



Reversing Ecosystem and Water Degradation in the Volta River Basin (REWard-Volta River Basin)

Part I: Project Information

GEF ID

9910

Project Type

FSP

Type of Trust Fund

GET

Project Title

Reversing Ecosystem and Water Degradation in the Volta River Basin (REWard-Volta River Basin)

Countries

Regional, Benin, Burkina Faso, Cote d'Ivoire, Ghana, Mali, Togo

Agency(ies)

UNEP, IUCN

Other Executing Partner(s):

Volta Basin Authority, Ministries in charge of water resources in Countries, other relevant National Authorities

Executing Partner Type

GEF Agency

GEF Focal Area

International Waters

Taxonomy

International Waters, Focal Areas, Type of Engagement, Stakeholders, Strategic Action Plan Implementation, Freshwater, Aquifer, Lake Basin, River Basin, Fisheries, Pollution, Nutrient pollution from all sectors except wastewater, Climate Change, Climate Change Adaptation, Climate information, Adaptation Tech Transfer, Climate resilience, Influencing models, Convene multi-stakeholder alliances, Transform policy and regulatory environments, Strengthen institutional capacity and decision-making, Demonstrate innovative approach, Beneficiaries, Local Communities, Civil Society, Non-Governmental Organization, Trade Unions and Workers Unions, Community Based Organization, Academia, Partnership, Information Dissemination, Consultation, Participation, Private Sector, SMEs, Communications, Awareness Raising, Public Campaigns, Behavior change, Education, Gender Equality, Gender Mainstreaming, Women groups, Gender results areas, Knowledge Generation and Exchange, Capacity Development, Participation and leadership, Access and control over natural resources, Capacity, Knowledge and Research, Innovation, Learning, Adaptive management, Knowledge Generation, Knowledge Exchange

Rio Markers**Climate Change Mitigation**

Climate Change Mitigation 0

Climate Change Adaptation

Climate Change Adaptation 0

Duration

60In Months

Agency Fee(\$)

658,934

A. Focal Area Strategy Framework and Program

Objectives/Programs	Focal Area Outcomes	Trust Fund	GEF Amount(\$)	Co-Fin Amount(\$)
IW-1_P1	Political commitment/shared vision and improved governance demonstrated for joint, ecosystem-based management of transboundary water bodies On-the-ground demonstration actions implemented, such as in water quality, quantity, conjunctive management of groundwater and surface water, fisheries, coastal habitats.	GET	4,182,566	46,100,014
IW-2_P3	Improved governance of shared water bodies, including conjunctive management of surface and groundwater through regional institutions and frameworks for cooperation lead to increased environmental and socio-economic benefits. Increased management capacity of regional and national institutions to incorporate climate variability and change, including improved capacity for management of floods and droughts.	GET	2,940,000	29,010,622
Total Project Cost(\$)			7,122,566	75,110,636

B. Project description summary

Project Objective

Reverse ecosystem and water degradation and support integrated ecosystem-based development in the Volta River Basin through strengthened transboundary governance and restoration and conservation of ecosystems for sustainable livelihoods.

Project Component	Financing Type	Expected Outcomes	Expected Outputs	Trust Fund	GEF Project Financing(\$)	Confirmed Co-Financing(\$)
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Project Component	Financing Type	Expected Outcomes	Expected Outputs	Trust Fund	GEF Project Financing(\$)	Confirmed Co-Financing(\$)
Component 1. Improvement of knowledge base and development of management tools for informed decision-making process	Technical Assistance	<p>Outcome 1.1</p> <p>The transboundary network of data collection/processing delivers up-to-date information for decision making and basin planning to respond to environmental threats at basin, national, and local levels.</p>	<p>Output 1.1.1</p> <p>Annual Surface Water Resources Models and Decision Support Tools^[1] made available to support the optimization of water use and flows to minimize negative environmental impacts (links to Output 2.1.1)</p> <p>Output 1.1.2 Valuation of environmental capital, ecosystem services and functions completed and socio-anthropological impacts in the Volta basin assessed.</p> <p>Output 1.1.3 Shallow ground water aquifers inventoried, water quality assessed and measures for addressing pollution hot-spots are developed.</p>	GET	1,090,000	18,950,000
			<p>^[1] There are at least two options of such models to be applied, e.g. WEAP or MIKE. Both types of models could be applied in the region to build on previous interventions, such as the UNEP-GEF Floods and Droughts Management Tools.</p>			

Project Component	Financing Type	Expected Outcomes	Expected Outputs	Trust Fund	GEF Project Financing(\$)	Confirmed Co-Financing(\$)
Component 2. Strengthening of transboundary planning, regional and in-country coordination and capacity, also during extreme events related to climate change and variability	Technical Assistance	Outcome 2.1 Transboundary coordination improved through the capacity strengthening, development and installation of modern tools in accordance with Priority Actions of the SAP.	<p>Output 2.1.1 Functional Regional Coordination and National Water User Inter-Sectoral/Inter-Ministerial Committees Established to Assure Formal Dialogue between countries and sectors</p> <p>Output 2.1.2 A Regional Programme to fight against invasive species in the Volta Basin is developed and implemented[1].</p> <hr/> <p>[1] SAP Priority Action B.3 – There are a number of invasive species that have multiplied rapidly to cover extensive areas of the Volta Basin’s boundaries (see p. 15)</p>	GET	960,000	13,100,000

Project Component	Financing Type	Expected Outcomes	Expected Outputs	Trust Fund	GEF Project Financing(\$)	Confirmed Co-Financing(\$)
Component 2. Strengthening of transboundary planning, regional and in-country coordination and capacity, also during extreme events related to climate change and variability	Technical Assistance	Outcome 2.2 Capacity of VBA and national authorities strengthened through the development and implementation of a capacity building programme and early warning system(s) at basin, national, and local levels	<p>Output 2.2.1 Community oriented early-warning system(s) for droughts developed and put into operation[1].</p> <p>Output 2.2.2 The Volta basin Observatory is capacitated to manage and use the updated water use/balance models through a series of trainings[2] (feeds into Output 2.1.1).</p> <p>[1] SAP Priority Action A.6 – Besides direct anthropogenic pressure on the environment, land and water, climate change and climate variability is one of the main factors of negative changes in the Volta Basin, and a driving force for socio-economic impacts, particularly at the local level (see p. 16)</p> <p>[2] SAP Priority Actions B10, C1, C4.</p>	GET	850,000	8,000,000

Project Component	Financing Type	Expected Outcomes	Expected Outputs	Trust Fund	GEF Project Financing(\$)	Confirmed Co-Financing(\$)
Component 3. Strengthening of resilience of ecosystems for sustainable livelihoods in the Volta basin.	Investment	Outcome 3.1 Production systems in key sectors apply integrated water resource management and ecosystem-based approaches at community and sub-basin levels	Output 3.1.1 Measures on sustainable use of water for crop and livestock productions implemented to improve productivity, food security and incomes. Output 3.1.2 Sustainable fisheries management practices implemented to improve productivity, food security and incomes.	GET	3,200,000	29,559,000
Component 4. Knowledge management and sharing, and effective M&E	Technical Assistance	Outcome 4.1 Knowledge on environmental and water management aspects of governance improved through the development of targeted visual materials and public awareness campaigns	Output 4.1.1 Communication strategy for SAP implementation is developed and implemented, also through a series of public awareness campaigns. Output 4.1.2 International Waters knowledge products are generated and disseminated using existing global information and knowledge sharing platforms, e.g. GEF IW: LEARN.	GET	450,000	1,450,000

Project Component	Financing Type	Expected Outcomes	Expected Outputs	Trust Fund	GEF Project Financing(\$)	Confirmed Co-Financing(\$)
Component 4. Knowledge management and sharing, and effective M&E	Technical Assistance	Outcome 4.2 Project implementation based on RBM and lessons learned/best practices documented and disseminated.	Output 4.2.1. Project Monitoring & Evaluation Plan and system developed and in place Output 4.2.2. Mid-Term and Final Project Evaluations Output 4.2.3. A Project communication strategy is developed and implemented.	GET	233,396	483,939
Sub Total (\$)					6,783,396	71,542,939
Project Management Cost (PMC)						
GET					339,170	3,567,697
Sub Total(\$)					339,170	3,567,697
Total Project Cost(\$)					7,122,566	75,110,636

C. Sources of Co-financing for the Project by name and by type

Sources of Co-financing	Name of Co-financier	Type of Co-financing	Amount(\$)
GEF Agency	IUCN	In-kind	8,000,000
GEF Agency	UNEP	In-kind	750,000
Others	DHI	In-kind	4,500,000
Others	GWP project: WACDEP (Water, Climate and Development in Africa)	In-kind	2,000,000
Others	WMO-GWP project: Integrating Flood and Drought Management and Early Warning for Climate Change Adaptation in the Volta Basin	In-kind	2,225,000
Government	Burkina Faso	In-kind	6,816,303
Government	Ghana	In-kind	1,311,000
Government	Togo	In-kind	760,000
Government	Mali	In-kind	32,570,000
Government	Benin	In-kind	1,178,333
Government	Cote d'Ivoire	In-kind	15,000,000
Total Co-Financing(\$)			75,110,636

D. Trust Fund Resources Requested by Agency(ies), Country(ies), Focal Area and the Programming of Funds

Agency	Trust Fund	Country	Focal Area	Programming of Funds	NGI	Amount(\$)	Fee(\$)
UNEP	GET	Regional	International Waters		No	3,580,500	340,148
IUCN	GET	Regional	International Waters		No	3,542,066	318,786
Total Grant Resources(\$)						7,122,566	658,934

E. Non Grant Instrument

NON-GRANT INSTRUMENT at CEO Endorsement

Includes Non grant instruments? **No**

Includes reflow to GEF? **No**

200,000

18,500

Agency	Trust Fund	Country	Focal Area	Programming of Funds	NGI	Amount(\$)	Fee(\$)
UNEP	GET	Regional	International Waters		No	100,000	9,500
IUCN	GET	Regional	International Waters		No	100,000	9,000
Total Project Costs(\$)						200,000	18,500

Core Indicators

Indicator 4 Area of landscapes under improved practices (hectares; excluding protected areas)

Ha (Expected at PIF)	Ha (Expected at CEO Endorsement)	Ha (Achieved at MTR)	Ha (Achieved at TE)
0.00	20000.00	0.00	0.00

Indicator 4.1 Area of landscapes under improved management to benefit biodiversity (hectares, qualitative assessment, non-certified)

Ha (Expected at PIF)	Ha (Expected at CEO Endorsement)	Ha (Achieved at MTR)	Ha (Achieved at TE)
	15,000.00		

Indicator 4.2 Area of landscapes that meets national or international third party certification that incorporates biodiversity considerations (hectares)

Ha (Expected at PIF)	Ha (Expected at CEO Endorsement)	Ha (Achieved at MTR)	Ha (Achieved at TE)

Type/Name of Third Party Certification

Indicator 4.3 Area of landscapes under sustainable land management in production systems

Ha (Expected at PIF)	Ha (Expected at CEO Endorsement)	Ha (Achieved at MTR)	Ha (Achieved at TE)
	5,000.00		

Indicator 4.4 Area of High Conservation Value Forest (HCVF) loss avoided

Ha (Expected at PIF)	Ha (Expected at CEO Endorsement)	Ha (Achieved at MTR)	Ha (Achieved at TE)

Documents (Please upload document(s) that justifies the HCVF)

Title	Submitted			
Indicator 7 Number of shared water ecosystems (fresh or marine) under new or improved cooperative management				
	Number (Expected at PIF)	Number (Expected at CEO Endorsement)	Number (Achieved at MTR)	Number (Achieved at TE)
Shared water Ecosystem	Volta Basin			

	Number (Expected at PIF)	Number (Expected at CEO Endorsement)	Number (Achieved at MTR)	Number (Achieved at TE)
Count	0	1	0	0

Indicator 7.1 Level of Transboundary Diagnostic Analysis and Strategic Action Program (TDA/SAP) formulation and implementation (scale of 1 to 4; see Guidance)

Shared Water Ecosystem	Rating (Expected at PIF)	Rating (Expected at CEO Endorsement)	Rating (Achieved at MTR)	Rating (Achieved at TE)
Volta Basin		4		<input type="checkbox"/>
Select SWE				

Indicator 7.2 Level of Regional Legal Agreements and Regional management institution(s) (RMI) to support its implementation (scale of 1 to 4; see Guidance)

Shared Water Ecosystem	Rating (Expected at PIF)	Rating (Expected at CEO Endorsement)	Rating (Achieved at MTR)	Rating (Achieved at TE)
Volta Basin		3		<input type="checkbox"/>
Select SWE				

Indicator 7.3 Level of National/Local reforms and active participation of Inter-Ministeral Committees (IMC; scale 1 to 4; See Guidance)

Shared Water Ecosystem	Rating (Expected at PIF)	Rating (Expected at CEO Endorsement)	Rating (Achieved at MTR)	Rating (Achieved at TE)
Volta Basin		2		<input type="checkbox"/>
Select SWE				

Indicator 7.4 Level of engagement in IWLEARN through participation and delivery of key products(scale 1 to 4; see Guidance)

Shared Water Ecosystem	Rating (Expected at PIF)	Rating (Expected at CEO Endorsement)	Rating (Achieved at MTR)	Rating (Achieved at TE)
Volta Basin		2		<input type="checkbox"/>
Select SWE				

Indicator 11 Number of direct beneficiaries disaggregated by gender as co-benefit of GEF investment

	Number (Expected at PIF)	Number (Expected at CEO Endorsement)	Number (Achieved at MTR)	Number (Achieved at TE)
Female		5,000		
Male		10,000		
Total	0	15000	0	0

PART II: Project JUSTIFICATION

1. Project Description

1. The global environmental and/or adaptation problems, root causes and barriers that need to be addressed;

The Volta Basin (400,000 km²) is one of the major West African river basins that drains into the Gulf of Guinea (Figure 1). Its resources are shared by six countries: Benin, Burkina Faso, Côte d'Ivoire, Ghana, Mali, and Togo, of which Burkina Faso and Ghana have the major part both in terms of area and population (Table 1).

