

**REGIONAL FLOOD RISK  
MANAGEMENT STRATEGY  
AND  
2020 -2025 ACTION PLAN**

Directorate of Humanitarian and Social Affairs



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## **FOREWORD**

Floods are among the most destructive of natural phenomena. In West Africa, floods affect the agricultural sector, homes and public services and also lead to the loss of human lives and livestock. There are several institutional, technical and financial obstacles to the efforts to reduce and effectively manage floods. In the region, vulnerability to floods may be heightened due to a number of factors: high poverty rate, demographic trends, inadequate public investment in building resilience, the fragile environment, conflicts and climate change. The poor availability of and access to hydro-meteorological information make it impossible to forecast floods and issue warnings. The institutions and individuals responsible for developing and implementing the preventive measures are not adequately equipped.

This can be explained by the fact that over the last 30 years, the priority has been the development of drought management measures in countries, at the expense of flood-related disaster risk preparedness. The need to address floods in a comprehensive manner emerged following recurrent floods in recent years, thus providing the impetus for the development of a regional flood risk management strategy.

The vision of the ECOWAS policy is to have resilient Member States and communities where the risks do not adversely affect development and where development processes do not lead to accumulated risks from natural disasters.

This Regional Flood Risk Management Strategy addresses the gaps identified in flood risk management knowledge management and governance at the national and regional levels.

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ECOWAS Commission

## ACRONYMS AND ABBREVIATIONS

**ACMAD:** African Centre of Meteorological Application for Development

**AfDB:** African Development Bank

**AGRHYMET:** Regional Centre for Agriculture, Hydrology and Meteorology

**ASECNA:** Agency for Aerial Navigation Safety in Africa and Madagascar

**AU:** African Union

**CILSS:** Permanent Inter-State Committee for Drought Control in the Sahel

**CSO:** Civil Society Organisation

**DHA:** Directorate of Humanitarian Affairs

**DRM:** Disaster Risk Management

**DRR:** Disaster Risk Reduction

**ECOWAS:** Economic Community of West African States

**EM-DAT:** OFDA/CRED International Disaster Database

**EU:** European Union

**FAO:** Food and Agriculture Organisation of the United Nations

**GFDRR:** World Bank Global Facility for Disaster Risk Reduction and Recovery

**GIS:** Geographic Information System

**HFA:** Hyōgo Framework for Action

**ICT:** Information and Communication Technology

**IFCR:** International Federation of Red Cross and Red Crescent Societies

**IPCC:** International Panel on Climate Change

**IRIN:** Integrated Regional Information Networks

**MDGs:** Millennium Development Goals

**NBA:** Niger Basin Authority

**NDMA:** National Disaster Management Agency

**NEPAD:** New Partnership for Africa's Development

**NGO:** Non-Governmental Organisation

**PDNA:** Post-Disaster Needs Assessment

**SO:** Strategic Objective

**UEMOA:** West African Economic and Monetary Union

**UN OCHA:** United Nations Office for the Coordination of Humanitarian Affairs

**UNDP:** United Nations Development Programme

**VBA:** Volta Basin Authority

**WADB:** West African Development Bank

**WASCAL:** West African Centre for Scientific Services on Climate Change and Adapted  
Land Use

**WB:** World Bank

**WFP:** World Food Programme

**WMO:** World Meteorological Organisation

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Annex 1: Definitions and terminology

## **BRIEF SUMMARY**

West Africa is presently experiencing heavier and more frequent rainfall than in the past. The occurrence of floods in several West African countries has risen in the past decade, causing the loss of human lives and property. The damage and losses from floods amount to millions of dollars and consequently lower the chances of achieving the primary Millennium Development Goals (MDGs), which include the reduction of extreme poverty and hunger.

Flood response is mainly ad hoc and is deployed late in the post-disaster period in all West African countries. This weakness shows the absence of or inadequate policies and/or strategies, laws, institutional frameworks, resource allocation and trained personnel.

It is incumbent on ECOWAS to propose strategic guidelines, enabling all the States of the region, together with the stakeholders, to offer services efficiently and effectively. With this in mind, the strategy identifies the objectives and sets out the priority activities. The formulation of the strategy falls within several reference frameworks, including the 2015 - 2030 ECOWAS Action Plan for Disaster Risk Reduction, the 2015 - 2030 African Union Programme of Action for Disaster Risk Reduction, the 2015 – 2030 Sendai Action Framework for Disaster Risk Reduction, the 2008 West African Water Resources Policy and its 2012 Implementation Plan, the 2008 ECOWAS Environmental Policy, ECOWAS Vision 2020 and the Sustainable Development Agenda 2030.

This strategy has four strategic objectives.

The first strategic objective focuses on improving collaboration and developing synergy of action between the various institutions involved in flood risk management. ECOWAS, Member States and the regional weather centres recognise the importance of consultation, cooperation and information exchange in a spirit of subsidiarity to prevent flood risks. They also recognise the need to share experiences and expertise, in order to improve their understanding on matters of common interest.

The second strategic objective proposes the harmonisation of the flood risk management approaches in ECOWAS Member States, based on the assessment of flood risks and the development or updating of flood risk management plans at local and national levels.



The third strategic objective relates to the establishment and/or strengthening of flood warning systems and the dissemination of information on climate risks in Member States and the region. It takes into account capacity building for Member States' institutions on the collection, analysis and interpretation of climate data from hydrological and meteorological observation station networks and on the development of improved models for flood forecasting and reliable warnings.

The fourth strategic objective takes into account flood risks in development planning in Member States. It focuses on the integration of flood risks into masterplans and land-use plans for flood-resilient development.

The Strategy's Action Plan sets out priority activities for its implementation. At the national level, Member States monitor their goals and results. Thus, they compile summary reports on the status of flood risk reduction from time to time and define a set of goals to address gaps and challenges. The information needed for monitoring is obtained from existing national statistical systems and international data.

At the regional level, ECOWAS, in partnership with Member States, specialised institutions and international partners, coordinates and facilitates the implementation of the Action Plan. It coordinates resource mobilisation. It also publishes periodic summary reports on the status of implementation of the flood risk reduction policies of Member States.

## CHAPTER I

### I. INTRODUCTION

In contrast to the droughts of the 1970s, West Africa is now experiencing more frequent and intense rainfall than before. The number of flood cases in many West African countries has increased significantly over the past decade, resulting in loss of life and property.

Major rivers in the region (e.g. the Niger, Senegal, Volta and Lake Chad systems) often overflow their banks due to extreme rainfall, leading to severe impacts on livelihoods, food security and ecological systems (Armah et al., 2010; Descroix et al., 2012). This situation has often been compounded by several factors such as extensive and unplanned building in flood-prone areas, changes in land use due to population growth and the associated high rate of urbanisation (Di Baldassarre et al., 2010; Hounkpè, 2016; Li et al, 2016), release of water from dams (Agada and Nirupama, 2015), faulty engineering work on waterways, poor sanitation and lack of maintenance of drainage networks, obstructive activities of utility agencies, inadequate funding for flood mitigation measures (Odjugo, 2012; Okyere et al, 2013; Ouikotan et al., 2017), soil surface cementing that prevents infiltration of water and increases runoff (Odjugo, 2012) and poor waste management (Lamond et al., 2012).

Given that the region is not yet well prepared to deal with floods, the regional flood risk management strategy will enable ECOWAS Member States to follow up on priority activities for improved flood management. The priority activities are aligned with the four (4) priorities of the Sendai Framework for Action (2015-2030), which are: i) understanding disaster risks, ii) strengthening disaster risk governance to better manage them, iii) investing in disaster risk reduction for resilience, iv) enhancing disaster preparedness for effective response and to "Build Back Better" in recovery, rehabilitation and reconstruction.

In addition, national and local plans will target non-structural operations contributing to the identification and knowledge, monitoring and forecasting of floods, disaster preparedness and response, post-disaster management and feedback regarding structural actions dedicated to the protection of communities and the reduction of vulnerability.

