Regional strategy for flood and drought risk management in the Volta Basin

November 2022

(first draft)

ADAPTATION FUND

WORLD METEOROLOGICAL ORGANIZATION

Global Water Partnership West Africa

cima RESEARCH FOUNDATION

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FOREWORD

It will be developed in the finalized version of the document.

ACKNOWLEDGMENTS

They will be developed in the finalized version of the document.

ACRONYMS

AAL	Annual Average Loss
AU	African Union
DRR	Disaster Risk Reduction
ECOWAS	Economic Community of West African States
CILSS	The Permanent Interstate Committee for Drought Control in the Sahel
DHI	Danish Hydraulic Institute
DRR	Disaster Risk Reduction
EWS	Early Warning Systems
GEF	Global Environment Facility
IPCC	Intergovernmental Panel on Climate Change
IWRM	Integrated Water Resources Management
IWA	International Water Association
NDCs	Nationally Determined Contributions (according to the Paris Agreement)
SDAGE	water development and management master plans
SDGs	Sustainable Development Goal
UNDP	United Nations Development Program
UNEP	United Nations Environment Program
UNDRR	United Nations Office for Disaster Risk Reduction
VBA	Volta Basin Authority
VFDM	Project “Integrating Flood and Drought Management and Early Warning for Climate Change Adaptation in the Volta Basin” - Volta Flood and Drought Management
WAEMU	West African Economic Monetary Union
WMO	World Meteorological Organization

ABSTRACT

It will be developed in the finalized version of the document.

CHAPTER 1 - Introduction

1.1 Background

Over the past four decades, sub-Saharan Africa has experienced more than 1,000 hydro-meteorological disasters (World Bank, 2017), affecting around 320 million people. In addition to the loss of lives and the displacement of populations, episodes of drought and flooding have major economic impacts and jeopardize food security and the socio-economic development of countries.

Indeed, rainfall in West Africa is intensifying and becoming rarer at the same time, creating devastating rainfall events, and a variation in rainfall patterns in terms of space and time which is responsible for drought episodes both locally and regionally. Climate projections for West Africa suggest that this situation could be exacerbated in the future climate, and the impact of disasters could be amplified by population growth and pressure on water resources.

It is essential to improve disaster risk management, in particular by strengthening early warning systems and allowing the adaptation of agricultural practices according to hydro-climatic forecasts; in addition, by setting up adequate infrastructures and by imposing adapted spatial planning guidelines, and finally by strengthening the capacities of disaster risk reduction institutions mandated at the national and regional level. However, the appropriate scale to understand and act in an integrated manner on water resources and the impacts of hydro-meteorological phenomena, remains the watershed scale. Unfortunately, the boundaries of river basins rarely coincide with those of administrative entities, revealing the interdependence of countries or communities, upstream and downstream.

The transboundary Volta basin, shared by Benin, Burkina Faso, Côte d'Ivoire, Ghana, Mali and Togo, is particularly vulnerable to climatic extremes. Every year its population is affected by both recurrent droughts and floods in rural and urban areas. Faced with economic, environmental, and water management challenges, the six riparian states suffer from weak national economic performance and a low human development index (UNDP, 2019; World Bank, 2019). Climate issues are at the heart of the fight against poverty in the region.

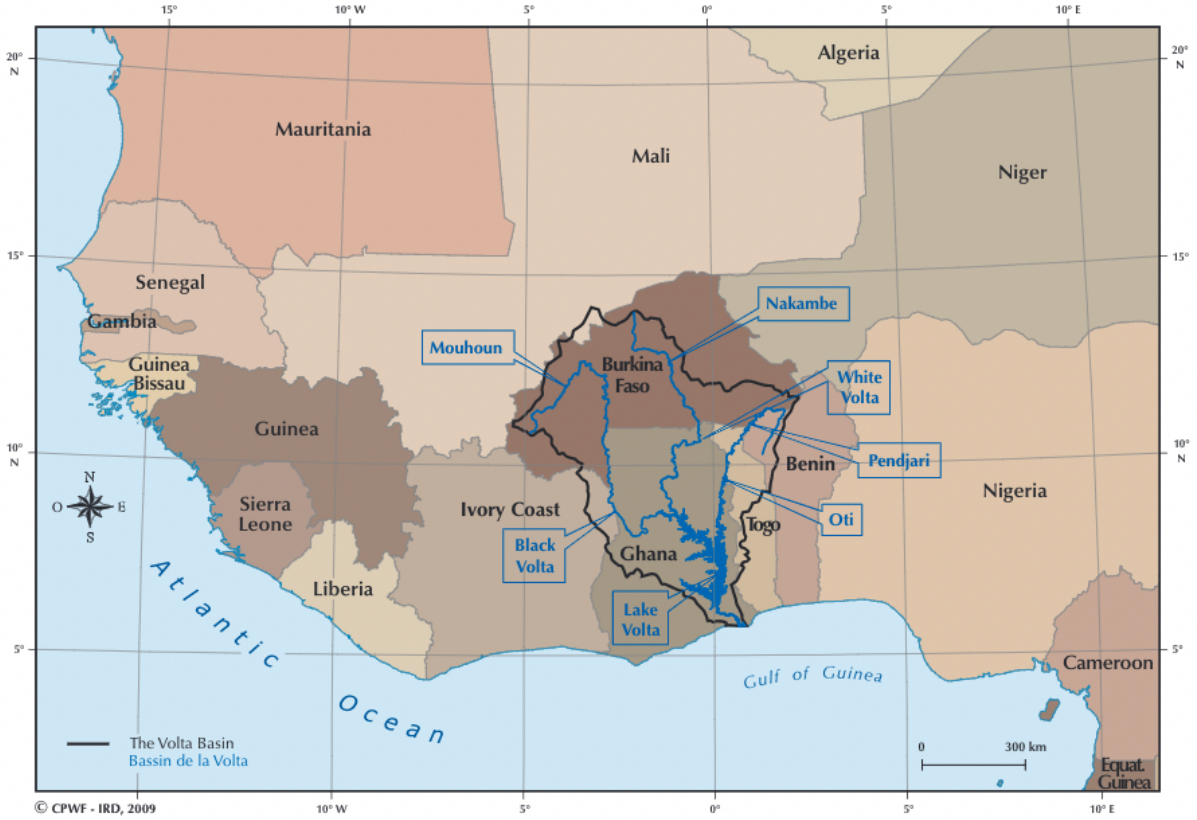

Figure 1. Situation of the Volta Basin in West Africa (Source: FAO GeoNetwork (2009) and Dieulin, 2007).