Table 1 Share of basin per country

Country	Area of basin (km ²)	Percentage of the basin in the country	Percentage of the country in the basin	Population in the basin projected for 2025 (1000)
Benin	13590	3.41	12.1	820
Burkina Faso	171105	43.0	62.4	15997
Côte d'Ivoire	9890	2.48	3.07	718
Ghana	165830	41.6	70.1	11696
Mali	12430	3.12	1.00	1260
Togo	25545	6.41	45.0	3385
Total	398390	100	-	33876

Source: Volta Basin Transboundary Diagnostic Analysis, 2013

The Volta Basin contains a rich set of ecosystems, many of them globally significant. These diverse ecosystems are largely shaped by the climatic diversity and climate zones of the region. Globally significant terrestrial ecosystems in the region include semi-deciduous and dry deciduous forests, savannahs, and steppes. In addition, the area contains riparian forests, grasslands, mangroves, and forest plantations, as well as specific ecosystems within protected areas. A hugely diverse range of freshwater aquatic ecosystems are fed by three major rivers: the Oti, the Black Volta and the White Volta. Extensive marine and coastal ecosystems stretch out from the Volta Estuary in Ghana northeast along the coast of Togo providing diverse and rich habitats. The basin contains vast biological diversity and a large number and range of species – many of which are endemic or threatened, or otherwise globally important.

According to demographic statistics, the population of the basin was 18.6 million in 2000 and is projected to reach 33.9 million in 2025 and 56 million in 2050. Although, overall, the economic situation has improved in recent years, the countries that share the Volta Basin remain among the poorest in the world. The basin's resources are vital to its population and to its economic development. The most important economic sectors are agriculture (which is currently extensive and mostly rain-fed), livestock production, fisheries, forestry, and the harvesting of biodiversity. Other growing sectors are industry, trade, mining, energy, recreation, and tourism.

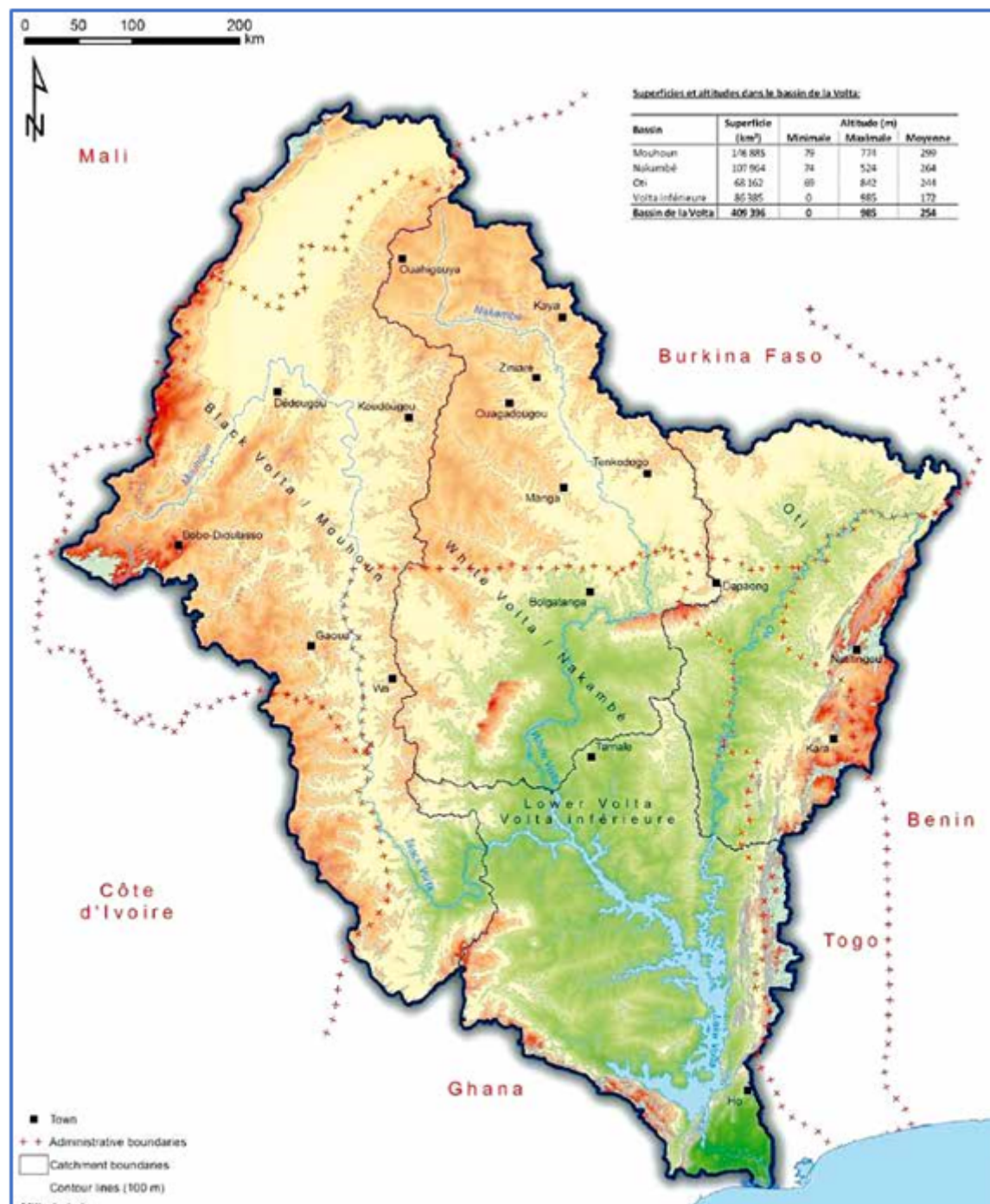


Figure 1 The Volta Basin

All sectors depend on and utilize the natural resources of the region, consequently all sectors potentially pose a threat to the sustainability of the resources if not appropriately managed. Existing infrastructure developments to manage water resources, notably for hydropower and irrigation, have already impacted the hydrological cycle at many points, and future plans pose a potential threat to the sustainability of the resources if not managed sustainably with a basin-wide Master Plan, yet to be developed and agreed upon by all the riparian countries.

Many socioeconomic trends suggest that the demand for, and the pressure on, the basin's natural resources are likely to grow over the coming years. The most notable trends are fast population growth and urbanization; growing demand for food; growing demand for water for agriculture, energy and households; high dependence on biofuels for energy; and rapid growth in livestock numbers. These factors are likely to combine with climate change and variability to pose a real threat to sustainable development of the Volta Basin and the integrity of its natural resources.

Many governance-related factors also affect the sustainable use and management of the natural resources of the region. These include fragmented and uncoordinated institutions, laws, policies, and investment programmes at regional, national, and local levels. Although greatly evolved in recent decades, these still remain incomplete and fragile. Instability, centralization, and difficulties in enforcing legislation are other governance factors that indirectly impact the basin's resources. Lack of trained and motivated human resources is also a key issue. In particular, efforts to develop multi-country cooperation, although greatly boosted by the recently established Volta Basin Authority, remain insufficient.

In line with international best practices, to address environmental and social concerns in the basin the UNEP-GEF Volta Project, Addressing Transboundary Concerns in the Volta Basin and its Downstream Coastal Areas, in collaboration with the Volta Basin Authority (VBA), finalized in 2013 the Transboundary Diagnostic Analysis (TDA), with a subsequent Strategic Action Programme (SAP) which was endorsed by the riparian countries in 2014. The Transboundary Diagnostic Analysis identified environmental problems that need to be addressed jointly by the VBA, the basin riparian countries and the international community. These concerns include: i) changes in water quantity and seasonal flows, ii) coastal erosion downstream of the Volta Basin, iii) invasive aquatic species, iv) increased sedimentation of river courses, v) loss of soil and vegetative cover and, vi) water quality concerns (agricultural, industrial and domestic pollution of water bodies). The TDA also identified governance issues such as policy, legislative and institutional constraints that undermine effective water resources management in the basin both at the national and regional levels.

This situation has led to several impacts such as change in ecosystem functions, loss of biodiversity, continuing decline in local access to water, flooding, spread of invasive aquatic species, reduction in agricultural production, livestock deaths, collapsed fisheries, loss of sources of biological materials and products, loss in wetlands services. The socioeconomic consequences of these impacts include increases in poverty levels, food insecurity, loss/reduction of livelihoods, declining health status of the population, reduction in income and revenue, migration with resulting conflicts.

The main root causes of these priority transboundary environmental problems identified by the basin TDA are climate change and variability, population increase, increased water and land use, poverty in the basin countries, slow adaptation of cultural and social beliefs and practices to changing circumstances, change of societal values, low levels of education and literacy and, lack of good governance.

The Volta Basin SAP has been developed with the aim to halt or slow the current rate of environmental degradation in the Volta Basin. To that end, the following seven Environmental Quality Objectives (EQOs) were identified for the basin: i-) EQO 1: water is optimized among primary users (domestic, agricultural, ecosystem and hydroelectric power) so that they receive adequate and sustainable supplies, ii-) EQO 2: the coast between Ada and Keta is stabilized by 2025, iii-) EQO 3: the proliferation of invasive aquatic

species is contained, especially in five priority biodiversity hotspots[1]¹, iv-) EQO 4: sedimentation in five key hotspots is reduced by 20 per cent by 2025, v-) EQO 5: critical ecosystem functions are conserved, restored and managed for sustainable use in at least five priority areas, vi-) EQO 6: water of sufficient quality is available to support ecosystem needs at four pollution hotspots and, vii-) EQO 7: the legal and institutional governance framework within the Volta Basin is strengthened.

Given the generally low levels of technical knowledge for sustainable natural resources management that characterizes the basin, coupled with priority transboundary concerns identified during the TDA process, the project envisages to address the following issues: weak integration of ecosystem-based management approaches in the governance and cooperation frameworks, lack of quality information for basin's resources management under the increasing pressures from climate change and climate variability on ecosystems and their services/functions in selected areas.

2. The baseline scenario or any associated baseline projects,

In the absence of the GEF project, the Volta Basin will continue to be impacted by:

- Existing inadequate political structures, institutional, legal and regulatory frameworks will hamper the ability of riparian countries to implement IWRM at sub-basin level;
- Inadequate support of riparian countries to the VBA in view of the effectiveness of its role;
- Inability of the Volta Basin Observatory and its associated national institutions capacities and skills to monitor the basin environmental resources, predict and assess potential climate change scenarios and impacts;
- Increased ecosystem degradation including, sedimentation of river courses, invasive aquatic species, coastal erosion, loss of soil and biodiversity and water pollution;
- Increased pressures on natural resources for various purposes (agriculture, livestock, fisheries, etc.) due to low and unsustainable productivity of the natural ecosystems;
- Low food production due to poor ability to adapt to and cope with climate and weather variability, especially periods of drought;
- Weak involvement of local stakeholders and communities in the sustainable management of basin's resources

The proposed project builds on a set of baseline projects, which aim to support the Volta Basin Authority and the riparian countries to achieve the objectives of the Volta Basin Convention and Strategic Action Programme. These projects need to be linked and complemented by an overarching initiative that addresses incomplete and inadequate information

basis for joint ecosystem-based management, ecosystem restoration and conservation as well as climate variability and change issues within the governance and cooperation framework of the Volta basin.

It also builds on past and current strong collaboration between UNEP, IUCN and VBA. For example, the UNEP, VBA and IUCN successfully implemented the GEF funded project that led to the development of the TDA/SAP of the Volta Basin. Recently, UNEP and IUCN successfully implemented the GEF funded project on protected areas and resilience to climate change that led to the development of tools to mainstreaming climate change into biodiversity and protected areas policies in Central and West Africa. In addition, IUCN, GWP/WA and VBA have a long tradition of cooperation through several projects including the past PAGEV (Project pour l'amélioration de la gouvernance de l'eau dans le bassin de la Volta) and the Poverty Reduction and Environmental Management Initiative (PREMI), and the ongoing Partnership for Environmental Governance in West Africa (PAGE) and WACDEP (Water, Climate and Development in Africa).

After the endorsement of the Volta Basin Strategic Action Programme by the riparian countries in May 2014, two GEF Agencies (World Bank and UNEP) showed interest in submitting complementary initiatives for funding.

The World Bank initiative development objective is to improve the capacity of the VBA for transboundary water resources management and international cooperation through institutional development and implementation of priority actions of the Strategic Action Programme, which will result in direct environmental and livelihoods benefits. Priority actions targeted include an independent institutional assessment of VBA, the development of a Water Charter for the Basin, restoration of flows through river bank rehabilitation, reversal of vegetation degradation through reforestation and enhancing of agricultural practices through water-conserving techniques.

At country level there are more activities and initiatives than can possibly be shown here. A list of identified initiatives and activities is provided per country in Annex R. Table 3 shows just the number of activities per country and how they relate to the SAP (no information was available for Côte d'Ivoire and Mali). The list may not be exhaustive but provides an indication of where significant resources and efforts are invested in the countries.

Some other major recent, ongoing and planned initiatives, which the project will build on and coordinate with include the following at basin level (see Table 2 for an overview):

- The primary objective of the interdisciplinary GLOWA Volta Project (GVP) was to provide an analysis of the physical and socio-economic determinants of the hydrological cycle within the Volta Basin in the face of global and regional environmental change. The corresponding primary output took the form of a scientifically sound and adequately tested Decision Support System (DSS) for the assessment, sustainable use and development of the Basin's water resources. The DSS provides a comprehensive monitoring and simulation framework, enabling decision makers to evaluate the impacts of climatic and land use trends with particular emphasis on the consequences of deliberate policies, investments and other interventions for the social, economic and biological productivity of water resources.

- Basin Focal Project Volta (PN55). CGIAR. The Basin Focal Project Volta (BFP Volta) (completed) carried out the following tasks: (i) Assessment of present conditions of the distribution of rural poverty, of farming systems with their productivity and water productivity, (ii) Analysis of opportunities and risks, especially under the double pressure of demography and possible climate change, and modeling of water resources to identify sensitivity of water allocation to development and climate scenarios, and (iii) Identification of research gaps and implementation plan.