#### **1.1 International, regional and national situation**

Adopted in March 2015, the Sendai Framework for Disaster Risk Reduction defines the priorities of the international community in terms of disaster reduction for the 2015-2030 period. It succeeded the Hyōgo Framework for Action, which covered the decade 2005-2015, by updating the concept of disaster. The new Framework applies to the risk of small or large scale, frequent or infrequent, sudden or slow-onset disasters, caused by natural or man-made hazards as well as related environmental, technological and biological hazards

and risks. It also calls for the strengthening of disaster risk governance, including national platforms.

- Disaster risk reduction concerns all sectors of the society. It can only be effective if national and local authorities, the private sector (especially the insurance sector), civil society, international organisations and the public at large come together to implement a common and inclusive agenda.
- The extent of exposure and vulnerability to flood risk determines the magnitude of the impact of disasters. In the region, exposure and vulnerability to floods can increase due to several factors which include high level of poverty, demographic trends, inadequate public investment to build resilience, environmental fragility, conflict and climate change.
- Most ECOWAS Member States have established national mechanisms for disaster risk reduction. Nationally, the level of development of these mechanisms varies from country to country. Ideally, they include: (i) legal provisions, (ii) a national response plan, and (iii) a national platform comprising a disaster management organisation. The legal provisions determine the overall vision of the country, the role of the various stakeholders, as well as the prevention tools and mechanisms in the area of disaster risk reduction. National platforms provide coordination, analysis and advice on issues relating to disaster risk reduction. Although the ECOWAS Humanitarian Policy and Action Plan authorised all ECOWAS Member States to ensure the establishment of specific national disaster management agencies in their countries, it should be noted that this has not always been effective.

### **1.2 Role of the regional flood risk management strategy**

The need to address the issue of flood at the regional level emerged following the recurrent floods and their impacts in recent years, which provided the impetus for the development of a West African regional flood risk management strategy. The strategy thus responds to the gaps in knowledge management and governance in flood risk reduction at national and regional levels. In the light of the concerns described, the regional flood risk management strategy is in line with the ECOWAS Action Plan for Disaster Risk Reduction (2015-2030), the African Union Programme of Action for Disaster Risk Reduction (2015-2030), the Sendai Framework for Disaster Risk Reduction (2015-2030), the West African Water Resources Policy 2008 and its 2012 implementation plan, the ECOWAS Environmental Policy 2008, the ECOWAS Vision 2020 and the 2030 Agenda for Sustainable Development. This strategy provides guidance to

intergovernmental organisations, Member States and their national bodies and river basin authorities on flood risk management in order to reduce the associated potential negative impacts with the aim of achieving sustainable management of flood-prone areas and the establishment of reliable forecasting and warning systems, adapted to the needs of end users.

## **CHAPTER II**

### **II. CLASSIFICATION OF FLOODS IN THE REGION**

The floods that regularly hit West African countries are generally associated with extreme rainfall events. They can be of different nature:

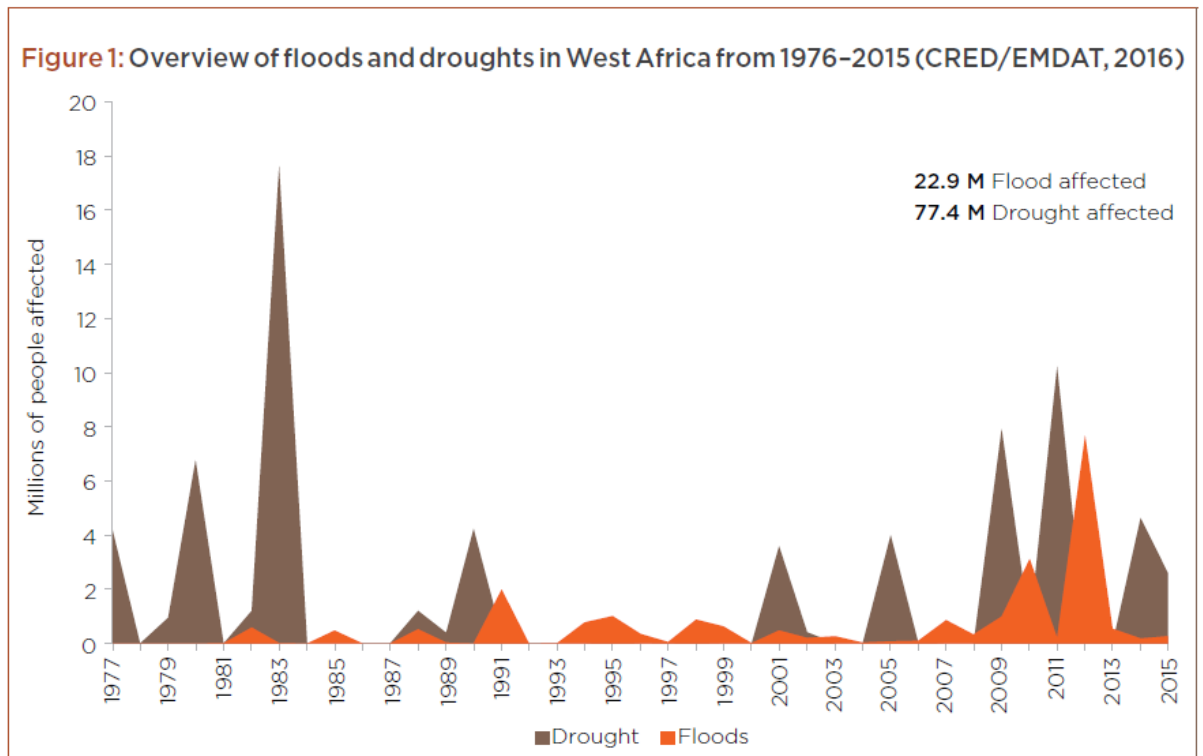
- ✓ River floods caused by rainfall on river basins located upstream and on tributaries that create a flood wave and the overflow of rivers. Local rainfall can sometimes exacerbate this type of disaster. This situation is particularly (but not exclusively) significant in the 16 cities located on the two (2) main rivers of the region namely the Senegal and Niger Rivers.
- ✓ High water table: local rainfall tends to cause the water table to rise. Groundwater flooding is mainly caused by prolonged periods of rainfall until the unsaturated area disappears and the water table rises to the topographic surface.
- ✓ Runoff floods:
  - In urban areas: urban flooding is caused by heavy and sudden rainfall that overwhelms the capacity of drainage systems, and by surface runoff. It should be added that this type of phenomenon is most often compounded by lack of maintenance of urban sanitation systems and major leaks in drinking water networks: service and drinking water therefore feed the water table, which is above the ground surface. Thus, a light rainfall of a few millimetres can become the cause of serious problems.
  - In rural areas associated with heavy rainfall and influenced by soil conditions, increase in land use and demographic pressure.
- ✓ Flash floods caused by excessive rainfall and characterised by a rapid rise in water level within minutes to hours.
- ✓ Coastal flooding: coastal countries face this type of threat, which is further exacerbated by the weakening of the dune ridge and the prospects for a rise in sea level as a result of climate change.