The Volta Basin covers an area of approximately 400,000 km^2, making it the ninth largest basin in sub-Saharan Africa (ABV, 2010). The population of the basin, estimated at more than 24 million, is predominantly rural and depends mainly on rain-fed agriculture (GEF-UNEP-DHI-IWA, 2017). However, 30% of the population of the basin is concentrated in urban areas (around Ouagadougou, Bobo-Dioulasso in Burkina Faso, Tamale, Wa and Bolgatanga in Ghana and in the Kara region in Togo).

The main river in the basin, the Volta, crosses Burkina Faso and Ghana, with an average flow at the mouth of 1,210 m^3/s in the Gulf of Guinea. The Volta basin is characterized by a north-south gradient in the distribution of rainfall, with high variability in time and space, high evapotranspiration, and river flow extremely sensitive to variations in rainfall, having an impact on agriculture and hydroelectric production.

1.2 Strategic context: international, regional and national disaster risk reduction framework (commitments and guidelines)

In this context of vulnerability of the basin to climatic shocks, a consensus has gradually emerged outlining the priority of taking floods and droughts into account in policies, programs and development projects in the Volta basin. This approach involves, among other things, the development and implementation of this strategy and the action plan for the integrated management of droughts and floods at the national and cross-border levels.

The Volta Basin Flood and Drought Risk Reduction and Management Strategy is in line with the international disaster risk reduction framework defined by the three main multilateral agreements on environment and sustainable development below, ratified by the six countries of the basin:

- The Sendai Framework for Action (2015-2030), aims to "substantially reduce disaster risk and loss in terms of human lives, damage to livelihoods and human health, and damage to the economic, physical, social, cultural and environmental assets of people, companies, communities and countries". By 2030, the Sendai Framework urges countries to, among other things, (i) improve disaster risk understanding, linking hazards to ecosystem degradation; (ii) strengthen disaster risk governance, emphasizing the need for cross-border cooperation for the implementation of ecosystem-based approaches to build resilience and reduce disaster risk; (iii) and invest in disaster resilience. The application of the Sendai Framework in Africa is coordinated by the African Union (AU) Action Program for Disaster Risk Reduction (2015-2030). To this end, the AU has established the African DRR Task Force to provide coordination and technical support to Member States and other stakeholders for the implementation of the Action Program.
- The 2030 Agenda for Sustainable Development recognizes and reaffirms the urgent need to reduce disaster risk. Although there is no specific Sustainable Development Goal (SDG) for disaster risk reduction in the United Nations Sustainable Development Cooperation Framework, it gives a very important role to the integration of disaster risk prevention for the achievement of most of the SDGs (UNDRR, 2020), particularly related to food security, human health, resilience of cities and climate change adaptation.
- The 2015 Paris Agreement on the climate and the development of Nationally Determined Contributions (NDCs) have enabled the six countries to set up a climate action plan to adapt to the effects of climate change. They describe early warning systems as one of the key areas for action to improve adaptation capacities, build resilience, reduce vulnerability and minimize loss and damage from the consequences of climate change.

At the regional level, the initiative to develop this strategy responds to the needs articulated by ECOWAS, particularly in its Disaster Risk Reduction Policy and Action Plan (2015-2030) based on the Sendai framework, its Regional Flood Risk Management Strategy and Action Plan (2020-2025) and its Gender Strategy and Action Plan for Disaster Risk Reduction (2020-2030). These guidelines work for the integration of DRR in sustainable development planning and activities in West Africa, particularly in terms of adaptation to climate change, with a focus on drought management and the fight against desertification. More broadly, the ECOWAS Directorate of Humanitarian and Social Affairs is advocating for the integration of natural risk management, including climate change, as a guiding principle in the various policies of West African countries: for example in its Environmental Policy (2008), its Vision 2020, its Regional Climate Strategy and Action Plan (2022-2030), as well as through the West African Water Resources Policy of 2008 and its implementation plan of 2012.

At the level of the Volta Basin, the existence of the Volta Basin Authority is key in the management of cross-border disasters in the sub-region. The establishment of an integrated and transboundary strategy for the management of floods and droughts in the basin responds to the mission of the Authority described in the Strategic Action Program of the Volta Basin 2014-2024, which promotes the establishment of an early warning system against droughts, floods and water losses in the Volta Basin (UNEP-GEF-Volta Project, 2014 - Action A6). Similarly, with the elaboration of the Volta Basin Water Charter (2018), the commitment of the six States to implement specific measures for the prevention and management of the impacts of floods and severe low flows is also specified. Within the framework of the ongoing elaboration of a Water Development and Management Master Plan (SDAGE) for the Volta Basin, the Basin Authority is working on the integration of transboundary water management issues and hydrological extremes in the context of climate change.

At the national level, the six riparian countries are keen to better integrate flood and drought risk reduction and management into their policies in an integrated and transboundary manner. As described in section 2.2.2, the national disaster risk reduction mechanisms in place vary between countries. All six countries have national disaster risk reduction strategies as a first step towards basin-wide harmonisation. Although primarily based on disaster response, the national strategies attempt to integrate action plans to improve disaster prevention, as in Burkina Faso, Côte d'Ivoire and Togo. Moreover, at the legal level, Burkina Faso already has a law on the “prevention and management of risks, humanitarian crises and disasters” (Law 012/2014), which takes into account elements of disaster prevention, preparedness and management (Ouedraogo, 2022).