- UNEP-GEF Volta Project (completed). Addressing Transboundary Concerns in the Volta Basin and in Downstream Coastal Areas. (completed). The major outputs were a regional Transboundary Diagnostic Analysis (TDA) identifying priority transboundary issues in basin, a Strategic Action Programme (SAP) to address the priority issues, and demonstration of national and regional measures to combat transboundary environmental degradation in the basin. The project's total duration including two extensions was six years from January 2008 to December 2014.

- The World Bank Project (Volta River Basin Strategic Action Programme Implementation Project - VSIP) is supporting: the development of the Volta River Basin Water Charter, the development of a Communications Strategy and Plan which will serve as the guiding document for improving coordination and collaboration among all relevant stakeholders; and on information sharing on current and planned projects in the Basin and the implementation of four SAP Priority Actions. This project was stopped in August 2019 ahead of the original planned completion date following an "Independent Institutional Assessment of the Volta Basin Authority, BRL, 2017" carried out as part of the project.

- The West African Science Service Centre on Climate Change and Adapted Land Use (WASCAL) Project: it is an initiative of the German Federal Ministry of Education and Research to establish, together with West African partner countries, a center of competence on climate change and adapted land use in West Africa. It is currently supporting the generation of knowledge and developing analytical capability in the region to solve current and future land management problems caused by changing climate and weather conditions, the primary objective of which was to provide an analysis of the physical and socio-economic determinants of the hydrological cycle within the Volta Basin in the face of global and regional environmental change. The corresponding primary output took the form of a scientifically sound and adequately tested Decision Support System (DSS) for the assessment,

sustainable use and development of the Basin's water resources. The DSS provides a comprehensive monitoring and simulation framework, enabling decision makers to evaluate the impacts of climatic and land use trends with particular emphasis on the consequences of deliberate policies, investments and other interventions for the social, economic and biological productivity of water resources.

- The Water, Climate and Development Programme for Africa (WACDEP) developed by the African Ministers Council on Water (AMCOW) in collaboration with Global Water Partnership (GWP) supports VBA for the following initiatives: i-) Assessment of the Current State of Water Management and Climate Change in the Volta Basin as part of the Establishment of an Observatory for Water Resources and Related Ecosystems, ii-) Outlines and principles for sustainable development of the Volta Basin, iii-) Setting-up of an Early Warning System for droughts, floods and incidence of pollution in the Volta basin, iv-) Implementation of Integrated Flood Management with a focus on Benin, Burkina Faso, Cameroon, Cote d'Ivoire, Ghana, Mali, Nigeria, Senegal and Togo.
- VBA is also involved in a Flood and Drought Management Tool project that is funded by GEF and implemented by UNEP, with the International Water Association (IWA) and DHI as the executing agencies. The project aims at developing methodologies and tools within a decision support system (DSS) to facilitate the inclusion of information about floods, droughts and future scenarios into integrated water resources management (IWRM) planning, Water Safety Planning (WSP), Transboundary Diagnostic Analyses (TDA) and Strategic Action Plans (SAP). The project was implemented from 2014 - 2018, and three pilot basins (Volta, Lake Victoria and Chao Phraya) were identified for development and testing of the Decision Support System.
- Integrating Flood and Drought Management and Early Warning for Climate Change Adaptation in the Volta basin (VFDM; funded by the Adaptation Fund) is implemented by WMO and executed by WMO and VBA (2018 to 2021). The main objective of the project is to assist the six countries in the implementation of coordinated and joint measures related to disaster risk reduction and climate adaptation. The groups of people who will most directly benefit of the project outputs are related to the types of activity: 1) new tools developed for risk reduction, such as flood and drought risk maps and Early Warning System, and climate change adaptation measures, 2) testing of the EWS on pilot areas, 3) capacity building activities integrated into the three components of the work project. The project will provide an important linkage to the meteorological offices within the different countries and there will be important synergies with respect to data, databases, drought early warning and dissemination to local communities.
- The Partnership for Environmental Governance in West Africa (PAGE) funded by Sida and implemented by IUCN is providing supports to the stakeholders in the Volta, Niger, Senegal and Mono basins. The PAGE is a regional five-year programme aimed at improving the livelihoods and living conditions of the people of West Africa through strengthened environmental policies and institutional framework. In fact, this partnership already exists, and it is because it has already produced significant outputs in the areas of governance and natural resources management at local, national and sub-regional levels that its members intend to extend the work to 2018. The project is a multi-actor-based intervention under three

specific working themes: i-) enforcement of regional laws and policies and shared governance; ii-) improving the state of ecosystems to adapt to climate change and alleviate poverty and; iii-) mobilizing knowledge for better decision-making. The project was implemented from 2014-2018.

• The WISE-UP to Climate’ aims to develop knowledge on how to use mixed portfolios of built water infrastructure (e.g. dams, levees, irrigation channels) and ‘natural infrastructure’ (e.g. wetlands, floodplains, watersheds) for poverty reduction, water-energy-food security, biodiversity conservation and climate resilience. WISE-UP aims to show the application of optimal portfolios of built and natural infrastructure using dialogue with decision-makers to identify and agree trade-offs between different uses of available water resources in the Volta and Tana River basins. The project was implemented from 2014-2018 and includes six partners - the Council for Scientific and Industrial Research (CSIR) Water Research Institute, The African Collaborative Center for Earth System Sciences (ACCESS) – University of Nairobi, the International Water Management Institute (IWMI), the Overseas Development Institute (ODI), the University of Manchester, the Basque Centre for Climate Change (BC3), and the International Union for Conservation of Nature (IUCN).

• TIGER-NET is a large application project funded by the European Space Agency, with the main goal of supporting the African Earth Observation Capacity for Water Resource Monitoring. TIGER-NET aims to support the satellite-based assessment and monitoring of water resources from watershed to cross-border basin levels through the provision of a free and powerful software package, with associated capacity building, to African authorities. More than 28 EO data processing solutions for water resource management tasks have been developed, in correspondence with the requirements of the participating key African water authorities (incl. Volta Basin Authority), and demonstrated via dedicated case studies covering a wide range of themes and information products, including basin-wide characterization of land and water resources, lake water quality monitoring, hydrological modeling and flood forecasting and mapping. TIGER-NET was implemented from 2012-2015, with an extension TIGER-BRIDGE from 2015-2017.

Table 2 **TABLE 2 Selected Major Interventions in the Volta Basin and their Relevance for the SAP**

Projects (donors)	Countries	SAP Priority Actions
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		A: Water is optimised among primary users (domestic, agricultural, ecosystem and hydropower) so that they receive adequate and sustainable supplies							B: The coast between Ada and Keta is stabilized by 2025 (1-2) The proliferation of invasive species is contained, especially in five priority biodiversity hotspots.(3) Sedimentation in five key hotspots is reduced by 20% by 2015.(4) Critical ecosystem functions are conserved, restored and managed for sustainable use in at least five priority areas (5-10)										C: Water of sufficient quality is available to support ecosystem needs at four pollution hotspots				D: The legal and institutional framework within the Volta Basin is strengthened											
		1	2	3	4	5	6	7	1	2	3	4	5	6	7	8	9	10	1	2	3	4	1	2	3	4	5	6	7	8	9	10	11	12
GLOWA	All																																	
BFP Volta	All																																	
UNEP-GEF Volta	All																																	
VSIP (CIWA/GEF)	All																																	
WASCAL	All																																	
WACDEP (DFID-Austria)	All																																	
Flood & Drought (GEF)	All																																	
VFDM (Adaptation Fund)																																		
PAGE (Asdi)	All																																	
WISE-UP (BMU)	All																																	
OTI Hazard Assessment (WB)	All																																	
TIGER-NET (ESA)	All																																	

Reference is made to Annex Q (showing priority areas of the SAP) and Annex R (showing the list of national projects).

Table 3 TABLE 3 Selected interventions per country relevant for the SAP

Projects (countries)	SAP Priority Actions																																
	A: Water is optimised among primary users (domestic, agricultural, ecosystem and hydropower) so that they receive adequate and sustainable supplies							B: The coast between Ada and Keta is stabilized by 2025 (1-2) The proliferation of invasive species is contained, especially in five priority biodiversity hotspots.(3) Sedimentation in five key hotspots is reduced by 20% by 2015.(4) Critical ecosystem functions are conserved, restored and managed for sustainable use in at least five priority areas (5-10)										C: Water of sufficient quality is available to support ecosystem needs at four pollution hotspots				D: The legal and institutional framework within the Volta Basin is strengthened											
	1	2	3	4	5	6	7	1	2	3	4	5	6	7	8	9	10	1	2	3	4	1	2	3	4	5	6	7	8	9	10	11	12
Benin				2								1								1				2	1		3						
Burkina Faso	3					2	4								2	2	2	1					2		6			3	1				
Ghana	6			4	2	5	5								2		2		3		3			2			4						
Togo	6			1			6											2			1				1			1					

Reference is made to Annex Q (showing priority areas of the SAP) and Annex R (showing the list of national projects). No information was received for Côte d’Ivoire and Mali

3. The proposed alternative scenario, GEF focal area[2]² strategies, with a brief description of expected outcomes and components of the project,

This project will address some of the actions in the SAP (see Annex Q) that have seen least coverage according to Table 2 and Table 3, such as Action B3 (combat invasive species), Action C3 (safeguard shallow groundwater) and Action D11 (assess economic value of ecosystems). However, it will also address issues that have seen considerable attention from

other initiatives but still remain challenges, such as Action A6 (early-warning system for floods and droughts), Action B8 (protect wetlands) and Action D10 (operationalize the Volta Basin Observatory). A full and detailed list of the actions addressed under the current project is provided in this Chapter.

This initiative, jointly prepared by UNEP and IUCN, will be leading a process of supporting the priority SAP implementation activities to address transboundary environmental concerns taking into consideration the importance of the basin's natural resources for the development of the region. This process will be gathering the main stakeholders and partners (donors, IFIs private sector, and civil society in the Basin around the implementation of the SAP with particular emphasis on building a sustainable financing platform for the basin's SAP). Taking into consideration the institutional challenges required in terms of policy, legal and legislative frameworks disparities, as well as the degradation of basin's environmental resources, the project will have 4 major pillars:

- i) better knowledge and characterization of the Volta basin water and environmental resources, including impacts of climate change,
- ii) application of this knowledge for the development of operational tools for the basin water resources, and supporting early warning in the case of extreme events, such as floods and droughts,
- iii) basin's ecosystems protection and restoration for enhanced and sustainable livelihoods for the local communities, and
- iv) information sharing, development of knowledge products, communications, and M&E.

This project fits within and complements the GEF portfolio of International Waters projects. It is expected to generate many useful lessons, will serve as a mature model for many other transboundary initiatives, and will contribute to the strengthening of the overall GEF-IW portfolio, through participation in IW:LEARN activities and the implementation of transboundary stress reduction demonstration projects. Moreover, the project is designed to incorporate lessons from other GEF IW initiatives such as projects on the Niger, Lake Chad and Senegal basins. The GEF funding will: enable regionally coordinated implementation of the SAP through the Volta Basin Authority and foster the removal of sectorial barriers to the integrated management of the Volta basin water resources and ecosystems.

This project is consistent with GEF's International Waters strategy as described in the GEF Programming Document:

- IW Objective 2 aims to Balance Competing Water-uses in the Management of Surface & Groundwater while considering climatic variability and change, through the development of 'Advance Conjunctive Management of Surface& Groundwater Systems' (Programme 3) and implementation of the 'Water/Food/Energy/Ecosystem Security Nexus' (Programme 4);
- IW Objective 3 – Programme 7 aims to Foster Sustainable Fisheries.

The project is focused on the implementation of the Volta Basin SAP and anchored on integrated, ecosystem-based approaches to the sustainable management of the basin.

In addition, the project will establish enabling conditions for adaptive ecosystem-based management through functional/capacitated national inter-ministerial, regional expert committees and development of data and information sharing system. Based on priorities identified in the SAP and existing regional and national Plans, the project will implement innovative transboundary actions to improve water efficiency use, promote IWRM, and reduce identified environmental issues and stresses, including through local, community-based actions. The potential impacts of climate change/variability, will be embedded in the management actions directed towards ecosystem carrying capacity as the central theme of the project. The project will also deliver additional outputs such as enhanced public awareness and strengthened stakeholder capacity to carry out actions.

The nature of the project (multitude of disciplines in six countries based on stakeholder inputs) makes it challenging to provide a detailed project description in this project document. It is therefore planned to implement a series of baseline assessments and/or more detailed elaboration of planned activities from both technical design point of view and with regard to geographic focus during the inception phase. It is planned to undertake this work in a participatory manner with engagement of key stakeholder groups. Such an approach is considered critical for the success of the Project and sustainability of outcomes and impacts.

For further details on the project's Logical Framework, including its Theory of Change, see Annex A.

Project objective: Reverse ecosystem and water degradation and support integrated ecosystem-based development in the Volta River Basin through strengthened transboundary governance and restoration and conservation of ecosystems for sustainable livelihoods.

The project proposed actions are categorized into the following four components to address the proposed project objective above:

- Component 1. Improvement of knowledge base and development of management tools for informed decision-making process (linked to SAP Environmental Quality Objectives 1, 5, and 7)
- Component 2. Strengthening of transboundary planning, regional and in-country coordination and capacity, also during extreme events related to climate change and variability (linked to SAP Environmental Quality Objectives 1, 3, 6, and 7)
- Component 3. Strengthening of resilience of ecosystems for sustainable livelihoods in the Volta basin (linked to SAP Environmental Quality Objectives 1, 5, and 7)
- Component 4. Knowledge management and sharing, and effective M&E (linked to SAP Environmental Quality Objectives 5 and 7)

The project will work closely with VBA and its Technical and Financial partners to ensure consistency and compatibility with the SAP and other parties involved in the SAP implementation. GEF resources will be used to implement key SAP Priority Actions (see Annex Q) related to the development of ecosystem-based management tools and serve as a vehicle to implement on-ground stress reduction measures aimed at demonstrating the establishment of sustainable use and management of the basin's resources.