### III. IMPACTS OF FLOODS

Since 2007, annual floods have killed thousands, affected millions of people and destroyed infrastructure and property worth millions of dollars (Armah et al. 2010; Braman et al. 2013; IRIN 2012; Paeth et al. 2011; UN OCHA 2009). In 2017, UN OCHA reported that the West and Central African regions experienced severe flooding during the rainy season, causing significant material and human losses. A combination of flooded rivers and high-impact incidents resulted in the destruction of infrastructure and agricultural assets, human displacement and difficulty to access humanitarian aid. An estimated 12,000, 5,256 and 1,700 houses were damaged in Niger, Burkina Faso and Mali respectively. Six hundred (600) deaths were recorded in Mali (Segou region), Ghana (Northern region) and Sierra Leone (in and around Freetown) respectively. Pastoral communities were particularly affected, with 26,000 animals lost (a sharp increase from 1,352 in 2016) in Mali and 16,000 cows perished in Niger. Two hundred and fourteen (214) tonnes of food in Burkina Faso and 9,800 hectares of cultivated land in Niger were also lost. In the case of Nigeria, weeks of heavy rainfall in 2017 caused flash floods and river flooding in Benue State, north-central Nigeria, affecting more than 100,000 persons in 21 local governments in the State. The floods in the Northern Region of Ghana displaced about 11,800 persons, while 147 communities in 11 districts were affected. The average occurrence of floods at the national level ranged from 0.3 to 1.4 flood events per year for the period 1966-2018. The floods affected between 150 and 227,083 people per event (injured and homeless), resulting in an average of 38 deaths per event in Nigeria. Although there are wide disparities between countries, it is consistently reported that flood damage increases with population size (Badou et al., 2017), along with other key factors such as increased rainfall anomalies, unplanned land management and poor management of reservoirs. Post-Disaster Needs Assessment (PDNA) was carried out in a few countries to estimate the economic losses resulting from floods:

- ✓ In Senegal (2009), damages and losses were estimated at CFAF44.5 billion nationally, including CFAF35.5 billion for damages and losses in the Dakar Region;
- ✓ In Burkina Faso (2009), damages and losses were estimated at CFAF45,859,000,000 or USD102 million;
- ✓ In Togo (2010), damages and losses were estimated at USD38 million dollars;
- ✓ In Benin (2010), damages and losses were estimated at CFAF124 billion (USD257 million);
- ✓ In Nigeria (2012), the overall impact on real GDP growth in 2012 was estimated at 1.4% (NGN570 billion);

- ✓ In Ghana (2015), economic losses were estimated at over USD108,200,000;
- ✓ In Sierra Leone (2018), the total economic value of the effects of landslides and floods was estimated at about SLL 237.37 billion (USD31.65 million).



#### IV. MEMBER STATES' CHALLENGES IN FLOOD RISK MANAGEMENT

Several institutional, technical and financial challenges are hampering efforts to effectively reduce and manage the effects of floods in West Africa. The implementation of the Action Plan of the strategy will help to surmount some of the challenges that hamper the implementation of effective flood reduction and management interventions by national institutions of ECOWAS Member States. The challenges identified cover five (5) areas, as set out below:

##### 4.1 Cooperation among stakeholders

- ✓ Poor coordination between intergovernmental institutions supporting their respective Member States in terms of flood management (ECOWAS, CILSS/AGRHYMET, River Basin Authorities, etc.) - linked to a need to clarify the respective responsibilities of these institutions and in compliance with the principle of subsidiarity.

##### 4.2 Flood Risk Management

- ✓ Lack of collaboration in cross-border flood management; inadequate communication and coordination between countries for cross-border flood management, use of unilateral or bilateral approach instead of using a River Basin Authority management platform, lack of data and absence of integrated monitoring networks between countries, lack of mechanisms for disaster preparedness-response-recovery planning and absence or weakness of early warning systems;
- ✓ Lack of cooperation between the hydrological and meteorological services in charge of floods in the various countries, lack of harmonisation between the various ministries/institutions in charge of flood risk management in Member States, and lack of human resources;
- ✓ Weak land development guidelines as well as lack of emphasis on resilient development, construction guidelines and limited flood risk and flood hazard considerations. In addition, in many cases, existing policies are not (or poorly) implemented.

#### 4.3 Warning systems and information dissemination

- ✓ Low capacity of Member States' national institutions to predict floods:
  - National flood warning systems, where they exist, are not very effective because they: (i) are not based on systematic operational procedures, (ii) lack a precipitation and flow data management system integrated with meteorological/flood forecasting systems, (iii) take insufficient account of hazard, exposure and vulnerability modelling, (iv) rely on often inappropriate means of communication, (v) are not linked to sufficiently powerful response systems, and (vi) are not linked to feedback and prevention systems that will prevent the repetition of similar phenomena.
  - These weaknesses concern both the public sector and non-state actors, in both urban and rural areas. In West Africa, the authorities responsible for developing and implementing flood prevention measures do not have sufficient experience in that area and in implementing the adaptation measures relating to flood management: this is due to the fact that over the last 30 years, priority has been given to the development of measures to manage the effects of drought, to the detriment of prevention, emergency preparedness, response and post-disaster recovery capacities relating to floods;
- ✓ Weak early warning and flood forecasting systems in ECOWAS Member States. Implementation initiatives for operational purposes do not always provide adequate and

relevant information to decision-makers in terms of the magnitude, timing and duration of floods. The low density of observation networks and the misinterpretation of data are additional constraints;

- ✓ Lack or weakness or under-exploitation of hydrometeorological data;
- ✓ Lack of data exchange (e.g. real-time water level data between upstream and downstream countries) between Member States weakens the quality of hazard and flood risk assessments, flood forecasting and early warning in various Member States.

#### 4.4 Flood Risk Management Policies

- ✓ Inadequate skills and resources of sectoral institutions (water, health, agriculture, land use planning, etc.) to effectively take flood risks into account in the planning and sizing of infrastructure. An integrated approach to flood management involves reducing vulnerability by strengthening resilience and developing a culture of prevention to anticipate events rather than being controlled by them;
- ✓ Unsatisfactory level of women and youth's involvement in mechanisms for the prevention, monitoring or management of hydrometeorological risks;
- ✓ Lack of appropriate flood risk insurance mechanisms at all levels (communities, owners, municipalities, country, region)

#### 4.5 Mainstreaming gender in disaster risk reduction policies and strategies.

Economic, social and political status make women more vulnerable during disasters. This situation is exacerbated by the high poverty rate among women and the cultural constraints they face. In addition, women are particularly affected by the social impact of environmental disasters but are not adequately integrated into planning for the protection and implementation of related initiatives. Their access to information is also limited.

Challenges faced by women during disaster periods include the following:

- ✓ inadequate resources of their own to cater for themselves, resources that will enable them act accordingly during disaster periods. The inadequate resources make them vulnerable to exploitation, violence and sexual abuse;
- ✓ They are not represented in decision-making systems and are victims of a traditional, routine and gratuitous form of gender oppression;
- ✓ Limited resources for their specific health needs, especially for pregnant and breastfeeding women;



- ✓ The socio-cultural aftermath of disasters is such that women tend to lose their own social support networks entirely.

### **CHAPTER III**

#### **VI. OBJECTIVES AND STRATEGIES**

The regional flood risk management strategy is part of the ECOWAS Action Plan for Disaster Risk Reduction (2015-2030), the Sendai Framework for Disaster Risk Reduction (2015-2030),

the African Union Programme of Action for Disaster Risk Reduction (2015-2030), the West African Water Resources Policy 2008 and its 2012 implementation plan, the 2008 ECOWAS Environmental Policy, the ECOWAS Vision 2020 and the Sustainable Development Agenda 2030. The strategy sets out the objectives to be achieved in terms of reduction of potential negative effects associated with floods.

## **6.1 OBJECTIVES**

The strategic objectives address the weaknesses observed in knowledge management and governance relating to flood risk management and reduction at national and regional levels.

The strategic objectives include the following:

- ✓ Improve collaboration and develop synergy among the various institutions involved in flood risk management;
- ✓ Harmonise flood risk management approaches among ECOWAS Member States;
- ✓ Establish and/or strengthen the flood warning system and dissemination of information on climate risks among Member States and in the region;
- ✓ Integrate flood risks in development planning in Member States.

## **6.2 STRATEGIES**

In order to address the challenges of flood risk management in the region, intergovernmental organisations, Member States, national bodies and river basin authorities are proposing to implement activities to attain the set objectives.