1.3 Scope of the strategy

The need to address floods and droughts in an integrated manner at the scale of the Volta river basin emerged as a result of the multiple transboundary impacts of floods and droughts in recent years. The urgent need to improve and harmonise disaster management in the region provided the impetus for the development of a common strategy for flood and drought risk reduction and management in the Volta Basin. This strategy thus responds to the gaps in knowledge management and governance for flood and drought risk reduction and management in the Volta basin. It enables the Authority to better fulfill its mission of managing and supporting sustainable development in the basin through the promotion of integrated flood and drought management.

This strategy provides a framework for States Parties, giving guidelines for integrated and transboundary flood and drought risk management, to be adopted by each government. It aims to:

- Establish a better understanding of integrated flood and drought risks;
- Improve governance for integrated and transboundary disaster risk management in the basin;
- Frame the integrated implementation of flood and drought risk reduction measures for resilience;
- Establish preventive action protocols based on integrated climate and weather forecasting.

To this end, it promotes :

- Harmonisation of national disaster management policies, legislation, regulations and strategies;
- Determination of the roles and responsibilities of actors in disaster management;
- Dialogue and consultation among States Parties in the planning, design, implementation and management of disaster risk reduction measures, projects and programmes;
- Scientific research, institutional capacity building and education on integrated disaster management issues;
- Strengthening linkages and information transfer between hydrometeorological services and national stakeholders in flood and drought risk reduction.

This shared, cross-border and multi-sectoral framework governs all measures and activities, public or private, in progress or planned in the basin, having an impact on flood and drought risks.

Convinced that an integrated and transboundary disaster management strategy is an appropriate instrument to ensure the reduction of impacts on the Volta Basin, the States Parties agree to the adoption of this strategy, named below «The flood and drought risk reduction and management strategy in the Volta Basin».

CHAPTER 2 – Analysis of the situation

2.1 Overview of the Flood and Drought Risk Profile in the Volta Basin

Within the framework of the VFDM project, a flood and drought risk assessment based on a probabilistic approach was carried out for the Volta basin, considering both current climate conditions and projected climate conditions. The results of this analysis and the policies recommendations for flood and drought risks integration, constitute the heart of the Volta basin risk profile (CIMA, WMO, VBA, GWP-WA, 2022).

2.1.1. Current diagnosis: climate, occurrence and impacts of floods and droughts

- Climate characteristics

The climate of the Volta Basin is the complex product of interactions between climatic influences at large scales (related to the movement of the Intertropical Convergence Zone) and at the regional scale (for example the influence of the characteristics of the terrain or coastal climate). From these interactions result a natural climatic variability in the basin, both in space, following a North-South gradient, and in time, with seasonal cyclic behaviors, from one year to another and from one decade to another. Indeed, in the north of the basin, the Sahelian part comprising Mali and northern Burkina Faso has a hot and semi-arid climate (BSh) (Kottek et al., 2016), with a marked rainy season of five months, while the rest of the basin is characterized by a humid tropical savannah climate (Aw), and pseudo-bimodal year-round rainfall in the south. Similarly, there is a precipitation gradient that increases from north to south of the basin, varying from 500 mm/year to 1100 mm/year respectively, with 70% of annual precipitation occurring in July, August and September (UNEP-GEF Volta Project, 2013). However, less than 10% of rainfall contributes to river flow. Indeed, the average annual temperature is high in the basin, also varying from 27°C in the south to 36°C in the north, implying high evapotranspiration rates. August and September (UNEP-GEF Volta Project, 2013). However, less than 10% of rainfall contributes to river flow. Indeed, the average annual temperature is high in the basin, varying from 27°C in the south to 36°C in the north, implying high evapotranspiration rates. However, less than 10% of rainfall contributes to river flow. Indeed, the average annual temperature is high in the basin, also varying from 27°C in the south to 36°C in the north, implying high evapotranspiration rates.

- Occurrence and impacts of floods

Floods are recurrent in the Volta Basin and occur every year, at transboundary level, and have considerable impacts on the population of the six countries.

Different types of floods affect the basin (ECOWAS, 2020):
- River flooding caused by rainfall on upstream watersheds, creating the overflow of major rivers.
- Floods linked to the rise in water tables, due to prolonged periods of rainfall.
- Runoff flooding in urban areas, caused by heavy and sudden rains that exceed the capacity of drainage systems, and by surface runoff, aggravated by the lack of maintenance of urban sanitation systems.
- Flash floods caused by excessive rainfall and characterized by a rapid rise in water level, locally, within minutes to hours.

The risk of flooding in the Sahelian region seems to have worsened since the 1970s, associated with successive droughts, which have reduced the ability of soils to retain water, increasing runoff during heavy rains. These conditions are, for example, the cause of the disastrous floods of 2009 and 2010 (WMO, 2019). According to the Deputy Executive Director of the Volta Basin Authority, in 2010 flooding in the basin caused nearly 45 deaths, damage to 55,000 houses, 455 establishments and 92 health centers, leaving 250,000 people homeless. In addition, a single event can locally affect several tens of thousands of people, such as the torrential rains of October 2019 associated with the release of water from the Bagré dam in Burkina Faso, which affected 26,000 people in the North-East region of Ghana.

According to the recent Volta basin Risk Profile study, focusing on fluvial flooding (CIMA, WMO, VBA, GWP-WA, 2022), the average number of people affected per year in the basin approaches thirty thousand (Figure 2). Of the six Member States, the situation is most worrying in northern Ghana and northern Burkina Faso. Floods also affect the road network and hundreds of thousands of hectares of agricultural and protected areas on average per year. In addition, the annual losses related to floods for the built-up sector reach approximately 25 million USD on average per year.