Specific attention will be given to the coordinated and sustainable financing of the SAP implementation with emphasis on the creation of synergies and building on the existing best practices avoiding duplication of efforts and resources.

During the validation workshop of the project document by the basin countries held on 5-7 November 2019 in Ouagadougou preliminary comments to the specific project activities were received and a first estimation of costs for activities to be carried out at the national level was agreed by the participants. Reference is made to the Workshop Report attached in Annex T.

Component 1. Improvement of Knowledge Base and Development of Management Tools for Informed Decision-Making Process

Component 1 responds to the need for setting up and/or reinforcing an adequate knowledge system, as well as for strengthening of stakeholders' capacities in sustainable transboundary management. It captures actions, which contribute to the expanding knowledge and scientific characterization of the Volta Basin's natural resources in view of a better

adaptation to climate change and sustainable management of the basin's ecosystems. These actions will also capacitate VBA to build its basin investment policy and enable cohesion and coordination of various development projects in the Volta Basin. Even if it is well known that this is a part of the mandates of various national institutions, and the Volta Basin Observatory (Component 2), the findings of the TDA and discussions with stakeholders during the SAP process have shown that:

- The current, clearly articulated, transboundary or regional focus needs to be translated into national priority actions, as the regional objectives provide boundary conditions for the countries, however, the key management decisions eventually affecting the regime of the entire basin are taken at the national level. There is an increasing need for coordinating interventions at the two levels.
- National technical services often need reinforcement of their capacities for successful acquisition, treatment and dissemination of data and information for decision makers and managers;
- The Volta Basin Observatory is still a new creation and, therefore, needs strengthening of its capacities including development of analytical tools to be fully operational,
- Sustainable management at the basin level and the ability to support the implementation of ongoing and planned initiatives, mainly the basin strategic programme, the water charter, investment plan, and national/regional plans, policies, projects and programmes require coherent and updated knowledge on the status of the basin's water resources and ecosystems.

Reversing Ecosystem and Water Degradation in the Volta River Basin (REWard-Volta River Basin)

Component 1. Data/Information/Knowledge

Outcome 1.1 Studies and Assessments

Output 1.1.1 Annual Surface Water Resources Models And Decision Support Tools

Output 1.1.2 Values Of Environmental Capital, The Ecosystem Services And Functions And The Socio-Anthropological Impacts

Output 1.1.3 Shallow Groundwater Quality Assessment And Measures For Addressing Pollution Hot-Spots

Component 2 Regional/National Coordination, Capacity and Tools

Outcome 2.1 Coordination and IAS Program

Output 2.1.1 Functional Regional Formal Dialogue And National Water User Inter-Sectoral/Inter-Ministerial Coordination Committees

Output 2.1.2 Regional Program To Fight Against Invasive Alien Species

Outcome 2.2 Capacity Building and Systems

Output 2.2.1 Community Oriented Drought Early-Warning System(s)

Output 2.2.2 Volta Basin Observatory Capacitated To Manage And Use Updated Water Use Models

Component 3 National Level Interventions

Outcome 3.1 Sectoral Interventions

Output 3.1.1 Measures On Sustainable Use Of Water For Crop And Livestock Productions

Output 3.1.2 Sustainable Fisheries Management Practices

Component 4. Knowledge management and sharing, and effective M&E

Outcome 4.1 Knowledge On Environmental And Water Management Aspects Of Governance

Output 4.1.1 Communication Strategy For SAP Implementation

Output 4.1.2 International Water Knowledge Products

Outcome 4.2 Project Implementation Based On RBM And Lessons Learned

Output 4.2.1. Project Monitoring & Evaluation

Output 4.2.2. Mid-Term And Final Project Evaluations

Output 4.2.3. Awareness Campaigns on Management of Natural Resources

Figure 2 Project components and outputs

Component 1 provides a knowledge and informational basis for the implementation of the majority of activities within the Project. The three key outputs of Component 1 are described in detail in the following:

Output 1.1.1: Annual Surface Water Resources Models and Decision Support Tools (SAP Priority Action A.5)

Use of mathematical models and decision support tools in the Volta Basin has been recognised in the SAP (ref. Priority Action A.5) as important instruments to perform good practice water resources planning and management. Embedding mathematical models as part of a dedicated Decision Support System (DSS) creates an opportunity for international and national organisations and institutions in the region to apply science-based methodologies and share experience based on a consistent and agreed methodology using a common IT platform. Involvement of local institutions and governments into the delivery of Output 1.1.1 will positively contribute to the capacity strengthening in the region, capacitate future upscaling and enhance the sustainability of the output.

The focus within Output 1.1.1 will be to formulate and implement a dedicated Decision Support System, which supports active river basin planning and management by providing:

- Access to a comprehensive knowledge base on water resources availability and use, populated with temporal and spatial data/ information and helpful knowledge products characterising the issues in the Volta River basin;
- Access to a water resources system modelling framework for simulating present conditions and future scenarios in the Volta River basin (or sub-basins) on required temporal and spatial scales;
- Web-based DSS, providing access to relevant data and information as well as tailored tools for specialists, practitioners, decision makers and stakeholders related to river basin planning and management;
- Access to intuitive application components for information sharing that will allow a wider group of users to actively participate in the basin planning process and impact assessments; and
- An expandable and modern DSS, which can cater for emerging technologies, e.g. new ways of data acquisition or adoption of innovative methodologies for improving water resources assessments and basin management.

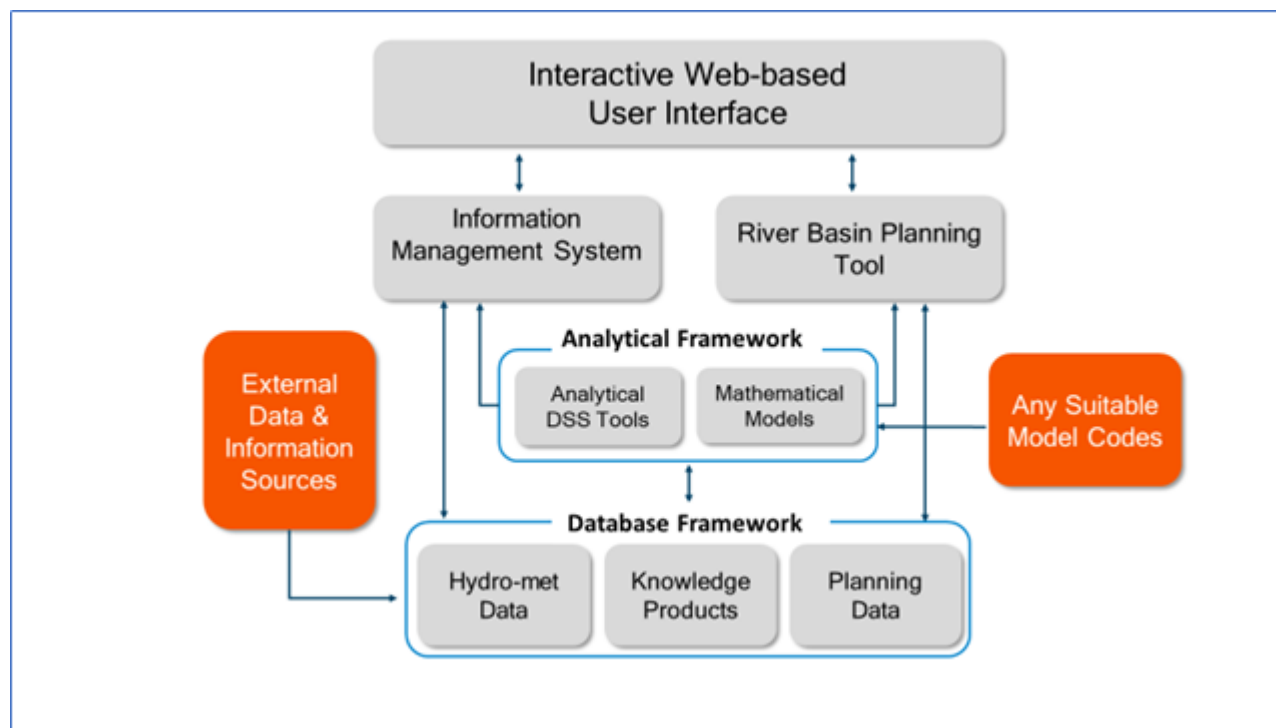


Figure 3 Bespoke DSS tailored for planning and management decisions in the Volta river basin based on an architecture that cater for other multiple usages including forecasting and early warning (output 2.2.2.1)

Achieving Output 1.1.1 requires the following activities:

Activity 1.1.1.1: Establishment of an improved Knowledge Base

Activity 1.1.1.1 will establish an improved dedicated knowledge base for the Volta River basin as an integral part of the DSS database (see Figure 3). This knowledge base will be built by drawing upon relevant data and information from existing repositories to create the required knowledge products for the basin and planning analyses in the DSS. The populated DSS database that will emerge from this project does not substitute any existing database or knowledge base systems but may in fact enhance some of the existing systems through data and information exchange. We anticipate that the knowledge base of the DSS database will:

- Exchange data with the *hydrological* database available at VBA/VBO (storing hydrological data of key gauging stations up to 2008) and thereby enhance this database as well;
- Contain a repository for *Abstraction and Water Uses* data and information, based on gathered data and projections about sectoral water usage in the basin;
- Contain a repository for *Hydraulic Infrastructure* data and information, based on gathered key data (dam design, operation rules, etc.) on existing and planned infrastructure investments in the basin;
- Exchange data and information with the Volta Basin Information Sharing System (VB-ISS) by using compatible database formats. The required information is to a large extent already available in the national organizations, but further efforts will be made to collect and process these;
- Make automated and manual data acquisition of Earth Observations available in the DSS. The DSS will transfer additional EO information to the VB-ISS which may not be part of its current EO data acquisition procedure.

The existing Water Resource Information System developed by DHI (2013) will be linked to the DSS.

As part of Activity 1.1.1.1 an inventory and analysis of the existing national/regional data and information about water resources availability, current and future water uses and demands, hydraulic and hydrological regime of the Volta River, existing and planned hydro-constructions, and irrigation infrastructures will be conducted.

This will also include a partial institutional assessment of VBA to establish a mechanism for the exchange of data and information at national and regional levels. This will guide the capacity building to enhance the Volta Basin Observatory (VBA/VBO) to be able to operate and maintain the developed DSS (including database and modelling tools) in a sustainable manner. Based on the experience from the recent DSS implementation for the Zambezi Watercourse Commission^[3], the implementation of the DSS presents a unique opportunity to improve the coordination and participation of member states in the management of their environmental and water resources in a combined regional and national manner.

This activity will strengthen the knowledge base, enhance the data and information availability, and provide opportunities for sharing both through the developed DSS and through an updated VB-ISS, which has been developed in previous phases of the UNEP-GEF Volta Project.

Activity 1.1.1.2: Establish a reliable water resources system model for the Volta River Basin

Under this activity existing (national) water resource model(s) for the Volta River basin will be reviewed with the aim to establish a reliable water resources system model that fits the purpose of transboundary planning and management.

An important benefit of embedding simulation models within the DSS framework, is an intuitive and simple working environment for using simulation models in planning and management analysis and decision making.

Existing water resources system models established previously for the Volta River Basin have been based on the WEAP, MIKE HYDRO BASIN and other model codes. A review of these will establish the basis for selecting and establish the most appropriate modelling framework for the DSS. It is not anticipated that the water resources system model in the DSS

is directly linked to any numerical groundwater model, but review of any existing groundwater models for the Volta basin may provide relevant information of how to conceptually represent groundwater development and sustainability in the modelling framework and planning decision making.

Based on the findings from the review a new enhanced modelling framework will be designed and developed either through updating and operationalization of existing model(s) or establishing a new model or models, which can smoothly be embedded in the DSS for basin planning and management activities.

The model(s) will be set up, calibrated and applied using the information uploaded and stored in the DSS's knowledge base. This includes data and information for all key water uses, e.g. hydro-power, domestic and rural water supply, agriculture (including livestock and crop production, fisheries, etc.).

The result of this Activity 1.1.1.2 will be a cloud based modelling system, which supports regional and national decision making in relation to water requirements, water allocation and development and implementation of new water resources infrastructures under considerations of future climate change, population growth etc.

Activity 1.1.1.3: Implementing the DSS for water resources planning and management

Models are important for creating a sound and transparent basis for decision making. But models require a decision framework around them in order to become useful tools for water managers. This activity will implement a bespoke DSS specifically for water resources planning and management aspects. It will take advantage of the already developed (GEF funded) Floods and Droughts Portal, which provides functionalities for linkage between data management, simulation models, planning analysis and basin plan development. The purpose of the DSS implementation is to create a decision environment around the established river basin system models to produce the decision variable necessary for the basin planning.

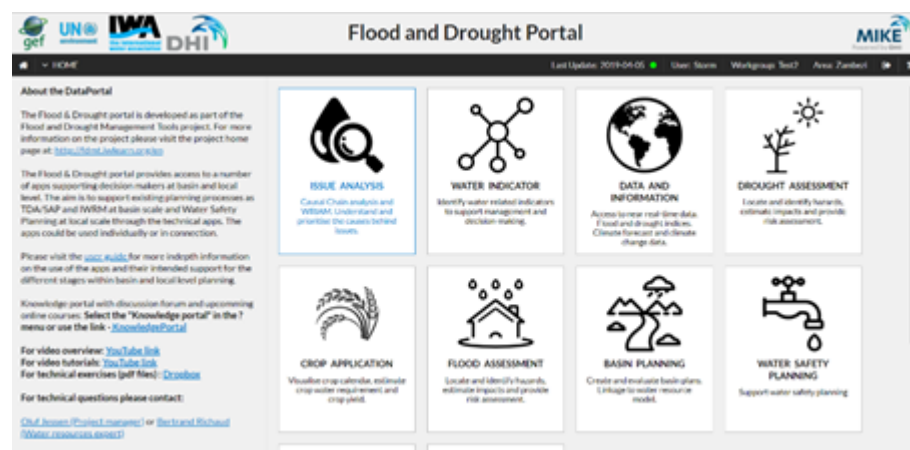


Figure 4 The DSS will build on the existing flood and drought portal functionalities and concepts and further enhanced to streamline dedicated planning and management needs in the Volta river basin.

