implement this approach by constructing drainage infrastructure and managing solid waste. The various project components emphasize the need to adopt a cohesive Strategy and Policy Framework for Urban Management and Flood Management.





Despite all the projects being on track to achieve the expected outcomes, there is a need to enhance the integration, design, and implementation of robust climate action in projects financed in cities across sub-Saharan Africa.

Most member countries assessed have not developed clearly defined Urban Climate Action Plans to support their investments in flood management. As a result, there is an urgent need for technical support to be provided to national and municipal authorities to develop and implement urban climate action plans that address the priority areas specific to each city context.

Multistakeholder Engagement must be encouraged to promote strong community and CSO participation, leadership development, knowledge sharing, dissemination of good practices, and resource sharing.

Multistakeholder collaboration is crucial to promote the broader application of Integrated Flood Management (IFM) principles. Furthermore, research institutions necessitate backing to create scientific methodologies and curricula, as well as gather data essential for executing Urban Climate

Action Plans. This is to support a comprehensive approach towards tackling climate-related risks in the context of urban development in Sub-Saharan Africa.

The need for effective flood management within the framework of urban development necessitates substantial financial resources from both the public and private sectors. For municipal and national authorities to successfully implement Urban Climate Action Plans, it is essential to employ skilled personnel to establish internal and external financial mechanisms and devise strategies for financing adaptation measures in the context of urban development, including incentives for both public and private stakeholders. New impetus must be given to the mobilisation of climate finance. It is essential to find innovative ways to deliver climate finance at the required level of need.

Finally, leveraging experience based on research and return on experience (REX) is crucial to extend and propagate knowledge about flood management issues and climate adaptation in urban planning and flood management more broadly within the sub-Saharan Africa sub-regions' cities.



## H. Conclusion and Recommendations

Urban flooding presents a major challenge for societies and economies in numerous cities across the globe, particularly in the context of climate change. This phenomenon can result in substantial damage to infrastructure, property, livelihoods, and disrupt essential services and economic activities. Moreover, it has significant effects on health, including the loss of human life and disruption of health services and WASH services. Despite the rise in natural and climatic risks, Sub-Saharan Africa is not exempt from this issue. However, African cities tend to implement a limited number of structural solutions that are not always effective, and they rarely adopt climate action or best practices from around the world.

Hence, it is imperative to elevate the standards of urban governance in relation to flood management and adaptation to climate change, particularly regarding the planning, implementation, and reporting of urban development. It is vital to incorporate climate adaptation and resilience into urban flood projects to minimize vulnerability and improve the ability of urban communities and systems to cope with adverse situations.

In light of the research and empirical findings of this study, the following recommendations are made to enhance flood management practices in cities across Sub-Saharan Africa, in response to the challenges posed by a changing climate.

- a. **Advance towards an Integrated Approach to Urban Flood Management:** The IsDB should assist Member Countries in implementing Integrated Flood Management principles through the development of sound flood management policies and programmes.
- b. **Incorporating Climate Adaptation and Resilience Objectives in the Early Stages of Project Development:** Based on this strategic focus, IsDB's new intervention should be designed in the pursuit of SDG targets 1.5,

11.5 and 13.1 and may comprise within the framework of an Urban Climate Action Plan the following components at a minimum:

- i. Flood risk assessment,
  - ii. Flood management strategies, including non-structural measures,
  - iii. Flood management governance.
- c. **Double-down on Targeted Investment in Urban Resilience:** IsDB must advocate for a new generation of urban flooding interventions that align with its existing policies, strategies, and action plans. To achieve this, they can develop accessible guidelines for designing, implementing, and monitoring climate adaptation and resilience-building initiatives in urban development projects and investments.
  - d. **Support Capacity Enhancement through Technical Assistance Support:** The Bank is encouraged to increase support to Member Countries (MCs) in their efforts to implement their nationally determined contributions, particularly for:
    - i. The integration of climate considerations into urban planning,
    - ii. The production of adequate data for risk assessment and vulnerability analysis,
    - iii. The implementation of Urban Climate Action Plans and Stormwater Management Plans
    - iv. The development of capacities to enable cities to adopt international practices,
    - v. Collaboration and knowledge sharing.

# List of Reference Documents for this Knowledge Brief

1. Overview of Urban Flooding in sub-Saharan Africa
2. Climate Adaptation Results and Impacts in Sub-Saharan Africa
3. Lessons Learned from IsDB Operations and Recommendations
4. Knowledge Brief on Urban Flooding and Climate Adaptation Actions

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