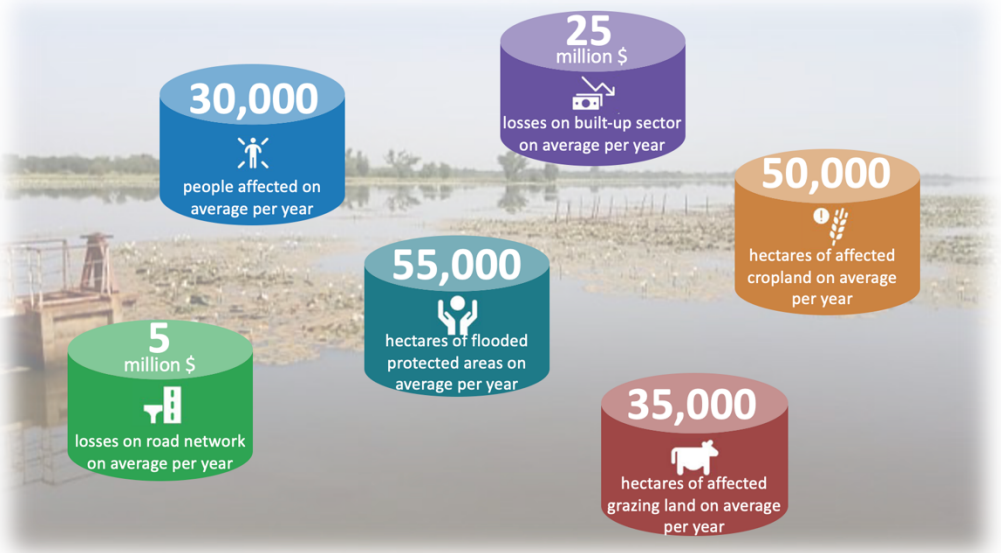

Figure 2. Annual average losses (AAL) due to riverine floods for different indicators according to the Volta Basin Risk Profile (current climate conditions).

- Occurrence and impacts of droughts

In the Volta Basin region, as in West Africa, the high variability of rainfall in time and space is responsible for drought episodes, which have increased in number since the 1970s. Within the basin, episodes of drought and dry spells are particularly recurrent in the north of the basin, in Ghana and Burkina Faso (GEF/UNEP/DHI/IWA, 2017), a more arid region. Today, some communities in the basin such as in the North-East region of Ghana, suffer from drought every year (Yiran & Stringer, 2016). Although few studies identify and examine the historical impact of these episodes at the basin scale, in Burkina Faso alone, nearly 20 million people have suffered from periods of drought since the 1980s. Hydrological drought also affects the Volta Basin, implying a deficit in river flow, a drop in groundwater levels or reservoirs below recommended thresholds for prolonged periods with important consequences for access to water, irrigation and the preservation of ecosystems (Water Charter - ABV, 2018).

The risk profile of the basin reveals that more than 4.5 million people are exposed to severe drought conditions on average per year (Figure 3), especially in the north (CIMA, WMO, VBA, GWP-WA, 2022). The agricultural sector, which depends mainly on rain-fed agriculture, is the first to be impacted. The drought considerably affects the annual production of the six countries of the Volta Basin (particularly in Mali and Burkina Faso) and has a worrying impact on food security. Moreover, these losses have strong economic repercussions; for example, drought-related maize production losses represent an annual average loss of almost USD 17 million. Droughts also have a significant impact on livestock and the livelihoods of pastoral communities in the Volta Basin, as also on protected areas: on average, 5 million

animals and 750,000 hectares of protected areas are exposed per year to severe drought conditions.

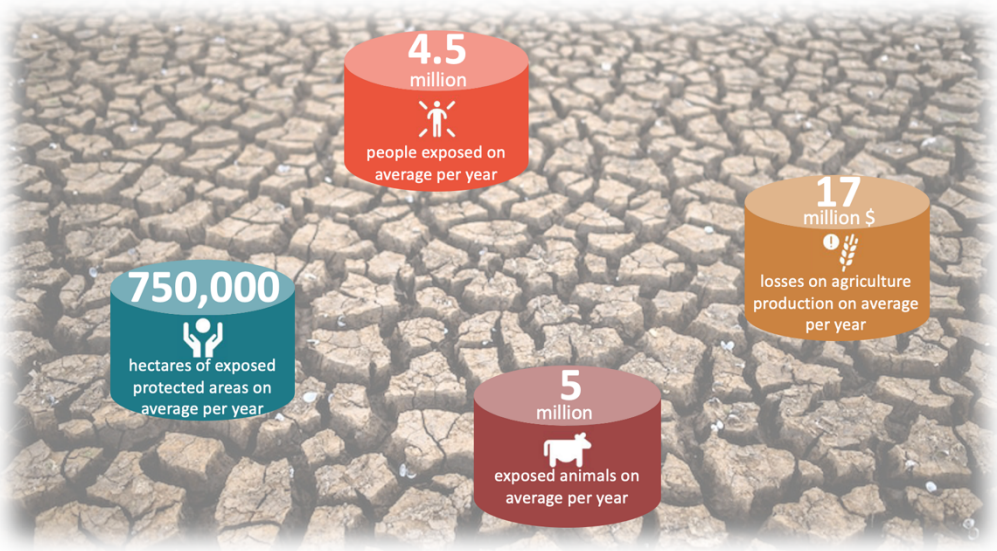

Figure 3. Annual average losses (AAL) due to severe droughts for different indicators according to the Volta Basin Risk Profile (current climate conditions).

2.1.2. Projections: impacts of climate and demographic change on flood and drought risk

- Future changes

Climate change is one of the major factors influencing disaster risk in the Volta Basin. In West Africa, global warming has already led to changes in temperature, precipitation, and storm frequency and intensity (UNEP-GEF Volta Project, 2013). The intensification of this phenomenon is expected in the coming decades. Indeed, on a global scale, the IPCC scenario SSP3-RCP7.0 predicts a doubling of CO2 emissions, and an increase in global temperature between 2.8°C and 4.6°C by 2100.

The recent Volta Basin Risk Profile study (CIMA, WMO, VBA, GWP-WA, 2022) was carried out using different global circulation models projected in the medium (2050) and long term (2080). It reveals a general warming trend in the Volta Basin region of up to 3.1°C around 2080. Regarding the impact on precipitation patterns, the studies are not subject to consensus because of the high intrinsic and multi-scale variability of the climate in West Africa. However, climate change is likely to cause more intense and temporally concentrated rainfall and runoff, as well as a delay in the rainy season (Van De Giesen et al., 2010). Furthermore, the cyclical decadal (decade-to-decade) climatic behavior of alternating consecutive wet and dry periods is also projected to continue in the future according to global circulation models (Liersch et al., 2019). The predicted climate variability will lead to

an increase in the magnitude and frequency of extreme events and an increase in the impacts of drought even in a hydrological regime of average increase in river flows. Years with little precipitation will be more frequent, alternated by years of more abundant precipitation (CIMA, WMO, VBA, GWP-WA, 2022). Predicted climate variability will lead to an increase in the magnitude and frequency of extreme events and an increase in the impacts of drought even in a hydrological regime of average increases in river flows. Years with small precipitation will be more frequent, alternated by years with more precipitation (CIMA, WMO, VBA, GWP-WA, 2022).