Activity 1.1.1.3 will build on and benefit from the development of similar DSS tools in previous and ongoing project activities carried out by DHI and partners in a number of World Bank funded projects, e.g. the Shire River Basin operational DSS[4]⁴, the Zambezi Basin Planning DSS[5]⁵, the Ayeyarwady Decision Support System[6]⁶.

In line with all dedicated technology transfer projects we will undertake a brief business analysis, which will touch upon four common important aspects for successful IT solution implementation:

- **Types of future users of the DSS** – Who will use the DSS and which type of functionality will each category of users need to have access to? Some DSS users will need strong technical skills to apply tools and models on a frequent basis while others may only occasionally use it, e.g. for obtaining information;

This analysis helps configuring user interfaces and user access rights for the future user community.

- **Ways of working with the DSS** – Mapping of the expected ways of working for each user category. It reveals expected user behaviours and work flows that will lead to appropriate user interface design and requirements.
- **Additional functional requirements** – To identify any key functional requirements that must be included to meet the expected level of functionality. As our generic DSS platform / framework has evolved over the last 10 years we expect it includes most of the anticipated functionality. However, any new requirements identified helps to ensure that the DSS serves its purpose.
- **Non-functional requirements** – To identify the non-functional requirements that lead to correct dimensioning of hardware and software and other aspects that the DSS shall meet but not directly related to features the software need to expose.

During the implementation of the DSS, we will apply an agile software implementation process where the configuration/development of the DSS will progress iteratively in relative short time intervals to ensure a steady progress and low-risk implementation. In this way we - together with future users - monitor progress and ensure acceptance and, if necessary, make adjustments to the implemented DSS.

As part of the configuration and implementation of the DSS we define the expected use of the DSS, in a planning process context and for other uses, in order to ensure its capability to support the planning and management processes in Volta River basin. To the extent practical and technically feasible, the DSS tools and systems developed under the project will be embedded or coupled to VBA's existing IT-infrastructure in order to enhance the sustainability of the systems. This will make it easier for VBA to use, maintain and sustain the DSS.

Based on the improved knowledge base, the decision-making process will utilise the results from the embedded water resources system model through an indicator-based approach as illustrated in Figure 5

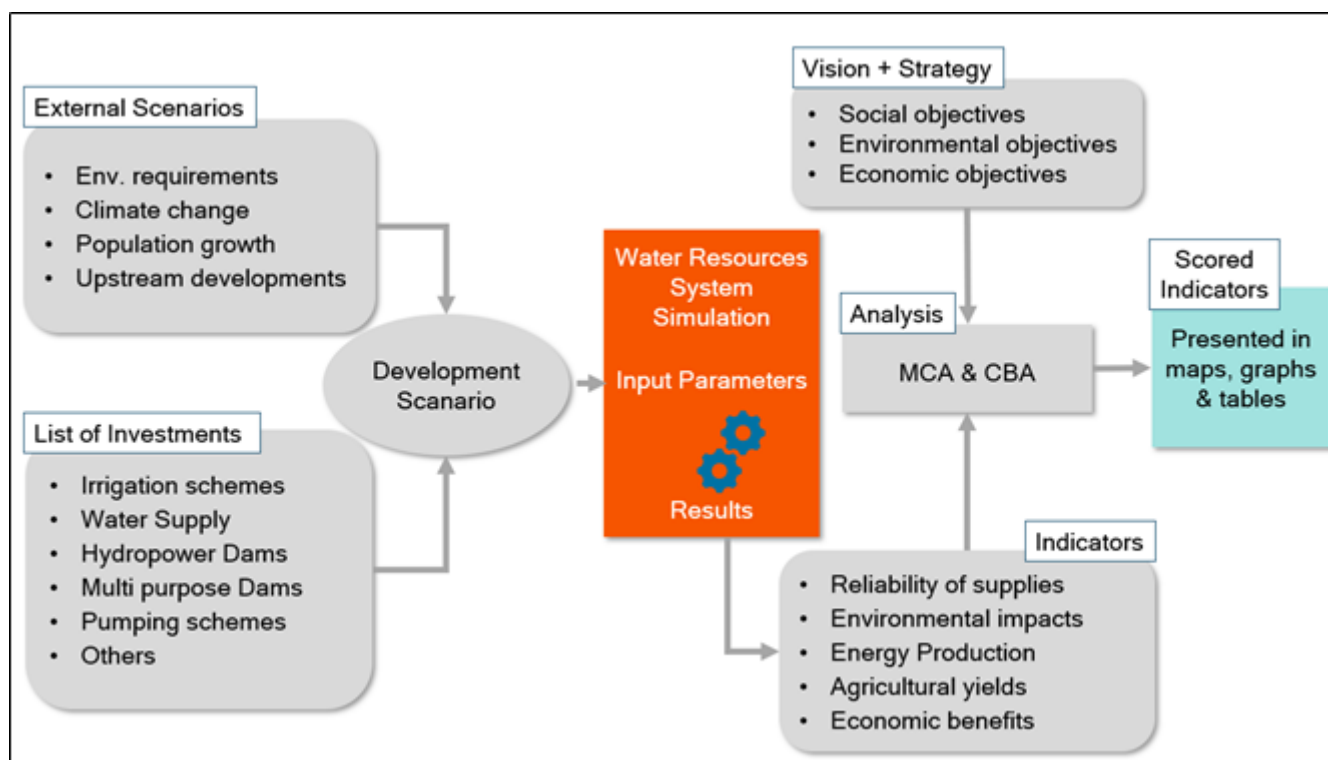


Figure 5 Workflow of the planning application in the DSS, including the use of MCA and CBA tools.

The implemented DSS will provide tools supporting water management within the Volta basin with specific focus on analysing priority investments for improved water availability, increased water security, socio-economic benefits, protection of ecosystems and natural resources, and climate resilience in a coordinated management of the Volta basin surface and groundwater resources and related ecosystems. The DSS is designed in a way so it could be further expanded to cover flood management, water allocations, permitting, hydropower production etc., but this is outside the scope of the current project.

Identification and planning of future investments will be supported by imposing investments and external scenarios as input parameters to the water resources model and translating model results into indicators, which can be compared in an MCA/CBA analysis framework.

From Output 1.1.1 the DSS will incorporate workflows, which can be used in desktop studies as well as in stakeholder workshops, where decision makers and stakeholders can discuss outcomes of various planning scenario options based on agreed visions and strategies for the basin development regionally, nationally or locally.

The DSS will be set up with focus on drought management and water availability. Flood warnings as well as hydropower optimisation will not be part of functionality within this project framework.

The project “Integrating Flood and Drought Management and Early Warning for Climate Change Adaptation in the Volta Basin”, implemented and executed by WMO in collaboration with VBA and GWP-WA, will focus on flood management and is also foreseen to support rehabilitation of existing monitoring stations. The REWarD project will thus not include rehabilitation of the monitoring station infrastructure.

The DSS will be cloud based to ensure efficient support and maintenance in order to limit the resources from VBA required to maintain and operate the IT infrastructure needed for the DSS. The general tendency is currently to outsource the hosting and storage of water resources tools, which allows access to the tool from anywhere in the Volta basin. Moreover, cloud based systems are better secured than any locally hosted systems. A sustainability plan for the DSS will be developed in collaboration with VBA. Possible license costs and cloud based services subscription will be included into the GEF budget allocated for this activity.

Output 1.1.2: Valuation of Environmental Capital, Ecosystem Services and Functions, and Socio-Anthropological Impacts in the Volta Basin (SAP Priority Action D.11)

Countries within the Volta Basin are heavily dependent on the environment as a source of livelihood-supporting services and resources. Society uses and depends heavily upon the environment for its basic needs. The source and “sink” services are scarce and continue to degrade, limited by economic activities. In order to change the currently observed negative dynamics, the adoption of more environment-friendly and sustainable patterns of use that will increase the base of environmental assets over time and improve the environment’s capacity to continuously provide goods and services is needed. The valuation of natural resources and ecosystem services is, therefore, an attempt to assign quantitative and monetary values to the goods and services provided by these ecosystems. Effective planning of their use and management is hindered by the lack of robust and quality-assured data and information on socio-economic and ecological characteristics and values of key resources. We simply risk making irrational decisions regarding management, use and protection of natural resources if we do not know the real value of these assets. Reliable and authentic data collection and analysis is paramount for sound future decisions in the Volta Basin.

The project will support the process of an environmental valuation for a better characterization and knowledge of the basin ecosystems through the assessment of values of environmental resources and ecosystem functioning for an effective decision-making, resource development and management. We believe that results of this valuation exercise will inform the process of operational and long-term planning at regional, but also at national level. One of the key applications of the results of this study will be prioritization of the future SAP implementation related activities in the basin, particularly at country level within the implementation of NAPs. It is recognised, however, that the involvement of country teams on activities on valuation is insufficient, and additional efforts will be required to strengthen the current capacity in the countries.

A socio-economic study on the relationships between water uses, the environmental services and water resources, and their impacts on each other will be carried out including review of existing studies such as “WISE UP to Climate”. Valuation and accounting of ecosystem services in the Volta river basin will be conducted, based on:

- (i) Existing studies,
- (ii) mapping and assessment of the state of ecosystems, their services and related socio-economic impacts in the basin,
- (iii) assessment of their value, including economic value,
- (iv) promotion of the integration of these values into the reporting, planning and financing tools at the Volta Basin Authority (environmental database, Master Plan, sustainable financing strategy), and

(v) providing additional prioritization information for the implementation of SAP-related initiatives at country level, as well as an effective parameter for a longer-term planning at national and sub-national level.

The Project intends to go beyond a “proof-of-concept” or demonstration only. The current interest and investments in the Volta basin over the years have clearly indicated the need to move from development of concepts to concrete implementation modalities and schemes. The currently available instruments and mechanisms will be assessed at the start of the project in order to focus in the Project on the implementation of and improving the existing approaches, rather than developing new ones.

The results will be indicator definitions and indicator values in the DSS – the DSS has a component that allows defining and calculating indicators. Indicators are the basis for carrying out multi-criteria-analyses (MCA) and trade-off-analyses to support decision-making in basin management. The DSS has tools that support this – in its module called Analysis Manager.

Activity 1.1.2.1: Review of Existing Valuation Instruments

The methodologies that are to be applied in this work need to be defined and scoped. This requires review and valuation of results from previous works, as well as deriving new ones where necessary and feasible. We shall review studies conducted for the region that relate different types of effects that result from climatic/hydrologic and socioeconomic drivers and from development interventions with social, economic and environmental impacts. Climatic and hydrologic drivers are phenomena like extreme rainfall or river flows (droughts and floods). Socioeconomic drivers have to do with population growth or changes due to economic development, such as increased per capita demands for water or energy. Development interventions deal with developing water infrastructure, such as dams or irrigation sites, or changed operation of water infrastructure or irrigation practices. The causes, in some context also called “drivers”, lead to different types of impacts such as change in ecosystem functions, loss of biodiversity, decline in local availability of water, flooding, spread of invasive aquatic species, reduction in agricultural production, livestock reduction, affected fisheries, reduction of sources of biological materials and products, reduction in wetlands services.

The reviews and analyses will focus on understanding and determining the key drivers and impacts in the basin. Impacts that need to be quantified with indicators include increases in poverty levels, food insecurity, loss/reduction of livelihoods, declining health status of the population, reduction in income and revenue, migration with resulting conflicts. It may not be possible to directly quantify such impacts, and the task would even be more challenging to relate such impacts to causes and drivers.

The following questions demonstrate and exemplify the types of issues that will be addressed in this activity:

1. In this region, what are the main natural and human induced drivers that affect the socio-economic-environmental system? E.g. climate variability, expansion of agriculture (more land, modernized techniques), extensive fishing, infrastructure development, such as building dams;
2. What are the relevant socio-economic-environmental effects? E.g. production reliability of rainfed agriculture, land degradation, farmers’ and fishermen’s livelihoods, environmental health of river reaches;
3. What are the dependencies and interactions between causes and effects? E.g. how does climate variability affect productivity of rainfed agriculture; how does expansion of agricultural land affect land degradation; how do specific catchment management methods reduce land degradation; building dams affecting the hydrological regime downstream, how will the ecological health of river reaches downstream be affected?
4. How are effects to be parametrized and what are candidate indicators that can represent the effects? E.g. ecological health of river reaches can be represented with the occurrence of certain fish species; livelihoods of farmers and hence their incomes depend on land productivity and that again depends on rainfall reliability.

Furthermore, based on the findings, we shall determine appropriate valuation methods for the region. The valuation methods will have to allow quantifying effects and assigning values to these – non-economic and economic. Depending on the environmental issues, the values will include economic/monetary indicators. Where appropriate, we shall analyse and derive relationships between the environmental effect and the categories of economic values: Are the values of interest direct or indirect use values or option values (that can be

derived on the basis of so-called revealed preference methods)? Or are the values of interest rather non-use values (that can be derived on the basis of so-called stated preference methods)? This would lead to a comprehensive valuation concept that would include determining the “total economic value” of environmental services, where possible and necessary. Concrete candidate monetary valuation methods include market price-based, travel cost-based, ecosystem service replacement cost as well as contingent valuation methods. Before applying these methods, we shall analyse and determine their suitability for the region and the environmental services of interest.

Activity 1.1.2.2: Derive Socio-Economic and Environmental Indicators

Based on the reviews and analyses we shall create relationships between drivers and impacts. In doing so, we shall determine and scope the relevant drivers and impacts. With this set of causes and effects we shall determine how impacts are to be represented with indicators, and along with that we shall setup heuristics to establish “functional relationships” and simplified rules between quantifiable causes and indicators.

The indicators will be quantified in units that relate to the respective phenomenon (e.g. number of displaced persons for displacement due to infrastructure development). This is the first level of valuation. In addition, where necessary and possible, economic indicators will be developed as well (e.g. costs or benefits), to represent the economic effects respectively. A monetary quantification of impacts is delicate, as this could easily imply that it would be justifiable to implement interventions with economic/monetary benefits that outweigh “monetized impacts” on environmental services. Depending on the outcomes of Activity 1.1.2.1, the economic/monetary valuation approach in this context will comprise deductive, revealed preference, declared preference or value transfer methods, where applicable and possible.