### **6.2.1 Improving collaboration and development of synergy among the various institutions involved in flood risk management**

ECOWAS, Member States and Regional Climate Centres recognise the importance of consultation, cooperation and sharing of information to prevent flood risks through cooperation and regular consultation on environmental developments and in particular on disaster risks in their respective countries. They also recognise the need to share experiences and expertise in order to improve their understanding on issues of common interest. Disaster risk data can be obtained from regional climate research centres such as the African Centre of Meteorological Applications for Development (ACMAD), the Regional Centre for Agriculture, Hydrology and Meteorology (AGRHYMET), the Permanent Inter-State Committee for Drought Control in the Sahel (CILSS), the West African Science Service Centre on Climate Change and Adapted Land Use (WASCAL), national meteorological and hydrological services, university and research centres. Creating room for systematic dialogue and establishing communication and/or networking channels and platforms will improve the relevance, reliability and availability of information.

The various steps include:

- ✓ compile a comprehensive list of national and regional institutions and agencies working in the area of floods, and specify their mandates;
- ✓ develop a plan for strengthening collaboration among regional and national institutions;
- ✓ strengthen inter-agency cooperation by promoting an integrated and consistent system for data collection, processing, exchange, analysis, forecasting and communication (the integrated regional system should be connected in real time and non-real time to national systems, whether integrated at the national level or separately. It should not duplicate the work done at the national level but should provide additional information for better crisis and flood risk management);
- ✓ establish advisory groups to evaluate and refocus flood risk management approaches at national and regional levels.

### **6.2.2 Harmonisation of flood risk management approaches of ECOWAS Member States**

Member States recognise the need to increase knowledge of flood risks to help develop national and local (municipal) plans. They agree to use a Geographic Information System (GIS) to map flood risks, taking into account hazard for various return periods, exposure and vulnerability (population, agricultural land, infrastructure, and all types of movable and immovable assets). The development of national and regional plans for integrated flood management will aim at leveraging the positive effects of floods (groundwater recharge, agriculture, fisheries, renewal of the river ecosystem) as well as reducing the negative impacts of floods (loss of life and property, loss of livelihoods as well as purchasing and production power, migration, psychosocial effects, impediments to development and economic growth, political implications);

The various steps include:

- ✓ identify the focal point within the institution or body designated by the national authorities;
- ✓ conduct a flood risk assessment at the local, national and regional level;

Each Member State shall carry out a flood risk assessment, based on:

- maps, at the appropriate level, including the boundaries of river basins, sub-basins and, where appropriate, coastal areas, showing topography and land use;
- description of floods that occurred in the past, which had significant negative impacts on human life and health, the environment, cultural heritage and economic activity, for which there is still a likelihood of similar events occurring in the future, including a description of the extent of the floods and the water flow routes, and an assessment of the negative impacts caused by such floods;

- assessment of the potential negative impacts of future floods on human life and health, the environment, cultural heritage and economic activity, taking into account elements such as topography, the location of rivers and their general hydrological and geomorphological characteristics, including floodplains as natural retention areas, the effectiveness of existing man-made flood defence infrastructure, the location of populated areas, areas of economic activity as well as long-term developments including the impact of climate change on the occurrence of floods.
- ✓ support Member States in the development and/or update of flood risk management plans at the local and national level;
 

The flood risk management plan aims at reducing the negative effects of floods by taking into account local and national specificities and by integrating a regional vision at the transnational level too. Management plans should focus on prevention, protection and preparedness. Revision of the management plans should take place at regular intervals. Flood risk management plans should take into account the flood risk assessment; flood zone and flood risk maps; a description of the appropriate flood risk management objectives; a summary of the measures to achieve the appropriate flood risk management objectives, where they exist; a description of the cost-benefit analysis method, specified by the Member States concerned. ECOWAS will develop guidelines for flood risk assessment at different levels (local, national).
- ✓ support Member States in post-disaster assessments as well as in the development and implementation of recovery plans;
- ✓ support Member States in the establishment of a single disaster management structure or body.

### **6.2.3 Establishment and/or strengthening of flood warning systems and information dissemination on climate risks in Member States and the region**

The description of this strategic objective focuses on strengthening the capacities of Member States' institutions for the collection, analysis and interpretation of climate data from the hydrological and meteorological observation station networks. The interpretation and analysis of data generated by hydrological and meteorological stations will complement flood risk mapping. The improvement of the availability of quality data and information on specific flood risks, as well as the development of improved models, are necessary for predicting flood vulnerability and issuing reliable warnings. The installation of modern hydrological and meteorological monitoring equipment will increase the spatial coverage of national monitoring

networks. There is also a need to have data management systems and develop products with ground-based data (weather/hydro) that can be used to validate forecasts in real time. In order to promote the effectiveness of warnings, a detailed communication strategy on flood risks and threats will be developed. Research programmes on climate-related threats will be integrated into national and regional school curricula.

The various steps include:

- ✓ strengthen the capacity of hydrological and meteorological agencies to collect, analyse and process data in order to provide flood monitoring and forecasting services for warning;
- ✓ conduct operational research on various components of flood management;
- ✓ initiate or strengthen public-private sector involvement in the development of products and services on the various components of flood management at the national and regional level;
- ✓ strengthen prevention systems and set up flood forecasting and warning systems;
- ✓ strengthen cooperation and develop specific products to meet the needs relating to flood forecasting and warning;
- ✓ set up a regional support and advisory unit for flood and climate risk management;
- ✓ strengthen the spatial coverage of national hydrological and meteorological monitoring networks;
- ✓ operationalise and leverage hydrological and meteorological observation networks;
- ✓ mainstream flood management and gender into harmonised national and regional policies for integrated water resources management;
- ✓ strengthen collaboration in the management of cross-border floods by emphasising the role of River Basin Authorities and their relations with national and regional institutions;
- ✓ integrate flood risk awareness into school textbooks;
- ✓ develop a sensitisation and communication strategy at various levels of flood risks and threats;
- ✓ integrate flood risk awareness into school textbooks.

#### **6.2.4 Inclusion of flood risks in development planning in Member States**

The description of the strategic objective focuses on the integration of flood risks into master plans and land-use plans for flood-resilient development. The training of national institutions on flood risk not only allows the development of possible methods to reduce the negative impacts of floods, but also facilitates the integration of flood risk into urban development plans,

infrastructure development and building codes. These plans will take into account the history of extreme rainfall events, measured flood water levels and flood risks associated with projected climate change. In addition, measures will ensure that future needs and risks relating to public sanitation and health are adequately considered in the infrastructure development process.

The capacity of rainwater drainage systems, through maintenance and expansion of existing drainage systems, should be strengthened. Women and the youth should have access to climate information and participate in the planning process for warning systems.

The various steps include:

- ✓ integrate flood risks into master plans, land use plans and other planning documents;
- ✓ develop and implement a waste management and rainwater drainage policy;
- ✓ develop and strengthen prevention systems (protective dikes, development of river channels, regulating dams, weirs, treatment of river basins, drainage, bans on construction and settlement in flood-prone areas);
- ✓ integrate flood risks in coastal area management ;
- ✓ support the implementation of national strategies to combat coastal erosion;
- ✓ develop an awareness plan for a better understanding of the importance of rainwater drainage by the population;
- ✓ develop a guide for best practices and actions for prevention, intervention and restoration of environmental health for national public health directorates in the event of floods;
- ✓ develop and adapt ICT systems to the early warning system and train women and girls on how to use them;
- ✓ develop a good guide for best practices, taking into account prevention, response and recovery.

## **CHAPTER IV**

### **VII. ACTION PLAN OF THE STRATEGY**

The 2020-2025 Action Plan of the ECOWAS Flood Risk Management Strategy aligns with the ECOWAS Disaster Risk Reduction Action Plan (2015-2030), the African Union Programme of Action for Disaster Risk Reduction (2015-2030), the Sendai Framework for Disaster Risk

Reduction (2015-2030), ECOWAS regional programmes and policies and the 2030 Sustainable Development Agenda. The Action Plan puts forward priority measures for implementation of the strategy.

### **7.1 Enhancing collaboration and developing synergy of action among the different institutions involved in flood risk management**

Synergy between the various specialised institutions and national departments and agencies involved in flood management leads to greater effectiveness. The impact of conflicting interests across the different institutions results in a duplication of efforts and additional cost for Member States and donors, which should be avoided by encouraging synergy rather than giving preference to one above the other.