In addition to climate change, population growth projections are putting additional pressure on the Volta Basin and its resources. Indeed, according to United Nations projections, the population of the basin is expected to grow at a rate of between 2.5% and 3%, reaching nearly 59 million people in 2050, with a greater increase in its upstream part (Williams, 2016).

- possible impacts of climate change on the risk of floods and droughts

The Volta Basin Risk Profile Analysis (CIMA, WMO, VBA, GWP-WA, 2022) addresses the possible evolution of the impact of climate and demographic change on flood and drought risk. The results show that future projections only exacerbate current trends in the risk profile, particularly in space. Addressing today's situation and priorities is therefore urgent for the future.

By 2100, almost three times as many people as today will be affected by floods in the Volta Basin, possibly up to 80,000 people per year. A flood with a return period (of losses) of 50 years could then affect up to 165,000 people. Annual average losses in the built-up sector could exceed USD 4 million in Ghana, and agricultural losses could increase by up to 40%. On the other hand, an increase in water availability and hydropower potential is expected for the period 2017-2100, particularly in the north of the basin, due to an increase in the intensity and frequency of rainfall and flooding, which is therefore not in contrast to a sharp increase in the impact of droughts in the region.

Indeed, by 2100, three times as many people will be affected by droughts in the basin, i.e. more than 15 million, distributed mainly in the north of the basin and highly urbanized areas. Agricultural production losses are expected to increase (+36%) to reach nearly USD 23 million, with an increasingly marked contrast between the north and the south, and more substantial losses per hectare in Burkina Faso (USD 30-35 /ha per year). The same is true for the exposure of livestock, which is greater in the northern zone.

2.2 Flood and drought risk reduction in the Volta Basin: institutions and practices in place

2.2.1. Volta Basin Authority

The governments of the six riparian countries of the Volta Basin created the Volta Basin Authority (VBA) by signing its Convention in 2007. The VBA has overall responsibility for implementing international cooperation for the rational and sustainable management of water resources and strives to harmonize national water policies. While the Convention provides a general framework for cooperation, it implicitly refers to the need to develop additional protocols toward an effective implementation and optimal management of the basin.

The ABV has five main organs and mechanisms:

- The Conference of Heads of State and Government. It is the Authority's supreme organ for policy and decision-making. It defines the Authority's general cooperation and development policy and oversees its implementation.
- The Council of Ministers. It shall be responsible for the formulation and monitoring of the Authority's sectoral policies and programs, in accordance with the general cooperation and development policy defined by the Conference of Heads of State and Government;
- The Forum of Parties Involved in the Development of the Volta Basin. It is a consultative body created under the Council of Ministers. It brings together all the stakeholders of the basin;
- The Committee of Experts, created to provide technical advice to inform and facilitate decision-making;
- The Executive Directorate, which is the executive body in charge of managing the daily activities of the VBA.

National Focal Structures have been established in each participating country to oversee the implementation of national programs and to provide a link between the VBA and member countries at the local and operational level.

With regard to disaster management, the Authority is, for example, facilitating bilateral cross-border cooperation for the evacuation of excess water from dams between Burkina Faso and Ghana. More specifically, the VBA Water Charter outlines the commitment of the six states to put in place specific measures for the prevention and management of the impacts of floods and extremely low water levels (Articles 61 and 62), as well as for adaptation to climate change (Chapter 7) in relation to the water resources management.

2.2.2. Disaster Risk Management Action Plan - National and Regional Frameworks

With the assistance of ECOWAS, the six Volta Basin states have set up national disaster risk reduction mechanisms, within the framework of the program Africa Caribbean Pacific (ACP) – European Union (EU) Natural Disaster Risk Reduction (NDRR). The degree of development of these flood and drought management mechanisms at national level varies from country to country:

- At the legal level, there are a number of legal instruments at the national levels that frame the sustainable management of the environment, natural resources, water, climate change, land and biodiversity. In terms of disaster management, only Burkina Faso has a law relating to the prevention and management of risks, humanitarian crises and disasters" (Law 012/2014) which takes into account the elements of disaster prevention, preparedness and management.

- All six countries have developed a national strategy for disaster risk reduction. Focussed mainly on disaster response, national strategies are now trying to integrate action plans oriented on improving disaster prevention, as in Côte d'Ivoire, Togo, and Burkina Faso through the Integrated drought management plan (2019).

- A multi-stakeholder institutional framework in the form of a Platform is in place in each country. Composed of state actors, local authorities, NGOs and associations, these platforms benefit from the support of technical and financial partners for capacity building and to strengthen disaster response measures.

Table 1. Disaster management platforms in Volta Basin countries.

Country	**Name of the disaster management platform**
Benin	The National Platform for Disaster Risk Reduction and Climate Change Adaptation (PNRRC-ACC)
Burkina Faso	National Council for Emergency Relief and Rehabilitation (CONASUR)
Ivory Coast	National Platform for Risk Reduction and Disaster Management
Ghana	National Disaster Management Organization (NADMO)
Mali	National Platform for Disaster Risk Reduction (PNRRC)
Togo	National Platform for Disaster Risk Reduction (PNRRC)

In addition, disaster risk management is adressed at the national level in (i) National Action Programs for adaptation to climate variability and change, focusing on disaster preparedness and response; (ii) National Climate Change Adaptation Plans; (iii) Master Plans for Water Development and Management (SDAGE); (iv) Sectoral policies concerning production-agro-sylvo-pastoral and environment-water-sanitation issues; (v) Water Codes and national water policies, which include at the national level the establishment of measures to mitigate the effects and prevent damage caused by extreme hydrological events (floods and droughts) .