The developed heuristics will represent response/production functions of the different components of environmental services. The types of “responses” or “productions” can include non-economic and economic indicators - the methods that will be applied in these analyses will encompass economic and non-economic valuation approaches. The results of the functional analyses and estimations of service values (non-monetary and monetary) will be validated against past observations as far as possible.

With the cause and effect mechanisms determined and formalized, we shall integrate the rules in the indicator component of the DSS. This component is on the one hand an inventory of indicators distinguished by the themes (1) social, (2) economic, and (3) environmental. On the other hand, the inventory includes and has embedded the heuristics as functional rules (e.g. response and/or production functions) that allow calculating the respective indicators for given inputs (causes or drivers).

The result of this activity will be a library of indicators in the DSS that allow quantifying the social, economic and environmental impacts due to climatic and economic drivers. This again would be the basis for comparative analyses with the DSS that allow understanding and validating future scenarios. The comparative analyses supported by the Analysis Manager of the DSS entail multi-criteria-analyses (MCA) and trade-off-analyses, which are well-established methods for supporting decisions in basin management.

Activity 1.1.2.3: Scenario Analyses with Case Studies

In collaboration with key stakeholders we shall scope a set of scenarios for which the different impacts are to be quantified. The scenarios will encompass different anticipations of the future. These are concrete assumed states of the region and/or basin – like what-if questions. The assumptions will also account for uncertainties, that will be quantified as far as possible. The what-if questions will also cover interventions that aim at mitigating certain types of impacts (e.g. poverty alleviation through irrigation development, or environmental protection through catchment management).

The case studies will be defined and scoped in accordance with a well-known and defined methodology for valuing ecosystem services in policy appraisal contexts. The key steps in this methodology are:

1. Establish an environmental baseline
2. Identify and provide qualitative assessment of potential impacts of policy options on ecosystem services
3. Quantify the impacts of policy options on specific ecosystem services

4. Assess the effects on human welfare
5. Value the changes in ecosystem services

This methodology will be used to outline the case studies. The purpose of the case studies is to determine and confirm the scope and validity of the indicators developed.

The scenarios will be modelled and simulated in hydrological and water budget and allocation models. The models will be integrated in the DSS so that their outputs can serve as inputs for indicator calculations. As the model inputs will have quantified uncertainties – e.g. as ensembles of rainfall or lower and upper bounds of water demands – the outputs will also reflect uncertainties, usually as ensembles of results. The uncertainties will propagate into the calculation of indicators, so that each indicator can be represented with a range of values, allowing the calculation of quantiles of indicator values.

High level what-if questions are of the following types:

1. Assuming population growth and economic development projections and climate change scenarios what will the land degradation and reliability of yields of rainfed and irrigated agriculture be like in 30 years?
2. If the operation rules of a reservoir are changed to maximize hydropower production how will the flows downstream affect biodiversity, water level fluctuations in the reservoir fishery yields and water flow fluctuation downstream agricultural practices (and hence livelihoods of farmers)?
3. What will be the effects of catchment management practices on land degradation and hence on livelihoods of farmers and pastoralists?

Activity 1.1.2.4: Multi-Criteria-Analysis for Comparative Evaluation and for Identification of Trade-Offs

Ultimately, indicators should support understanding system behaviour and should inform decisions: Given a set of scenarios what would be the effects, which development intervention is the most preferable, and what would be the costs and effects? In this activity we shall emulate this decision-making process with the aim at verifying the suitability of the indicators developed for state-of-the-art informed decision-making methods: Cost-Benefit-Analysis (CBA), Multi-Criteria-Analysis (MCA), Robust Decision Making (RDM) and Trade-Off-Analysis

The project will analyse the indicators reflecting (1) social, (2) economic and (3) environmental affects using an MCA-approach. As the analyses take into account uncertainties the method that we shall apply will be based on RDM. The investigations will include trade-off-analyses, so that we can quantify win-win and win-lose outcomes for the scenarios analysed with the indicators. These investigations will be carried out with the embedded analysis tools in the DSS that allow CBA, MCA, RDM and trade-off-analyses. With these analyses we shall identify, quantify and verify the interdependence of socio-economic and environmental aspects vis-à-vis water development scenarios as well as climate and socio-economic scenarios in the basin/region. The results are expected to affirm that the developed indicators - non-monetary and monetary alike - are appropriate for valuation and accounting of ecosystem services in the Volta river basin.

Output 1.1.3: Shallow Groundwater Quality Assessment and Measures (SAP Priority Action C.3)

Shallow groundwater for irrigation plays an important socio-economic role in several locations of the Volta basin. Due to the relatively low costs for establishing shallow wells - from where the water can be manually drawn during the dry season - many smallholders are able to generate additional income and improve their living conditions.

Agricultural production in the Volta Basin has traditionally been based on rainfall supplemented with low-tech irrigation using buckets and watering cans to draw water from hand-dug wells tapping the shallow groundwater. With the low-tech irrigation system, annual precipitation has balanced water abstraction thus maintaining the water balance equilibrium. Consequently, fresh water has been sufficiently available for the domestic water supply and the “low-tech” agricultural production.

However, to respond to the growing population more and more areas have during the recent years been converted into areas with intensive crop production and a corresponding increasing water demand. This has resulted in shallow groundwater aquifers being over-abstracted and often exacerbated using motorized pumps. The large-scale abstraction of groundwater from the shallow aquifers is the main factor disturbing the previous equilibrium between recharge and sustainable use. The result is poor performance of the irrigation schemes and difficult working conditions for the low-tech agricultural activities (e.g. increased depth to water table or even dry wells) with the risk of conflicts, income loss and increased poverty. Over-abstraction negatively impacts the poorest groups because they cannot afford to dig deeper wells. This particularly impacts the lives of poor women, who are forced to walk longer distances to fetch water for domestic purposes.

In the coastal area of the Volta Basin irrigation based on shallow groundwater has been practiced since the 19th century. Here the increasing irrigation demand is raising concerns with respect to the saline-fresh water interface in the coastal belt. The past has shown that the shallow groundwater in the coastal belt has been able to sustain domestic water supply and smallholder agricultural production based on low-tech schemes (dug shallow wells). Recent more “industrialized” irrigation schemes (based on motorized pumps) have disturbed the saline-fresh water interface resulting in poor (saline) water quality for domestic water supply and for agricultural production. The impact of climate change (e.g. distribution of rainfall and sea level rise) is expected to further aggravate this situation.

Also in the Northern more dry parts of the Volta basin shallow groundwater is exploited for agricultural purposes which requires careful management in order to share the resources among the users and in order to avoid a falling water table making the often manual lifting too inefficient/costly.

To prepare for the future challenges (increased irrigation demand and impacts of climate change) it is important to understand the safe yields of the shallow aquifers as well as defining measures to be respected by the water users in order to manage this important resource in a sustainable way.

The following activities shall be implemented under output 1.1.3:

1. Selection of pilot study areas (within Ghana, Togo and Burkina Faso) exploiting shallow groundwater for irrigation.
2. Mapping of the existing water abstraction, water quality, and contamination sources in the pilot areas.
3. Establish low-cost permanent monitoring system and determine safe abstraction rates
4. Define measures to be applied to ensure sustainable use of the shallow aquifer
5. Disseminate lessons learned

Activity 1.1.3.1: Selection of pilot study areas (Ghana, Togo and Burkina Faso) depending on shallow groundwater for irrigation.

As focus will be on the challenges related to the coastal belt as well as in the more dry Northern areas of the basin. The pilot areas will be selected based on consultations with the water resource authorities in the respective basin countries. The ideal pilot sites will be an area with a well-functioning water user association depending on shallow groundwater and having challenges related to water quality (salinity). A well-functioning water user association representing the water users is important for the sake of easy and well-defined communication. The main challenges for the pilot area may be 1) intrusion/up-coning of saline water due to the abstraction, 2) limited shallow groundwater in the Northern dry areas and/or 3) risks from other nearby contamination sources (e.g. waste sites, industries).

As part of the selection process for pilot sites and the definition of the detailed activities to be carried out considerations shall also be taken to ongoing and planned activities related to ground water in the respective countries. This includes the WB/IDA loan to Burkina Faso related to groundwater as well as the WB Sahel Irrigation Initiative. In terms of pollution, existing knowledge of natural and anthropogenic contamination to be obtained via the national or local authorities, shall be taken into account when selecting the pilot sites.

A Memorandum of Understanding will be made with the respective water user associations defining their responsibilities, project activities and expected outcome.

Activity 1.1.3.2: Mapping of the existing water abstraction, water quality, and contamination sources in the pilot areas.

With support from the water user associations all wells within the pilot area will be mapped. Earth observation images may support this mapping. Also, larger groundwater abstraction points (deep motorized wells/boreholes) in the vicinity of the pilot area will be inventoried as these may have an impact on the shallow groundwater in the pilot area. Selected water users within the pilot area will be interviewed with respect to their use of the shallow wells including water quality aspects. On this basis a water level and water quality testing program will be carried out at the end of the rainy season and at the end of the dry season to understand the yearly variation in both water level and water quality. In the coastal belt, the water quality test will include conductivity indicating possible intrusion of saline water into the shallow aquifer. The water quality testing program may also include parameters to test for possible impact from nearby contamination sources such as waste sites or sewage discharge. The test result will be supplemented with existing knowledge of the hydrogeological conditions of the area and its surroundings as can be obtained from the local or central water resource authorities.

Activity 1.1.3.3: Define low-cost permanent monitoring systems and safe abstraction rates

The aim of this activity is to define and establish a simple monitoring system that the water users can operate by themselves for no or limited costs in order to guide them in their operation of the shallow wells and thus avoid intrusion of saline water into the wells. One example of such guidance is the observation of the water level in selected “monitoring wells” and procedures to only abstract water when the observed water level is above an agreed threshold. Other examples can be the monitoring of the actual salinity (conductivity) and only abstracting water when the salinity level is below a certain level.

The actual definition of the optimal thresholds for the safe abstraction may be a result of an iterative process where the thresholds are adjusted until the “optimal safe yield” is achieved. During this process it is important that the water users are actively involved in deciding the threshold levels in order for them to understand that the thresholds must be respected to maintain an acceptable water quality for the irrigation purpose.

Activity 1.1.3.4: Define measures to be applied to ensure sustainable use of the shallow aquifer

Water user association will normally have agreed rules for exploitation of the water resources with specific persons having specific responsibilities. It is expected that the operation of the monitoring for the saline intrusion as well as the enforcement of the agreed thresholds shall be an integral part of the existing rules. This implies that members shall be trained in carrying out the monitoring work including informing / ensuring that the agreed thresholds are respected. The implementation will take into account measures to mitigate potential use conflicts between pastoralist and farmers in certain parts of the basin.

A signal system of red-green indication may be applied by the water user association to show when abstractions are not allowed for the entire or part of the irrigation scheme.

Activity 1.1.3.5: Disseminate lessons learned

Lessons learned from the pilot sites shall be compiled into a document, which can assist other water user associations with similar challenges. The following issues are expected to be part of the lessons learned:

- What are the threats to the water quality of the shallow groundwater level?
- What are the possible consequences of over-abstraction from the shallow groundwater?
- Can the problems linked to over-abstraction be solved by establishing a simple monitoring system operated by the water users themselves?
- How to monitor water levels and water quality?
- What are the costs involved and how to finance them?
- How to integrate monitoring and safe yield procedure into existing rules/procedures for water user associations?
- Relevant training activities.
- Relations between water user associations and sub-basin authorities

Workshops to present the lessons learned will be held in the Volta basin member countries in districts having similar challenges as in the pilot areas. Dissemination documents shall be prepared in relevant local languages and distributed to relevant water user associations.

The actual selection of pilot sites and establishment of the initial monitoring system are foreseen to be completed within two and a half year. During the remaining part of the project period regular support to the pilot areas will be provided in order to optimize the monitoring system. At the same time the lessons learned will be collected, compiled and disseminated.

Component 2. Strengthening of Transboundary Planning, Regional and In-Country Coordination and Capacity, Also During Extreme Events Related to Climate Change and Variability

As identified in the SAP^[7], the increasing pressure by individual countries on the basin's water resources, as well as other natural resources, and an increase in the number of floods, led to a realization among the six riparian countries of the basin that a closer and more coordinated approach to managing the basin's resources was needed. The affiliation or involvement of the riparian countries to a number of regional organizations and/or international agreements relating to the protection of the environment within the Volta Basin has

induced, progressively, all the six countries to recognise the need to strengthen regional collaboration. It is important that the proposed project links with all key regional cooperation platforms (e.g. EU African Water Facility, etc.) to complement the ongoing interventions with effective support from the project.

However, a number of SAP Priority Actions identified as critical pre-requisites for a successful transboundary cooperation, have still not been finalized. According to VBA[8]⁸, there is a need to address key missing tools for successful cooperation in the proposed project. Component 2 addresses this request within four outputs.

Output 2.1.1: Functional Regional Formal Dialogue and National Water User Inter-Sectoral/Inter-Ministerial Coordination Committees Established (SAP Priority Action D.2)

To ensure that national policies and institutions support the sustainable water resource management of the Volta River Basin, the capacities of the regional and national-level governance agencies will be strengthened by the establishment and/or operationalization of inter-ministerial (inter-sectoral, with close engagement of major water users in the countries) committees and the full integration of the integrated national-level planning results and initiatives into a transboundary process of water resource management.

Modelling results on an optimized water resource management process (Component 1) will present a technical basis for supporting various water management decisions in the Volta basin, however, it is imperative that these advices are a) politically and technically discussed within the countries with relevant water users and b) discussed at the basin level based on due information to the regional decision-making process. The basin-level discussions are facilitated, according to its mandate, by VBA. This is why, an institutional coordination mechanism needs to be set up, which would allow regional governance bodies, i.e. VBA, as well as regional and national water users, to maintain effective formal dialogue at all stages of water resource management, from, for instance, monitoring to water allocation and dam operation[9]⁹.