The specific mandate of the respective institutions and agencies and their synergy of action through complementary measures will jointly contribute to improving flood forecasting and will enable stakeholders to engage in an inclusive approach to flood forecasting.

### **7.2 Harmonisation of flood risk management approaches of ECOWAS Member States**

An integrated flood risk management entails a better consideration of spatial and temporal dimensions in flood management. The risk assessment provides a homogeneous vision of risks at various levels and helps to identify areas that would require priority attention in order to mitigate the adverse effects of flooding. It will provide the relevant agencies with technical references for assessing the impact of different types of floods on human health, the environment, property and economic activity. It will result in the development of flood management plans at local and national levels.

### **7.3 Establishment and/or strengthening of flood warning systems and information dissemination on climatic risks in Member States and the region**

Inadequate spatial coverage of the national meteorological and hydrological observation stations and low usage of existing data are major obstacles to the development of reliable flood forecasting and warning systems. There is a need to harmonise the systems for climate data collection and usage across the national climate services.

### **7.4 Integration of flood risk in development planning in Member States**

The integration of flood risk in development policies is now a priority both at national and regional levels in reducing the vulnerability of the population. The master plan and development plan should refer to flood hazard and flood risk maps. Generally, it is pertinent to take into account building restrictions in high-risk areas, limited sensitive equipment in flood-

prone areas and increased capacity of the existing sensitive equipment by change of location. Whenever construction becomes feasible, adaptation to the possible risks, identification of areas that pose a threat to human life and assessment of the safety of the existing population must be considered, in addition to surveillance, forecast, warnings and evacuation, and protection measures.

### **8. Action Plan**

The strategy's Action Plan outlines priority activities alongside specific, measurable, achievable and realistic time-bound indicators that align with the expected outcomes of each stage of the process.

### **9. Budget**

The budget estimate for the Action Plan amounts to USD46,315,000 and mainly covers training and research, hydrological and meteorological equipment, flood warning, forecast and prevention systems, flood management plans and recovery plans.



**Table 1: MATRIX OF THE 2020-2025 ACTION PLAN**

Strategic objective 1. Improve collaboration among the various institutions involved in flood risk management							
Priority activity	Expected outcome	Measurable indicator	Reference value /Target	Supervising Organisation	Partners	Budget Estimate USD	Timeline
1.1 Compile a comprehensive list of national and regional institutions and agencies involved in flood management and state their respective mandates	The database of institutions involved in flood risk management is compiled.	Existence of the database of institutions engaged in flood risk management	Reference value: 0  Target: 1	ECOWAS	AGRHYMET ACMAD WASCAL River Basin Authorities National Institutions and Agencies WMO	50 000	2020
1.2 Develop a plan for strengthening collaboration among the national and regional institutions	Regional institutions work in synergy based on a plan to strengthen collaboration in flood management.	Existence of a collaboration plan for regional institutions involved in flood management	Reference value: 0  Target: 1	ECOWAS	AGRHYMET ACMAD WASCAL River Basin Authorities WMO	30 000	2020 -2021
1.3 Strengthen institutional collaboration by developing an integrated and coherent system for compilation, processing and sharing of data, analysis, forecast and communication	A flexible integration system is set up alongside online data sharing tools	Existence of an MoU between ECOWAS, the specialised institutions and the Member States, for the collection, processing and sharing of data, analysis, forecast and communication  Existence of an online platform	Reference value: 0 Target: 1  Reference value: 0 Target: 1	ECOWAS	AGRHYMET ACMAD WASCAL River Basin Authorities Member States WMO NGO, CBO, traditional authorities, institutions, private sector	30 000	2020-2024
1.4 Set up consultation groups to evaluate and provide new direction to flood management activities at regional and national levels (with gender considerations).	The consultation groups evaluate, reorient flood management efforts and share information.	Existence of consultation groups at national and regional levels  Reports prepared by the consultation groups at national and regional levels	Reference value: 0  Target: 1	ECOWAS	Member States AGRHYMET ACMAD WASCAL River Basin Authorities Member States WMO NGO, CBO, traditional authorities, institutions, private sector	150 000	2020-2022

Strategic Objective 2. Harmonise the flood risk management approaches of the ECOWAS Member States							
Priority activity	Outcome	Measurable indicator	Reference value /Target	Supervising body	Partners	Budget	Timeline
2.1 Identify the focal point within the institution or body designated by the national authorities	The institution and focal point are identified in each Member State	Existence of an institution responsible for flood risk evaluation (to be notified).	Reference value: To be established during implementation of the activity Target: one in each Member State	Member States	ECOWAS	-	2020
2.2 Assess risks connected to flooding on a local and national scale (with due consideration for gender and persons with disability)	Flood hazard and flood risk maps are prepared and published taking due account of socioeconomic indicators, demographic indices, the land value, land use and property in each of the Member States	Availability of flood hazard and flood risk maps coupled with socioeconomic indicators - including demographic indices, the land value, land use and property in each of the Member States	Reference Value: To be established during implementation of the activity Target: i. flood risk maps including the socioeconomic indicators 15 (one per country)	Member States	ECOWAS ACMAD WASCAL River Basin Authorities NGO, CBO, traditional rulers, private sector Traditional rulers institutions, private sector	2,250,000	2020 -2024
2.3 Support Member States in developing and/or updating flood management plans at local and national levels (with due consideration for gender and persons with disability)	Each Member State has a flood management plan taking due account of flood hazard and flood risk maps and socioeconomic indicators – demographic indices, the land value, land use and property	Existence of national flood management plans taking due account of socio-economic indicators – including demographic indices, the land value, land use and property in each Member State	Reference value: To be established during implementation of the activity  Target: 15 (one per country)	Member States	ECOWAS ACMAD WASCAL River Basin Authorities NGO, CBO, traditional rulers, private sector	450,000	2020 -2025
2.4 Assist Member States in post-disaster assessment, developing and implementing recovery plans (with due consideration for gender and persons with disability)	A skilled post-disaster analyst is identified in each Member State  A recovery plan has been adopted for each Member State	Existence of a national recovery plan in each Member State and personnel trained in post-disaster evaluation.	Reference value: To be established during implementation of the activity Target: 15 (one per country)	Member States	ECOWAS ACMAD WASCAL River Basin Authorities NGO, CBO, traditional rulers, private sector	450,000	2020-2025
2.5 Support Member States in setting up a single disaster management structure or body (with due consideration for gender and persons with disability)	Each Member State has a single disaster management structure or body	Existence of a single disaster management structure or body	Reference value: To be established during implementation of the activity Target: 15 (one per country)	Member States	ECOWAS	150,000	2020 -2022

Strategic Objective 3. Establish and/or strengthen the flood warning system and information dissemination on climate risk in Member States and the region							
Priority activity	Outcome	Measurable indicator	Reference value/Target	Supervising organ	Partners	Budget	Timeline
3.1 Build the capacity of institutes of meteorology and hydrology in collecting, analysing and processing data for flood forecasting and monitoring services (with due consideration for gender and persons with disability)	The institutes of meteorology and hydrology have provided forecasts on floods and climate risk;	Number of staff trainings for institutes of meteorology and hydrology on data collection and flood forecasting;  The institutes of meteorology and hydrology develop upgraded warning systems to monitor and issue flood warnings	Reference value: To be established in the course of implementation  Target : To be established in the course of implementation	Member States	ECOWAS AGRHYMET ACMAD WASCAL River Basin Authorities WMO	7,500,000	2020 -2025
3.2 Conduct research on the various aspects of flood management (with due consideration for gender and persons with disability)	Research institutes have published papers on the various aspects of flood management	Number of research papers on various aspects of flood management	Reference value: To be established in the course of implementation  Target : To be established in the course of implementation	ECOWAS	AGRHYMET ACMAD WASCAL River Basin Authorities Member States WMO	300,000	2020-2025
3.3 Engage or strengthen public-private sector participation in developing products and services on the various components of flood management at national and regional levels (with due consideration for gender and persons with disability)	The public-private sector is engaged in the development of products and services on the various flood management components at national and regional levels	The number of products and services developed at national and regional levels through public-private sector participation.	Reference value: To be established in the course of implementation  Target : To be established in the course of implementation	Member States	ECOWAS ACMAD WASCAL River Basin Authorities NGO, CBO, traditional rulers, private sector	300,000	2020-2025
3.4 Strengthen cooperation and develop products tailored to needs arising from flood situations at national and regional levels (with due consideration for gender and persons with disability)	Specific products tailored to meet needs arising from flood situations are available	Existence of specific products to address flood related needs	Reference value: To be established in the course of implementation  Target : To be established in the course of implementation	ECOWAS	AGRHYMET ACMAD WASCAL River Basin Authorities Member States WMO Private sector	300,000	2020-2025