ECOWAS has also developed strategic documents in the area of disaster risk management, which provide guidance to Member States and their national departments:

- The Disaster Risk Reduction Policy, and the 2015–2030 Action Plan based on the Sendai Framework. One of the action lines aims to support the integration of disaster risk reduction into climate change adaptation, in particular drought management and combating desertification.
- The Early Warning Strategy and the Regional Flood Risk Management Strategy (and its 2020-2025 action plan).
- The Gender Based Disaster Risk Reduction Strategy and Action Plan (ECOWAS DRR GSAP, 2020-2030)

Other regional projects are having an impact on the development of disaster risk reduction practices in the Volta Basin:

- The Great Green Wall (GGW) Initiative in the Sahara and Sahel launched in 2007 by the African Union has been successful in addressing land degradation and desertification, in two countries of the Volta Basin (Mali and Burkina Faso)
- The West African Science Service Center on Climate Change and Adapted Land Use (WASCAL), funded by the German Ministry of Education and Research is a large-scale, research-based climate service center designed to help address challenges related to climate change and to build resilience of human and environmental systems to increased climate variability.
- The overall goal of the Global Water Partnership (GWP) Regional Integrated Drought Management Program in West Africa (IDMP WAF) is to build resilience to drought and climate change in the region through strong partnership, following an Integrated Water Resources Management (IWRM) approach.
- The Hydromet program in Africa, launched in 2016 and implemented by the World Bank Group, the Global Fund for Disaster Reduction and Recovery (GFDRR) has improved hydrometeorological services, early warning and response systems in Africa. The Project focuses on solutions for rain-fed agriculture and aims to improve the timeliness and accuracy of weather, climate and hydrological forecasts.

2.2.3. Early warning services in place thanks to regional and international actors

The development of early warning services by national meteorological and hydrological services is a key element for the prevention and management of drought and flood risks in the Volta Basin. With the help of regional and international institutions, including the ECOWAS Meteorological Program adopted in 2017, and in collaboration with WMO and the AGRHYMET Regional Center, the six countries have been able to strengthen the capacity of their hydrometeorological services, and establish early warning systems through technical and financial support.

In July 2020, the ECOWAS Commission and the Permanent Interstate Committee for Drought Control in the Sahel (CILSS) endorsed the AGRHYMET Regional Center as the Regional Climate Center for West Africa and the Sahel (CCR-AOS). This center now provides for 5 of the 6 countries of the Volta Basin (excluding Ghana):

(i) Operational weather and climate forecasting activities,
(ii) Operational climate monitoring activities,
(iii) Operational database services, in support of long-range forecasting and climate monitoring,
(iv) Operational capacity building,,
(v) Management and dissemination of weather and climate information.

The establishment of a regional multi-hazard early warning system is one of the objectives of the ECOWAS 2015-2030 Action Plan. A memorandum of understanding is in place between ECOWAS and the African Risk Capacity (ARC), allowing for the exchange of knowledge, data and methods to improve the predictability of hazards, with the objective of strengthening their capacity to prepare for and respond to disasters.

According to the results of the analysis of national capacities and needs for the development of forecasting and early warning systems in the framework of the VFDM project (National consultation reports 2020 available onlinehttps://www.floodmanagement.info/volta-basin/deliverables), there are not yet fully operational early warning systems at national level for the risk of floods and droughts. Several SAP initiatives are in place in each country, at different scales, resulting in the presence of numerous web portals generating climate information. Harmonization of these projects is therefore necessary. The systems in place are very rarely impact-based, and remain insufficient in terms of communication and dissemination of messages to be useful to the population. In addition, alerts are often not linked to national action or decision-making protocols.

Finally, these initiatives suffer from a lack of long-term follow-up, human capacity to maintain them, and coordination at the national level.

Among the list of early warning system initiatives in the Volta Basin region, the most relevant are referenced below:

- A Flood Early Warning System (FEWS-Volta) was developed by the World Bank and the Ghana Water Resources Commission in 2012 for the White Volta basin, later extended to the Oti sub-basin (VBAWMO-GWP, 2016) by HKV in Togo. The EWS uses a coupled hydrological and hydraulic model and provides a daily forecast with a 5-day lead time based on satellite rainfall data.
- In Benin, an early warning and agrometeorological information system (SPIAM) has been set up to reduce the vulnerability of agriculture to climate change by the NGO "Initiatives for an integrated and sustainable development (IDID-ONG)". An agro-meteorological interpretation committee publishes a bi-monthly bulletin from the beginning to the end of the crop season, facilitating the access of rural populations to agro-meteorological forecasts and advice.
- Burkina Faso has equipped itself with early warning systems oriented towards the risk of drought, such as with the establishment of the Regional Food Security Surveillance System, thanks to the ECO-AGRIS project (2015-2018). The project has strengthened information systems at local, national and regional scales to meet information needs for food and nutrition monitoring, for decision-making..
- In Ivory Coast, SODEXAM is working to develop a system of vigilance, alert, and weather and climate services for users (VIGICLIMM, 2020). The VIGICLIMM project, funded by the French Development Agency (AFD), aims to improve the quality of climate information by ensuring, in particular, flood prevention, adaptation of agriculture to climate change, food security, etc It ensures the strengthening, modernization and upgrading to international standards (ICAO, WMO) of all meteorological observation network and the climate information system of SODEXAM, as well as its human capacities.
- In Togo, the Red Cross movement is working on forecast-based financing projects, setting up early warning systems for floods and droughts in several regions.
- The World Bank-WMO CREWS project (2017-2021) focuses on the modernization of the hydrometeorological flood warning systems in Mali. A Flood Prediction tool in the Inner Niger Delta (OPIDIN) is used to make predictions about peak flows. It operates on the basis of daily readings of water levels taken by the National Directorate of Hydraulics (DNH) and its regional representations.
- As part of the "Flood and Drought Management Tool" project, the UNEP-DHI partnership designed and implemented a web portal (https://www.flooddroughtmonitor.com/). It provides near real-time data on floods and droughts to assess the occurrence of drought, based on a series

of drought indices, in three pilot watersheds, including the Volta Basin (CTCN, 2017).