The process of the development of an operational tool for water resource management, and also communicating results of and discussing modelling applications under Outputs 1.1.1, will facilitate specific inter-sectoral/inter-ministerial cooperation mechanisms or/and platforms to be developed by the Project. An effective decision-making mechanism is to be based on results of participatory processes of inclusive consultations with key governmental and non-governmental water users in the basin, particularly in a transboundary context. Inter-dependence of hydraulic regimes and conflicting demands for water resources are to be optimized through an iterative participatory planning and development process.

The World Bank GEF/CIWA sponsored Volta Basin Strategic Action Programme Implementation Project (VSIP), which ended at the end of August 2019, did address some of the issues related to the establishment of a regional consultative dialogue (Component 2[10]¹⁰). Inputs and lessons learned from the WB-implemented project will be assured for an effective design of activities under this Output.

Through an inclusive, participatory and iterative approach, the VBA and the basin stakeholders must work to ensure that the achievement of a truly collaborative process at basin scale become a reality especially with the current development of the Basin Water Charter process. Two activities will be supported by the project, as indicated below:

Activity 2.1.1.1: Support regional dialogue on governance and management of water resources in the Volta Basin

The VBA already has an annual Basin Stakeholders Forum, which is an information, awareness and exchange platform for the main players in the water sector, to improve water governance in the Volta Basin. In order to ensure that national policies and institutions support the sustainable management of water resources in the basin, the project will work to strengthen the current objectives of the Annual Basin Stakeholders Forum so that this platform effectively integrates results and planning initiatives at country level in a process of transboundary management of water resources.

With a view to continuous dialogue and the strengthening of national and regional governance agencies, the project will support VBA in the establishment and operationalization of the Inter-parliamentary Committee of the Volta Basin enshrined in the Basin Water Charter programmed to be adopted in 2021 by the summit of Heads of State and Government. From an operational point of view, a capacity building and advocacy plan will be developed and implemented with the support of the VBA and national experts so that the decisions taken by the Council of Ministers are better shared at the appropriate level and their applicability at national and local level is facilitated and effective. Four (4) thematic training sessions will be organized for parliamentarians for their effective involvement on issues related to investments in water infrastructure in the basin, benefit sharing, conflict sensitivity and sustainable financing of the VBA. All of these concerns are challenges that the Volta Basin stakeholders must address in the medium and long terms to achieve the objectives of the SAP and the Basin Water Charter.

Activity 2.1.1.2: Establish National and Regional Coordinating Committees of Water Users in the Volta Basin

As in the Niger Basin, the VBA wants to strengthen the effective involvement of all stakeholders in the basin in the national and transboundary governance of water resources in the portions of the basin. To achieve this, the project will support the VBA in the process of setting up a regional coordination and national coordinations of water users in the basin, with the aim of:

- Promoting consultation among stakeholders for sustainable development in the basin, at local, national and regional levels, with the following working areas: food security, the achievement of sustainable development objectives concerning water, poverty, health, education, hydraulic infrastructure, etc.;
- Strengthening the capacities of mobilization, organization, advocacy and sustainable actions of basin actors at the local, national and regional levels.

In concrete terms, the project will support the organization of a regional constitutive forum for natural resource users of the Volta Basin to set up national and regional users coordination structures and to have a regional capacity building action plan. In order to facilitate the development of the National Coordination's annual work plans in relation to Action D4 of the Strategic Action Program of the basin, the project will organize (6) training sessions on transboundary water cooperation, issues on major hydraulic infrastructures (dams), conflict sensitivity and regional policies on water and the environment in West Africa (ECOWAS/UEMOA).

Output 2.1.2: A Regional Program to Fight Against Invasive Species in the Volta Basin (SAP Priority Action B.3)

The main project output is the development and implementation of a Regional Program to fight against invasive alien species (IAS) in the Volta Basin. To meet this output, it is necessary to develop tools and methods to reduce proliferation of IAS and upon implementation provide sufficient capacity building among stakeholders.

A constantly increasing number and uncontrolled growth of populations of IAS, particularly aquatic weeds, is becoming a limiting factor in sustaining ecosystems of the Volta Basin. This has been of particular concern for some of the tributaries, especially in the Volta Lake, the Oti River, the Pendjari River and the Lower Volta^[11]¹¹. Although exact figures are not available, thousands of hectares of ponds, rivers and lakes are infested by the invasive species in the Volta Basin.

The most common IAS found in the basin are harmful aquatic weeds and floating plants, especially mimosa pigra (tree), and the aquatic weeds water hyacinth (*Eichornia crassipes*), *salvinia molesta* (previously named *Salvinia auriculata*), and *Pistia stratiotes*^[12]¹².

The aquatic weeds tend to block the access to lakes and rivers, and they can also create substantial problems for various types of water intakes and hydropower systems. The direct impact on the ecosystems comes from the physical cover on the waterbodies, preventing the native aquatic plants access to flourish. The thick cover from the invasive species can also

completely block out the penetration of sunlight into the water column and thereby preventing primary production on the river/lake bed and in the water column. This can lead to anoxic conditions and death of aquatic animals underneath the floating weeds.

IAS are difficult to control in all freshwater aquatic environments, since they have very rapid proliferation capabilities. Early detection and rapid response offer the greatest likelihood of successful control and the opportunity for eradication. It is essential that any new infestations are controlled as soon as possible. If allowed to become established, the seed bank rapidly expands, increasing costs and duration of the control program. Physical, chemical and biological preventive methods are often used, in combination or alone as management methods. For example:

- Biological agents that have been used successfully to control water hyacinth in Ghana are the *Neochetina eichhorniae* and *Neochetina bruchi* (beetles).
- the *Neohydronomous affinis* weevils (beetle) imported from South Africa is used for controlling the *Pistia stratiotes*.

However, direct mechanical removal of the IAS may also be considered in cases where they block waterways or intakes. Optimally, the harvested IAS should be utilized for e.g. biogas or biofuel production, but removal of the IAS can be challenging, both in terms of the actual mechanical removal and then land-based transport to a utilization-facility. The waste products from biogas or biofuel production can most probably be used for agricultural purposes.

At this stage, the following risks have been identified^[13]:

- (1) Direct and indirect effects from bio-controls on non-targets;
- (2) Dispersal of a bio-control agent to a new area, either autonomously or with deliberate or inadvertent human assistance, and
- (3) Changed relationships between a control agent and a native species, particularly as generated by global climate change.
- (4) Practical and economic challenges for mechanical removal (specialized boat) and utilisation, including transport

The following specific project activities are envisaged.

Activity 2.1.2.1: Review and risk assessment

The nature of invasive aquatic weeds in the Volta Basin has to be explored in more detail to identify trigger mechanisms controlling the proliferation of the weeds.

A number of projects addressing control of IAS implemented in Volta Basin countries, for instance in Ghana, have already been carried out and the effects of these projects must be assessed to provide knowledge about the experiences. However, based on the present situation, it is obvious that an integrated coordinated effort is still required to address these problems at basin scale. An inventory of national activities in the countries, as well as internationally-funded projects, shall be carried out.

To minimize the risk of further introduction of IAS in the Volta Basin, it is paramount to identify the risks and to develop and establish a number of strictly specified actions. The stipulated procedures need to ensure that enough information on invasive species and their biological and physiological requirements are available to evaluate the risk of potential invasions. In addition, studies of trigger-mechanisms, which activate proliferation of the species, will be studied in support of development of tools for potentially controlling the proliferation and spreading of the species.

The approach of utilizing biological control to fight IAS is to use their natural enemies against them. The impacts from a successful biological control agent last longer than most management and engineering measures and it reduces the need for, or amount of, chemical, mechanical, and physical controls. However, it is of utmost importance to investigate the consequences of using any biological agents (insects, fish or pathogen) for combatting the aquatic weeds. It requires very specific studies of the whole life cycle for any of the biological agents to ensure that there are no unwanted side-effects, which might in principle cause additional disturbances for the ecosystems.

An assessment of technical solutions and applications for mechanical removal and utilization will also be carried out to establish a baseline for taking decisions regarding potential mechanical removal.

Activity 2.1.2.2: IAS mapping and early warning system

Considering the size of the Volta Basin, a satellite-based approach is required for mapping the occurrence and spatial patterns of IAS.

Several different satellite sensors can potentially be used to map IAS occurrence. In general, the most common types of earth observation sensors used are optical and radar. Optical sensors work by collecting the radiation reflected by the surface of the earth from the sun. These sensors often return images containing several bands depending on the satellite capabilities. The images are easy to interpret and visualize but are sensitive to atmospheric noise and are very dependent on good weather conditions (absence of clouds). Radar sensors work by emitting a radio pulse and measuring the returned signal. This enables the sensor to work independent on lighting conditions and to look through the clouds. The images are, however, often harder to interpret as the returned signal is dependent on the structural conditions of the surface.

A robust mapping system needs to combine the strengths of both optical and radar imagery, and a multi-sensor approach, where IAS identification is based on the synergistic use of high resolution optical and radar imagery, should be the preferred approach. With the advent of the European Copernicus Program, suitable input imagery can come from free and open data acquired by Sentinel-1 and Sentinel-2 satellites.

Sensor	Type	Spatial Resolution	Temporal Resolution
Sentinel-2	Optical	10 m	5-days
Sentinel-1	RADAR	10 m	12-days

The Copernicus satellite data allow for high-frequent and high-resolution mapping starting from 2015/2016 onwards meaning identification IAS hotspot areas in the Volta Basin is possible in a cost-efficient manner over a full 4-year period. Based on this historical analysis, valuable insight in both IAS hotspot locations as well as the typical IAS growth/decay patterns will be established and fed into the risk analyses under activity 2.1.2.1.

Access to recent satellite-based mapping of IAS distribution allows for optimal management and effective control of the IAS. It is therefore planned to:

- Prepare historic mapping of IAS in the Volta Basin using a synergistic optical/radar approach based aiming to establish a temporal overview of IAS occurrence and spatial and temporal behaviour. Data must be prepared and shared in a GIS-ready format.

- Establish an automated system where IAS are mapped, and trends detected. The system should be based on recent data and updated regularly. The regular updating in combination with the trigger mechanism provides a unique platform for early warning of threats from IAS.

Activity 2.1.2.3: Tool Development and Implementation

Both historical and recent IAS maps will be made available in a web portal with easy access for stakeholders. Furthermore, the web portal will comprise information on trigger-mechanisms for proliferation of the species in order to provide support for early warning, i.e. identification of aquatic weed “trouble hotspots” based on an assessment of historical satellite-based mapping of IAS distributions. The portal will include access to historical IAS maps providing a temporal spatial overview of aquatic weed proliferation and to latest maps and trends on current proliferation of aquatic weeds.

The maps will also include assessment of the biomass of the IAS within a specified grid to provide input to potential mechanical removal. The biomass assessment will be based on simple biomass/area measurements.

Access to the portal will be provided to all relevant regional stakeholders including relevant workshops to ensure dissemination of results and hence capacity building.

The tool will facilitate and support the implementation of various mitigating measures for removal and/or preventing further spreading of the species to un-infested waters.

Output 2.2.1: Community Oriented Early Warning System(s) for Droughts (SAP Priority Action A.6)

Implementation and operation of forecasting and early warning systems are cost effective measures to alleviate impacts of extreme events (e.g. floods and droughts) or impacts of extreme incidents (e.g. pollution of water bodies) through involvement of emergency authorities or local community focal points. Based on tailored disseminations they can warn affected communities and/or initiate disaster mitigation measures through emergency activities and relief programs.

Undertaking climate change estimations is important for the long-term planning of water availability and investment planning, as described under Output 1.1.1, whereas weather forecasting is important for near-future impacts of disasters. IT systems for community-focused drought monitoring, forecasts and early warning may be implemented centrally but must include appropriate dissemination procedures that support local level warnings based on identified areas under risk and the anticipated level of hazards.

Droughts create hazards affecting multiple sectors to a various degree and the monitoring, forecasting and mitigation aspects must be designed to cover differences in needs throughout the Volta River basin. The basin planning as described under Output 1.1.1 may take this into account. From a strategic perspective, Output 2.2.1 must consider this in an operational manner.

The WMO-implemented project “Integrating flood and drought management and early warning for climate change adaptation in the Volta basin”, funded by the Adaptation Fund, will provide important and significant synergy opportunities for this activity. There will be linkages to the WMO project with respect to:

- Drought indices based on near-real time satellite data as well as seasonal forecast data are introduced within the GEF F&D project and the CTCN “Improving resiliency of crops to drought through strengthened early warning within Ghana”. The drought indices are defined based on input from GMet in Ghana and established for the VBA staff as well as for the key organisations within Ghana. The existing drought indices are to be further refined within the GEF Volta project by adding additional indices based on stakeholder requests and further ground truthing of the indices. The WMO project will play an important role in defining and selecting the appropriate drought indices to be used across the Volta basin.

- The WMO-implemented VoltAlarm system will mainly focus on floods but will have drought alerts as well, and the specific implementation of the drought alerts will be closely coordinated between the two projects
- The WMO project will perform demonstration of the added value of the E2E EWS VoltAlarm through a series of pilot testing during monsoon and dry seasons. The results of the pilot testing will be used to improve the drought early warning system.

The community oriented Early-Warning Systems for droughts (DEWS) will be developed and implemented as Output 2.2.1 within this project. We anticipate implementing it as a specific application component within the centrally located web-based DSS system with pull and push dissemination options for notifications and early warnings for local authorities and communities. The development and implementation will consider the needs to mitigate potential use conflicts between pastoralist and farmers in certain parts of the basin.

Based on our experiences from previous implementations of multi-purpose operational DSSs, e.g. the Shire River Basin operational DSS (for the Ministry of Agriculture, Irrigation and Water Development, Malawi), the DEWS will be implemented as a dedicated application component integrated within the same DSS environment as being developed for Output 1.1.1. It may utilise the same DSS infrastructure including the database framework, which will be expanded to store and process relevant data and information specifically required for the DEWS. It will also use some of the same dissemination functionalities as for the planning application but be set up in a more automated and scheduled manner in order to support operational workflows.