3.5 Set up a regional climate risk and flood management advisory/support unit (with due consideration for gender and persons with disability)	The regional unit provides assistance/advise on flood management and climate risk	An operational climate risk and flood management support/advisory unit	Reference value0 Target : 1	ECOWAS	ECOWAS WASCAL AGRHYMET ACMAD WMO Traditional rulers, private sector	-	2020 -2023
3.6 Boost the spatial coverage of the national hydrological and meteorological observation networks	Optimal spatial coverage of hydrological and meteorological observation networks is achieved in each Member State  Experts in hydrology and meteorology are engaged in the collection, processing and exchange of data, analysis and forecasting using an online tool	Number of automatic rain gauge stations installed in the sub region  Number of trainings provided to hydrology and meteorology experts on modelling the flood warning system	Reference value: Not specified  Target : Not specified	Member States	ECOWAS AGRHYMET ACMAD WASCAL River Basin Authorities WMO NGO, CBO, Traditional rulers, private sector	15,000,000	2020 -2025
3.7 Make the hydrological and meteorological observation networks fully operational	Each Member State has a fully functional observation network and forecast network.	Number of fully operational observation networks in each Member State	Reference value: Not specified  Target : Not specified	ECOWAS	Member States AGRHYMET ACMAD WASCAL River Basin Authorities WMO institutions Traditional rulers, private sector	7,500,000	2020-2025
3.8 Develop and establish operational hydrological and meteorological forecast and warning systems at the national level.	Operational hydrological and meteorological forecast systems are available in each Member State	Number of operational hydrological and meteorological forecast systems in each Member State	Reference value: Not specified  Target : Not specified	ECOWAS	Member States AGRHYMET ACMAD WASCAL River Basin Authorities WMO institutions Traditional rulers, private sector	9,000,000	2020-2025
3.9 Mainstream flood management and gender into harmonised national and regional policies for integrated water resources management	The region and Member States have harmonised and relevant policies for integrated water resources management that take due account of flood management and gender	Integrated water resources management policies at national and regional levels taking due account of flood management and gender)	Reference value: To be established in the course of implementation  Target : To be established in the course of implementation	Member States	ECOWAS AGRHYMET ACMAD WASCAL River Basin Authorities NGO, CBO, Traditional rulers, private sector	225,000	2020 -2025
3.10 Strengthen collaboration in the management of transboundary floods	Collaboration between Member States and also with specialised institutions is strengthened in	Existence of a framework for collaboration among the institutions in the	Reference value: To be established in the course of implementation	ECOWAS	ECOWAS AGRHYMET ACMAD WASCAL	50,000	2020 -2025

	the management of transboundary floods	management of transboundary floods	Target : To be established in the course of implementation		River Basin Authorities WMO NGO, CBO, Traditional rulers, private sector		
3.11 Integrate flood risk awareness in educational curricula (with due consideration for gender and persons with disability)	Pupils receive instruction on flood risk and subsequent management efforts at national and regional levels	Curricula that incorporates flood management at national and regional levels	Reference value: To be established in the course of implementation Target : To be established in the course of implementation	ECOWAS	ECOWAS AGRHYMET ACMAD WASCAL River Basin Authorities Les institutions et agences nationales NGO, CBO, Traditional rulers, private sector	30,000	2020 -2023
3.12 Develop a strategy for raising awareness at different levels regarding flood risk and threats through national and local platforms (with due consideration for gender and persons with disability)	Strategy for awareness creation at various levels regarding flood risk and threats is developed	A multi-level awareness strategy regarding flood risk and threats	Reference value: To be established in the course of implementation Target : To be established in the course of implementation	Member States	ECOWAS AGRHYMET ACMAD WASCAL River Basin Authorities Les institutions et agences nationales NGO, CBO private sector	30,000	2020 -2023
<b>Strategic objective 4: Integrate flood risk in development planning in Member States</b>							
<b>Priority activity</b>	<b>Outcome</b>	<b>Measurable indicator</b>	<b>Reference value/Target</b>	<b>Supervising body</b>	<b>Partners</b>	<b>Budget</b>	<b>Timeline</b>
4.1 integrate flood risk in master plans and town development planning and other planning documents.	Flood risk is integrated into the master plan and town development planning	A master plan and town development planning that incorporate flood risk	Reference value: To be established in the course of implementation Target : To be established in the course of implementation	Member States	ECOWAS	750,000	2020 -2025
4.2 Develop and implement a waste management and storm runoff policy (with due consideration for gender and persons with disability)	Appropriate waste management methods for flood risk reduction is developed and implemented	Existence of appropriate waste management methods for flood risk reduction	Reference value: To be established in the course of implementation  Target : To be established in the course of implementation	Member States	ECOWAS	450,000	2020 -2025

4.3 Develop a sensitisation programme to enhance the population's ownership of the importance of storm runoff management (with due consideration for gender and persons with disability)	An awareness plan to enhance ownership of the importance of storm runoff management in each Member State is developed	A sensitisation programme to enhance ownership of the importance of storm runoff management in each Member State	Reference value: To be established in the course of implementation  Target : To be established in the course of implementation	Member States	ECOWAS AGRHYMET ACMAD WASCAL River Basin Authorities Les institutions et agences nationales Traditional rulers, private sector	225,000	2020-2023
4.4 Develop and strengthen prevention systems (protective dikes, development of riverbeds, control dams, weirs, treatment of watersheds, runoff, ban on construction and occupation of flood-prone areas)	Countries have prevention systems in place (protective dikes, development of riverbeds, control dams, weirs, treatment of watersheds, runoff, ban on construction and occupation of flood-prone areas, etc.)	Existence of prevention measures (protective dikes, development of riverbeds, control dams, weirs, treatment of watersheds, runoff, ban on construction and occupation of flood-prone areas, etc.)	Reference value: To be established in the course of implementation  Target : To be established in the course of implementation	ECOWAS	Member States AGRHYMET ACMAD WASCAL River Basin Authorities Les institutions et agences nationales Traditional rulers, private sector	500,000	2020-2025
4.5 Integrate flood risk in the development of coastal areas (with due consideration for gender and persons with disability)	Flood risk is integrated in the development plan for coastal areas	Existence of development plans for coastal areas	Reference value: To be established in the course of implementation  Target : To be established in the course of implementation	Member States	ECOWAS River Basin Authorities Les institutions et agences nationales Traditional rulers, private sector	350,000	2020-2025
4.6 Provide assistance in the implementation of national strategies against coastal erosion	The population is engaged in activities to prevent coastal erosion.	Number of activities implemented in each Member State	Reference value: A définir lors de la mise en œuvre des activités  Target : A définir lors de la mise en œuvre des activités	ECOWAS	Member States	150,000	2020-2024
4.7 Develop a best practice guide for national public health agencies in the event of floods. To include prevention and response measures and environmental health recovery measures. (with due consideration for gender and persons with disability)	A best practice guide with prevention and response measures and environmental health recovery measures is available to national public health agencies in the event of floods	Existence of a guide for national public health agencies in the event of floods, with prevention, and response measures and environmental health recovery measures	Reference value: To be established in the course of implementation  Target : To be established in the	ECOWAS	Member States	15,000	2020-2023

			course of implementation				
4.8 Promote and adapt the use of ICT in the early warning system. Train women and girls to use the system, with due consideration for persons living with disability	Women and youth make use of the IT-friendly warning system	Existence of the IT-friendly warning system	Reference value: 0 Target : 1	ECOWAS	Member States AGRHYMET ACMAD WASCAL River Basin Authorities	50,000	2020-2024
4.9 Develop and /or review a best practice guide taking into account the prevention, response and recovery plan (with due consideration for gender and persons living with disability)	Each Member State has a best practice guide taking due account of prevention, response and recovery	Existence of a best practice guide giving due consideration to prevention, response and recovery	Reference value: 0 Target : 1	Member States	ECOWAS River Basin Authorities Les institutions et agences nationales NGO, CBO, Traditional rulers, private sector	30,000	2020-2023