In the sub-region, the VFDM project is addressing the need for harmonized impact-based forecasts, and enhanced warning dissemination, with the implementation and operation of a basin-wide transboundary early warning system, the myDewetra-VOLTALARM platform, for floods and droughts in the Volta Basin.

2.3 Challenges, Gaps, Opportunities and Needs for Integrated Flood and Drought Risk Management in the Volta Basin

Four main challenges are identified for an integrated flood and drought risk management in the Volta Basin, echoing the strategic priorities of the Sendai Framework for Disaster Risk Reduction 2015-2030. For each challenge, an analysis of opportunities and gaps is carried out, and a list of major needs is extracted.

- Challenge 1: Improving the understanding of flood and drought risks

Gaps and Opportunities:
Improving understanding of and access to data and knowledge related to flood and drought risks is a prerequisite for the establishment of a disaster reduction action plan for the Volta Basin. Commitments in terms of data sharing have been made within and between the countries of the basin. For example, the Water Charter specifies the role of the Volta Basin Authority in harmonizing the hydrological and hydrogeological data collected, and integrating them into a Basin Database (Article 23.2). Within this framework, a study on the establishment of a regional system for the exchange of data and information relating to the Volta Basin was carried out by the UNEP/GEF Volta project of the United Nations Environment Program. In spite of these commitments, the lack of data and knowledge exchange between Member States persists, and weakens the quality of flood and drought hazard and risk assessments. Indeed, there are few reference studies, harmonized at the basin level, which assess and map disaster risks, including all types of hazards (the different types of floods and droughts) as well as the exposure and vulnerability of populations and assets. The recent Volta Basin Risk Profile study (CIMA, WMO, VBA, GWP-WA, 2022) complements this need with an analysis of potential annual impacts related to floods and droughts under current and projected climate conditions.

Needs:

- To unify basin-wide, high resolution flood and drought risk mapping.
- To identify and describe the impact of recent disasters affecting the basin in a common database.
- To carry out a risk analysis taking into account the different types of flooding in the basin.
- To strengthen knowledge through studies on the groundwater resources of the basin.
- To analyze and map the social vulnerability of communities to floods and droughts.
- To ensure the management and sharing of socio-economic, climatic, hydro-meteorological and environmental data between countries.
- To pool resources and knowledge between countries and institutions, taking into account the results of the various projects underway or completed.
- To inform and sensitize the populations of the region on the risk of drought and floods, in particular by integrating the subject into the various teaching programs and professional training;
- to support research for the development of innovative risk indicators.

- Challenge 2: Strengthening governance and institutions for better integrated management of drought and flood risks in the basin

Gaps and Opportunities:

There is an appropriate multi-stakeholder institutional framework at the national and regional level for the management of floods and droughts, as well as structures for collecting and disseminating weather forecasts. However, the basin suffers from a lack of cooperation, coordination and harmonization between institutions in charge of disaster risk management within and between countries, as well as a lack of human resources. This hampers the development of effective and operational institutional and legislative mechanisms for disaster management throughout the basin. On the other hand, basin-wide governance is already in place with the Volta Basin Authority, which aspires to coordinate disaster risk management in the basin, in an integrated and transboundary manner.

Regional and national policies exist on the sustainable management of water resources in the basin, such as the Volta Basin Water Charter, which discusses the issue of disaster and climate change management. Specific policies, strategies and plans for disaster risk reduction have been developed at the national level, however they generally focus on emergency response rather than disaster prevention and preparedness. There is also a lack of a transboundary strategic plan linking water management and disaster management at basin level.

Needs:

- To clarify the respective competences and roles of the institutions involved in disaster risk management.
- To harmonize national policies for a shared vision of disaster management integrating risk profiles.
- To effectively consider drought and flood risks in national policies and strategies and the budgeting of interventions to improve the reduction and management of such risks.

- Challenge 3: Investing in flood and drought risk reduction measures for resilience

Gaps and Opportunities:

There is a common political will to address climate change, floods and droughts, and in an inclusive manner. However, financial and human resources are limited to invest in policies, programs or projects that integrate disaster, climate and development management. Indeed, the question of transferring international funds for climate disaster prevention and recovery to Southern states is also at the heart of the discussions at the 2022 Sharm el-Sheikh Conference on climate change (COP27).

A number of drought and flood risk reduction measures exist as the result of various projects implemented in the basin. For example, in Burkina Faso, a drainage network was built to manage potential flooding in the city of Ouagadougou, but its operation is compromised by garbage that accumulates in the channels blocking the system. Regarding drought issues, in Ghana large gorges have been constructed to retain water for hydroelectric generation and ensure water availability during dry seasons. However, these measures are not designed in an integrated and cross-border manner. In addition, land use planning and building guidelines are often limited to flood risks, with little emphasis on resilient development, and are generally not (or only weakly) implemented.

Needs:

- To mobilize innovative financing for disaster risk management budget allocation.
- To create a synergy of actions and mobilization of funding, including local funding.
- To consider the perspective of women, young people and people living with disabilities in all disaster reduction measures.
- To establish an integrated network of flood and drought risk reduction measures.
- To implement defensive measures to reduce flood risk: retention basin, reforestation, siltation and silting control, measures facilitating urban runoff, and improving the resilience of buildings.

- To implement non-structural measures to reduce the vulnerability of the territory and the population to droughts and floods: land-use planning policies taking into account social vulnerability, as well as the flood and drought risks.

- Challenge 4: Implementing early action protocols based on the integration of climate and weather forecasts

Gaps and Opportunities:

Although there are national weather forecasting structures, as well as numerous initiatives to strengthen hydro-meteorological warning systems, the inadequacy in terms of data creation and exploitation by the institutions in charge and the absence of integrated monitoring networks between countries prevent the implementation of an EWS at basin level.

National systems are also weak in terms of communication and dissemination of climate information and risk forecasts on floods and droughts. Moreover, national disaster planning and preparedness mechanisms are not always effective. There are few end-to-end Early Warning / Early Action Systems to reduce the risk of floods and drought at the national level, the most promising being the Togolese Red Cross River Flood SAP developed to reach the most vulnerable communities. In addition, appropriate flood and drought insurance mechanisms should be developed at the community, property owners, municipal, national or regional levels.

Needs:

- To strengthen the capacities of stakeholders and institutions on the use of climate prediction information for decision-making.
- To establish an end-to-end, nationwide early warning system for flood and drought risk in the basin region building on ongoing initiatives such as the Multi-Risk Early Warning (SAP/MR) of the W-Arly-Pendjari (WAP) complex and the SAP myDewetra-VOLTALARM platform in the Volta Basin.
- To emphasize effective communication and dissemination of warnings and hydro-meteorological forecast information by opting for impact-based messages, adapted to the experiences and knowledge of the most vulnerable beneficiaries and communities.
- To develop early action protocols according to alert thresholds based on hydro-meteorological forecasts.
- To develop a public-private partnership for communication on EWS and financing of anticipatory actions through climate insurance.
- To invest and raise awareness for climate-smart agriculture: dissemination of information based on climate forecasts adapted to the agricultural sector, integrating preventive actions adapted to the agricultural calendar.

CHAPTER 3 – Vision, objectives and strategic orientations

It will be co-developed during national workshops

3.1 Vision

3.2 Objectives of the strategy

3.3 Guiding principles of the strategy

3.4 Strategic orientations of the strategy

CHAPTER 4 – Means of implementation

4.1 Roles of key stakeholders at different levels

At State level

States Parties will monitor goals and outcomes at the national level. They undertake to compile periodic summary reports on the status of implementation of activities to reduce flood and drought risks and to define a set of objectives to address gaps and challenges. Based on the indicators common to all States Parties to assess progress, each country will determine its own indicators and monitoring mechanisms in accordance with the objectives of the strategy and submit them every two years to the VBA.

At VBA level

The VBA is committed to providing strategic guidance to States Parties while facilitating and coordinating the implementation of the Action Plan. It will initiate and coordinate the mobilisation of financial resources, the support for the implementation of the Strategy's Action Plan in the States Parties, as well as the staff capacity building. It is also up to the VBA to coordinate the definition and selection of monitoring indicators in partnership with the States Parties.

4.2 Cooperation and partnerships

It will successively develop the partnership framework and the mobilization of resources as well as priority actions to strengthen the mobilization of partnerships, including tools and approaches for developing partnerships, the communication strategy, capacity building targets and a roadmap.

The West African Economic Monetary Union (WAEMU) plays an important role in the implementation of the Action Plan through capacity building activities. The Permanent Interstate Committee for Drought Control in the Sahel (CILSS) also makes contributions, particularly with regard to regional water policy, flood management, drought and food security.

Specialized institutions such as the AGRHYMET centre, ACMAD and WASCAL play an important role in forecasting extreme weather and climate phenomena, and provide training and support in the field of water, environment, weather and climate.

The International Federation of Red Cross and Red Crescent Organizations (IFRC) provides technical expertise in disaster response and preparedness. Civil society and NGOs bring the voices and perspectives of citizens to the table, ensuring a people-centred risk reduction and response agenda.

The private sector plays an increasingly important role in the risk reduction agenda, in particular by protecting its own productive infrastructures (industries, commerce and services) against disasters.

Universities play an important role as independent research structures and technical partners to better understand risks and adopt regional and national policies.

Support for the country program by bilateral and multilateral partners, including United Nations agencies, the World Bank and the European Union, could also contribute to supporting the implementation of the Action Plan.

The World Bank, the African Development Bank (ADB) and the West African Development Bank (BOAD) work closely with ECOWAS in the implementation of regional programs. Bilateral partners (United Kingdom, Denmark, Spain, Germany, Switzerland and France) and the European Union support and coordinate the implementation of the main ECOWAS programs in the areas of agriculture, migration, trade facilitation, peace and security. It will therefore be crucial to establish a partnership and collaboration with ECOWAS for the implementation of the Action Plan.

The existence of the Climate Fund, GEF and other potential sources of funding, the presence of several possibilities for financing works from external resources, development partners (multilateral and bilateral funding), contributions from beneficiaries and the private sector may enable the VBA and States Parties to significantly increase the budgets allocated for disaster risk management. It is recommended that a sustainable budget, sufficient to cover the costs of some of the activities in the Strategy's Action Plan, be included in the respective country's budget laws.

4.3 Resource Mobilization

It should already be noted that the resources required not only for the implementation but also for the long-term maintenance of the actions undertaken within the framework of the strategy will be achieved through the budgetary allocations of the States Parties as well as the opportunities for projects and ongoing initiatives in countries. Additional resources may be mobilized through development partnerships and technical cooperation.

4.4 Monitoring and Reporting

The Strategy Action Plan sets out specific, measurable, achievable and realistic indicators defined over time and in accordance with the expected results throughout the process. The data necessary to assess the level of achievement or the progress made towards the achievement of results will be collected by the States Parties with the support of the VBA. Progress will be assessed against the

outcome and service indicators set out in the VBA Annual Work Plan. The VBA will produce detailed annual reports to provide information on the level of progress in achieving the targets. The operational and financial achievement sections will also be reported on by States Parties in the annual reports. The rating scale (not achieved, partially achieved and achieved) will be used systematically at year-end. The VBA and its Management appreciate the rigour of the external evaluations. A mid-term evaluation during the implementation period of the strategy will be carried out and followed by an adjustment of the plan if necessary, and the final evaluation will be carried out at the end of the programme.

4.5 Learning and sharing lessons

DRR measures are generally designed to have long-term benefits. Evaluation requires that partners have competent staff and that they have the necessary time and resources. VB encourages States Parties to plan accordingly.

In national and local disaster risk management programmes/projects, there is a need for participatory monitoring and evaluation. Although there is a wealth of literature on the subject of DRR, there is still much to be learned and shared on how to apply it in different contexts. VBA actively promotes the capitalisation, dissemination and mainstreaming of lessons learned and best practices.

Appendices

Annex 1 - Action plan for the first 3 to 5 years of implementation of the Strategy

It will be co-developed during the national workshops.

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