## **CHAPTER V**

### **VIII. IMPLEMENTATION OF THE 2020-2025 ACTION PLAN**

#### **8.1 Operational mechanism for implementation**

##### **8.1.1 At the national level**

Member States will oversee the attainment of objectives and outcomes at the national level. They will prepare periodic summary reports on the status of flood risk reduction and specify measures to address the gaps and challenges. Each country will draw from the common regional progress indicators when preparing their respective indicators and monitoring mechanisms, and in accordance with the strategic objectives. This will be submitted every two years to the ECOWAS Commission.

##### **8.1.2 At the regional level**

ECOWAS will provide strategic guidance to Member States, as well as facilitate and coordinate implementation of the Action Plan. ECOWAS will initiate and coordinate financial resource mobilisation, support for risk evaluation in Member States, and capacity building of experts from Member States. ECOWAS will coordinate efforts to define and select monitoring indicators in partnership with Member States.

#### **8.2 Partnership for implementation**

ECOWAS will coordinate and facilitate implementation of the Action Plan in partnership with Member States, specialised institutions and international partners. Member States are the primary beneficiaries of the flood risk management Action Plan. The specialised institutions shall play a major role in providing flood forecasts, setting up of warning systems, and building capacity of national experts in hydrology and meteorology. The West African Economic and Monetary Union (UEMOA) shall play a key role in the implementation of the Action Plan through capacity building activities. The Permanent Interstate Committee for Drought Control in the Sahel (CILSS) shall also make contributions particularly with regard to regional water policy, flood management, drought and food security.

Specialised institutions such as AGRHYMET centre, ACMAD and WASCAL shall play a key role in forecasting extreme climate and meteorological phenomena, and provide training and support on the environment, water, weather and climate. The River Basin Authorities shall play a key role in water management.

The International Federation of Red Cross and Red Crescent Societies (IFRC) shall provide technical expertise in the area of disaster preparedness and response. Civil society and NGOs shall convey the views of citizens, thereby guaranteeing a risk reduction and population-oriented response plan.



The private sector shall play an increasingly important role in the risk reduction plan, notably the protection of its production infrastructure (industries, trade and services) against disasters. Universities shall play a key role as independent research institutions and technical partners in providing a clearer understanding of the risks and subsequent adoption of regional and national policies.

By providing assistance as regards country programmes, the bilateral and multilateral partners including the United Nations agencies, the World Bank and the European Union, shall also support the implementation of the Action Plan.

The World Bank, African Development Bank (AfDB) and West African Development Bank (BOAD) are working closely with ECOWAS in the implementation of regional programmes. Bilateral partners including the European Union, United Kingdom, Denmark, Spain, Germany, Switzerland and France support and coordinate the implementation of major ECOWAS Programmes in the area of agriculture, migration, trade facilitation, and peace and security.

### **8.3 Resource mobilisation**

Resources required to implement and sustain efforts under the strategy will be mobilised from the internal budget allocations of ECOWAS and Member States, and from project opportunities and ongoing initiatives in the countries.

Additional resources may be mobilised through technical cooperation with development partners. Already, the United Nations agencies are key partners due to their existing climate research, application and monitoring programmes, and in particular, disaster risk reduction and climate change adaptation.

The African Development Bank and the World Bank conduct capacity-building programmes for government agencies. At present, both organisations are engaged in efforts to promote weather and climate services in Africa.

<b>Table 2. Budget estimate for implementation of the Action Plan</b>	
<b>Strategic objectives</b>	<b>Budget estimate (US \$)</b>
SO1: Improve collaboration among the various institutions involved in flood risk management	260,000
SO2: Harmonise the flood risk management approaches of the ECOWAS Member States	3,300,000
SO3: Establish and/or strengthen the flood warning system and information dissemination on climate risk in Member States and the region	40,235,000
SO4: Integrate flood risk in development planning in Member States	2,520,000
<b>Total budget</b>	<b>46,315,000</b>

#### **8.4 Communication**

ECOWAS is aware of the role of communication in the implementation of the Regional Strategy for Flood Risk Management and its 2020-2025 Action Plan. ECOWAS has plans to prepare a communication paper and improve support and visibility. It will organise, coordinate and supervise information and communication related activities, as well as information and awareness campaigns in Member States.

#### **8.5 Monitoring and evaluation**

The Action Plan outlines indicators that are specific, measurable, achievable, realistic and time-based, in line with the expected outcomes at each stage of the process. Data required to assess the level of completion or progress will be gathered by Member States with the support of ECOWAS. The progress will be evaluated based on the programme result indicators outlined in the ECOWAS Annual Work Programme. ECOWAS will publish detailed annual reports on the level of attainment of the set objectives. The Member States responsible for compilation of the annual reports will provide updates on financial and operational activities. The rating scale (not achieved, partially achieved and achieved) will be used systematically at the end of the year. The ECOWAS Commission and the Directorate of Humanitarian and Social Affairs appreciate the independence and rigour of external evaluations. There will be a mid-term review of the strategy's implementation and subsequent adjustments to the plan where necessary. The final evaluation will be at the end of the programme.

## CHAPTER VI

### IX. REFERENCES

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## X. ANNEXES

### DEFINITIONS AND TERMINOLOGY

#### Definitions and terminology, UNDRR 2009

**Climate change:** (a) The Inter-governmental Panel on Climate Change (IPCC) defines climate change as: “a change in the state of the climate that can be identified (e.g., by using statistical tests) by changes in the mean and/or the variability of its properties, and that persists for an extended period, typically decades or longer. Climate change may be due internal processes or external forcings, or to persistent anthropogenic changes in the composition of the atmosphere or in land use”.

**Disaster risk reduction (DRR):** The concept and practice of reducing disaster risks through systematic efforts to analyse and manage the causal factors of disasters, including through lessened vulnerability of people and property, wise management of land and the environment, and improved preparedness for adverse events.

**Disaster:** A serious disruption of the functioning of a community or a society involving widespread human, material, economic or environmental losses and impacts, which exceeds the ability of the affected community or society to cope using its own resources.

**Early Warning System:** The EWS is defined as a set of capacity necessary to generate and disseminate timely and meaningful information to enable individual, communities and organisations threatened by a hazard to prepare and act appropriately and in sufficient time

**Early warning:** The set of capacities needed to generate and disseminate timely and meaningful warning information to enable individuals, communities and organisations threatened by a hazard to prepare and to act appropriately and in sufficient time to reduce the possibility of harm or loss.

**Flood by direct overflow:** Flooding that occurs when a river overflows its banks to fill its flood plain by overrunning the entire valleys.

**Flood by indirect overflow:** When water rises from the groundwater table into sewerage systems at low-lying areas.

**Flood by runoff accumulation:** When there is no adequate capacity for water infiltration, soil removal, or drainage during abnormal rainfall. These floods can occur in urban areas, outside the actual riverbed, and may affect the normal flow of heavy rains, soil sealing, and urban design and sewerage systems.

**Flood:** An overflow of water that submerges an area (fast or slow), and which may be due to several factors, such as heavy rainfall in terms of duration and/or intensity.

**Forecast:** Definite statement or statistical estimate of the likely occurrence of a future event or conditions for a specific area.

**Hazard:** A dangerous phenomenon, substance, human activity or condition that may cause loss of life, injury or having other health impacts, property damage, loss of livelihoods and services, social and economic disruption or environmental degradation.

**Land-use planning:** The process undertaken by public authorities to identify, evaluate and decide on different options for the use of land, including consideration of long term economic, social and environmental objectives and the implications for different communities and interest groups, and the subsequent formulation and promulgation of plans that describe the permitted or acceptable uses.

**Mitigation measures:** The lessening or limitation of the adverse impacts of hazards and disasters. **Prevention:** Series of actions taken to completely avoid potential adverse impacts of hazards and minimise the related disasters.

**Preparedness:** The knowledge and capacities developed by governments, professional response and recovery organisations, communities and individuals to effectively anticipate, respond to, and recover from, the impacts of likely, imminent or current hazard events or conditions.

**Prevention:** Series of actions taken to completely avoid potential adverse impacts of hazards and minimise the related environmental, technological and biological disasters.

**Recovery:** The restoration, and improvement where appropriate, of facilities, livelihoods and living conditions of disaster-affected communities, including efforts to reduce disaster risk factors.

**Resilience:** The ability of a system, community or society exposed to hazards to resist, absorb, accommodate to and recover from the effects of a hazard in a timely and efficient manner, including through the preservation and restoration of its essential basic structures and functions. For the EU, resilience is the ability of a person, household, community, country or a region to resist, adapt and recover promptly from crisis and shocks.

**Risk assessment:** A methodology to determine the nature and extent of risk by analysing potential hazards and evaluating existing conditions of vulnerability that together could potentially harm exposed people, property, services and livelihoods.

**Risk management:** The systematic approach and practice of managing uncertainty to minimise potential harm and loss.

**Risk map:** The graphical depiction of a select number of **risks** designed to compile a list of threats and dangers and summarise them by order of priority. It makes it possible to identify



and prioritise the different hazard areas mainly according to their level of seriousness and likelihood of occurrence.

**Risk reduction plan:** A document prepared by an authority, sector, organisation or enterprise that sets out goals and specific objectives for reducing disaster risks together with related actions to accomplish these objectives.

**Risk:** The combination of the probability of an event and its negative consequences.

**Vulnerability:** The characteristics and circumstances of a community or a system that make it susceptible to the damaging effects of a hazard.

**Source: WMO, TECHNICAL REGULATIONS VOLUME III Hydrology – 2006 Edition**

**Alarm level:** Water level (stage) at, or approaching, flood level which is considered to be dangerous and at which warnings should be commenced.

**Aquifer:** Porous water formation capable of yielding exploitable quantities of water.

**Automatic Station:** Station at which instruments make and either transmit or record observations automatically, the conversion to code form, if required, being made either directly or at an editing station.

**Catchment area:** An area having a common outlet for its surface runoff.

**Climatological Station for hydrological purposes:** A climatological station set up in a drainage basin specifically to augment the existing climatological network in order to meet hydrological requirements.

**Climatological station for specific purposes:** A climatological station established for the observation of a specific element or elements.

**Climatological Station:** A station from which climatological data are obtained.

**Discharge:** The volume of water flowing across section in a unit of time.

**Drainage:** Volume of water across a free surface section in a unit of time.

**Flash flood:** Flood of short duration with a relatively high peak discharge which the time interval between observable causative event and the flood is less than four to six hours.

**Flooded area:** Area covered by water when streamflow exceeds the carrying capacity of the channel or as a consequence of damming the channel downstream.

**Forecast (warning) lead time:** Interval of time between the issuing of a forecast (warning) and the expected occurrence of the forecast element.

**Forecast update:** Adjustment of forecasts of events as new information becomes available.

**Forecast verification:** Determination of the accuracy of the forecasts through the statistical analysis of forecast errors.

**Ground water level:** Elevation, at a certain location and time, of the phreatic or the piezometric surface of an aquifer.

**Groundwater station:** A station at which data on ground water are obtained on one or more of the following elements: water level, water temperature and other physical and chemical properties of water and rate and volume of abstraction and/or recharge.

**Hydrograph:** Graph showing the variation with time of water stage, discharge or velocity, or some other hydrological characteristic. Flood through runoff. Flood by local precipitations or runoff which are unable to be evacuated by the hydrological or drainage network.

**Hydrological advisory:** Emergency information on an expected hydrological phenomenon which is considered to be potentially dangerous.

**Hydrological drought:** A period of abnormally dry weather sufficiently prolonged to give rise to a shortage of water as evidenced by below normal streamflow and lake levels and/or the depletion of soil moisture and a lowering of groundwater levels.

**Hydrological forecast:** A statement of expected hydrological conditions for a specified period and for a specified locality.

**Hydrological Observation:** The direct measurement or evaluation of one or more hydrological elements, such as stage, discharge, water temperature, etc.

**Hydrological observing Station:** A place where hydrological observations or climatological observations for hydrological purposes are made.

**Hydrological station for specific purposes:** A hydrological station established for the observation of a specific element or elements, for the investigation of hydrological phenomena.

**Hydrometrical Station:** Station at which data on water in rivers, lakes or reservoirs are obtained on one or more of the following elements: stage, streamflow, sediment transport and deposition, water temperature and other physical properties of water, characteristics of ice cover and chemical properties of water.

**Large river:** A river with a mean annual at the mouth exceeding 2 000 m<sup>3</sup>/s or with a drainage basin exceeding 500 000 km<sup>2</sup>.

**Long-term hydrological forecast:** Forecast of the future value of an element of the regime of a water body for a period extending beyond 10 days from the issue of the forecast.

**Major river:** A river with an average annual discharge at the mouth exceeding 100 m<sup>3</sup>/s or with a drainage basin exceeding 100 000 km<sup>2</sup>.

**Meteorological forecast (Forecast):** A statement of expected meteorological conditions for a specified time or period, and for a specified area or portion of airspace.

**Meteorological observation (Observation):** The evaluation or measurement of one or more meteorological elements.

**Notice – Hydrological warning:** Emergency information on an expected hydrological phenomenon which is considered to be potentially dangerous.

**Ordinary climatological station:** A climatological station at which observations are made at least once daily, including daily readings of extreme temperature and of amount of precipitation.

**Precipitation Station:** A station at which observations of precipitation only are made.

**Precision of observation or of reading:** The smallest unit of division on a scale of measurement to which a reading is possible either directly or by estimation.

**Principal climatological station:** A climatological station at which hourly readings are taken, or at which observations are made at least three times daily in addition to hourly tabulation from autographic records.

**Principal hydrometric Station:** A hydrometric station at which one or a number of elements, taking into account the significance of such elements in relation to the physical environment, are observed for a period of many years. The station is usually equipped with recording instruments.

**Rating curves:** A curve showing the relation between stage and discharge of a stream at a hydrometric station.

**Reference climatological station:** A climatological station the data of which are intended for the purpose of determining climatic trends. This requires long periods (not less than 30 years) of homogeneous records, where man-made environmental changes have been and/or are expected to remain at a minimum. Ideally the records should be of sufficient length to enable the identification of secular changes of climate.

**Seasonal hydrological forecast:** Forecast of the future value of an element of the regime of a water body for a season (usually covering a period of several months or more).

**Secondary hydrometric station:** A hydrometric station which is established only for a limited number of years to supplement the basic network of principal hydrometric stations.

**Short-term hydrological forecast:** Forecast of the future value of an element of the regime of a water body for a period ending up to two days from the issue of the forecast.

**Storm Surge:** The difference between the actual water level under the influence of a meteorological disturbance and the level which would have occurred in the absence of the meteorological disturbance.

**Water balance:** An inventory of water based on the principle that during a certain time interval, the total water gain to a given catchment area or body of water must equal the total water loss plus the net change in storage in the catchment.

**Water supply forecast:** A statement of the expected volume of available water with associated time distribution and probabilities, whenever feasible for a specified period and for a specified area.