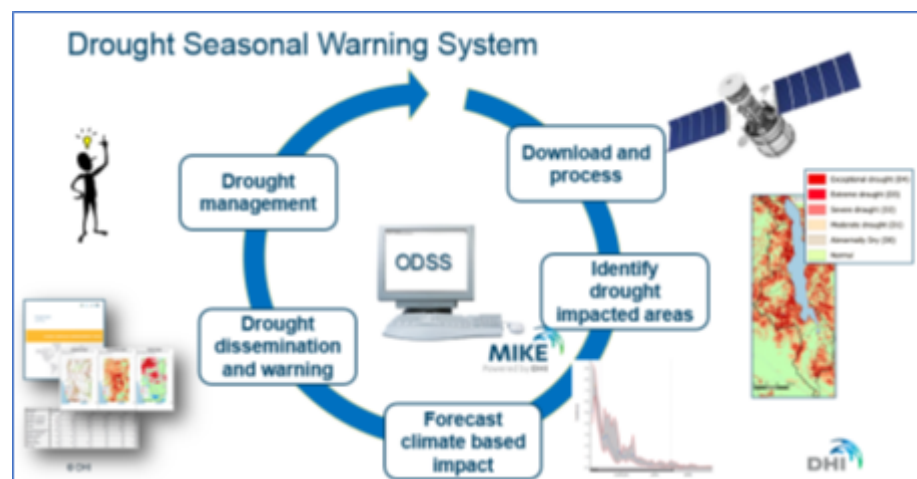


Figure 6 Suggested workflow for the drought forecast and early warning DSS for dissemination of up-to-date drought related information in the Volta basin.

Reaching Output 2.2.1 requires the following activities

Activity 2.2.1.1: Review of existing systems

Under this activity we will review research activities and community platforms used to communicate early warning information and improve indigenous knowledge on climate forecasts established to reduce vulnerability.

The review will build on the currently available knowledge and tools available in the region. Specific attention will be given to the UNEP-GEF Flood and Drought Management Tools Project, which has developed a comprehensive set of online tools for supporting management decisions on water resources. The Volta River basin was one of the pilot basins of this project. Despite the fact that the development of an early warning system is beyond the scope of that project, the platform, knowledge, and tools could support the development and installation of the DEWS.

The CTCN-funded project “Improving resiliency of crops to drought through strengthened early warning within Ghana” implemented a drought early warning system for the Upper-Eastern part of Ghana, based on extensive stakeholder consultations with national and sub-national organisations in Ghana. The available knowledge and information from the existing system and the extensive stakeholder consultation will be included.

We will carry out a brief business analysis along the same lines as for Output 1.1.1. with specific reference to the specific requirements for the DEWS. This concerns primarily the identification of future beneficiaries and their needs and means of providing notifications through the DEWS, e.g.:

- Who are the target beneficiaries of the DEWS, (e.g. farmers, herders, fishermen, mining industry, tourism industry) and what are their specific formats and information required?
- To what extent can (or should) remote areas, women, uneducated, ethnic groups with different languages be supported?
- Through which channels should or can drought warning information be disseminated (push/pull options, use of media and mobile networks etc.) and what dissemination protocols must be established?

The dissemination of the technical outputs to local and regional organizations will be supported through community-based approaches embedded in and supported by existing linkages between regional, national, and local level organizations. There will be a strong focus on utilising and improving existing dissemination methods and channels from the national to local levels. Development of effective modern web-based services or mobile apps supporting the dissemination should be considered. More details on the technical outlook of this task will be carried out in the Inception Phase.

Review of existing community-oriented Drought Early Warning Systems will be carried out. This will include review of a number of existing efforts, including:

- Flood forecasting White Volta (World Bank, 2013),
- Community Resilience through Early Warning (UNDP, 2012),
- Flood and Drought Management Tools (UNEP, 2014), and
- Improving resiliency of crops to drought through strengthened early warning within Ghana (CTCN, 2016).

Key DEWS actors will be national disaster management organizations (e.g. NADMO in Ghana and Conasur in Burkina Faso) and ministries of food and agriculture in the specific countries. We will approach the existing network of national agencies and organizations to obtain a greater understanding of existing efforts ranging from the local pilot studies to regional projects in the Volta basin

Activity 2.2.1.2: Implementing the DEWS application of the DSS

This activity will implement and operationalize a dedicated DEWS application taking advantage of the already developed GEF funded Floods and Droughts Portal system, which provides functionalities for linkage between data and variables suitable for drought monitoring.

Under Activity 2.2.1.2 we will design Information Products (hydrological bulletin, previsions for agricultural purposes) inspired by existing early-warning systems or systems under development and how they disseminate warnings on a regular basis locally. Such Information Products will be based on seasonal drought monitoring and seasonal drought forecasting supporting local communities, including farmers, herdsman, and fishermen, to adapt their activities to the forecasts at short and medium terms.

We anticipate developing a workflow in the DEWS application, which could include the following steps and be carried out on a regular basis (e.g. bi-weekly) during critical seasons:

- **Downloading and processing:** Latest satellite data is downloaded to the server and converted into a standard format (NETCDF). In addition, area-weighted time series are being computed for all catchments in the selected area.
- **Identify drought-impacted areas:** Indices are calculated including the latest raw data. For example, the SPI rainfall index is updated to include the latest rain events. For each index, drought categories have been pre-defined to identify drought-impacted areas.
- **Forecast climate-based impact:** Based on latest seasonal forecast, rainfall-based indices are computed to predict the future drought-impacted areas.
- **Drought dissemination and warning:** Drought-related information is disseminated through the web portal, where latest satellite products and derived drought indices can be viewed on a map. Furthermore, a drought report is issued on a bi-weekly frequency and automatically sent to the recipients. It contains the latest compiled drought related information such as maps, table and plots
- **Drought management:** The web portal and the drought reports are used by the authorities to monitor drought events and act to mitigate any severe impacts.

The DEWS drought monitoring component

The assessment of a potential drought may be carried out by monitoring and interpreting different types of drought parameters, e.g.:

- **Climate status:** based on observation and forecast of rainfall, as well as observation of day temperature.
- **Soil moisture status:** based on the observation of soil moisture content in the top layer of the soil.
- **Vegetation status:** based on the observation of the Normalized difference vegetation index (NDVI) providing information about the vegetation canopy greenness.

Each of the drought indices are translated into drought categories based on the specific intervals of each indices. The drought hazard can be described using several drought hazard categories as illustrated in Table 4.

Category	Description	Possible Impacts
Normal	Normal	No impact
D0	Abnormally Dry	Going into drought: short-term dryness slowing planting, growth of crops or pastures. Coming out of drought: some lingering water deficits; pastures or crops not fully recovered
D1	Moderate Drought	Some damage to crops, pastures; streams, reservoirs, or wells low, some water shortages developing or imminent; voluntary water-use restrictions requested
D2	Severe Drought	Crop or pasture losses likely; water shortages common; water restrictions imposed
D3	Extreme Drought	Major crop/pasture losses; widespread water shortages or restrictions
D4	Exceptional Drought	Exceptional and widespread crop/pasture losses; shortages of water in reservoirs, streams, and wells creating water emergencies

Table 4 Drought hazard categories

Below is an example of the widely used Standardized Precipitation Index (SPI) to characterize meteorological drought on e.g. a three months' timescale. The SPI values can be interpreted as the number of standard deviations by which the observed anomaly deviates from the long-term mean. The SPI can be compared across regions with different climates.

A three-month SPI provides a comparison of the precipitation over a specific 3-month period with the precipitation totals from the same 3-month period for all the years included in the historical record.

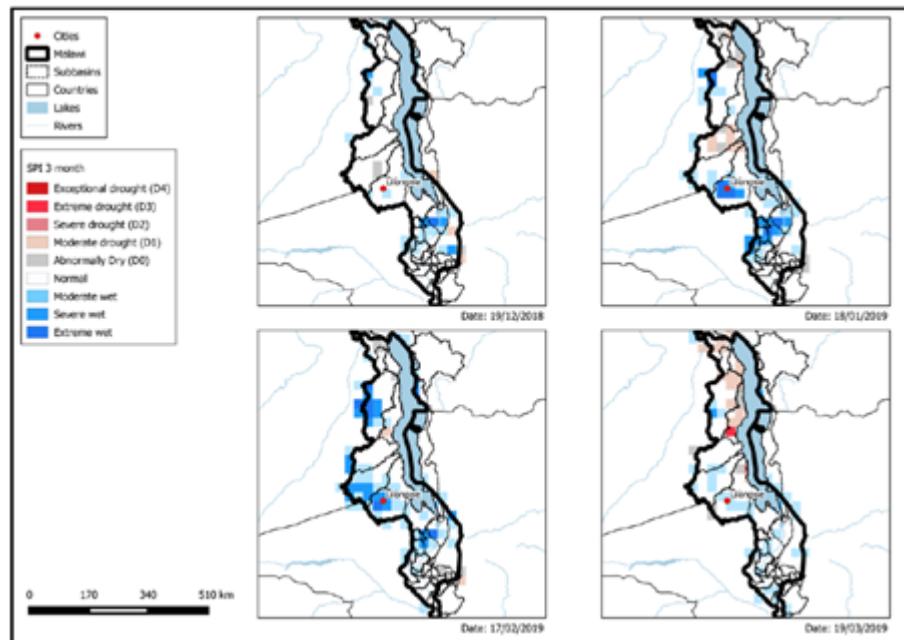


Figure 7 Example of mapping of SPI (3 months) in Malawi for four months from retrieval. (rainfall observations are based on the tropical rainfall measuring mission (TRMM) product. The temporal aggregation is done on the daily basis from 2000 to present. Source: <http://trmm.gsfc.nasa.gov>)

Seasonal rainfall forecasting

The seasonal rainfall forecast will provide an outlook of the upcoming season and will be used to assess how it will compare to a normal year. Since there may be a high spatial variability across the Volta River basin such forecast can be computed for different regions. Figure 8 shows an example of a seasonal forecast for a region in Malawi.

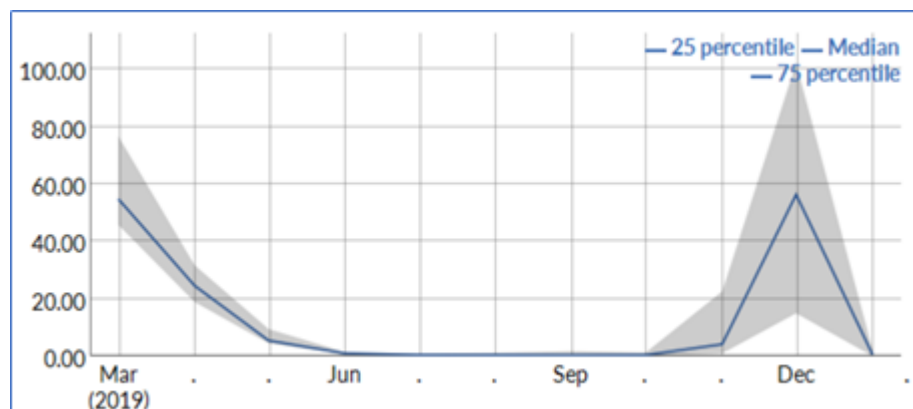


Figure 8 Example of a seasonal forecast (this forecast is based on the climate forecast system (CFS), which is a medium to long-range numerical weather prediction and a climate model run by the national centres for environmental prediction (NCEP). It provides a 20-member ensemble forecast with 9-month lead-time (spatial resolution: 0.5-degree, temporal resolution: daily). Source: <http://cfs.ncep.noaa.gov/cfsv2.info>)

As crop security may be an important factor, DEWS will also include a Crop Calendar component advising farmers on suitable planting and harvesting times. The crop calendar brings together information on crop phenology specific to the areas of concern with latest rainfall forecast information. It advises users about timings and associated activities for crop management. It also displays historical rainfall and seasonal forecasts (see Figure 9).

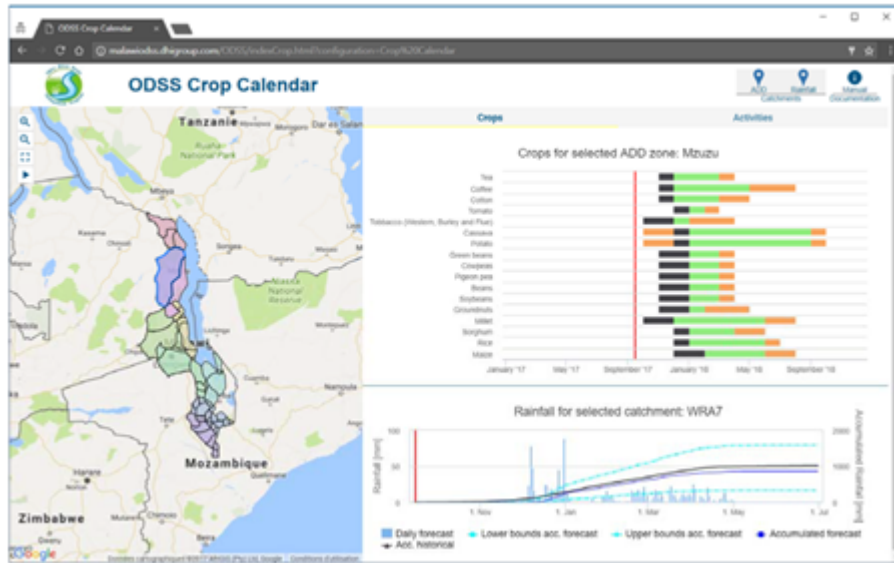


Figure 9 Example of crop calendar based on seasonal rainfall forecasting in Malawi. The map view shows agricultural development divisions in the basin. All the relevant crops within a selected add appears in the top right section and rainfall forecasts are shown in the lower right part of the screen.

Seasonal rainfall forecasting can also be applied to establish inflow forecasts for seasonal reservoir operation guiding the release operations for the coming months during the dry season.

Areas affected by critical events in the past will be identified as part of the baseline studies and used to validate the DEWS. The validation will test its ability to detect past areas impacted by droughts. This information is available at national level and will be collected as part of Component 1.

The feasibility of the cloud based DEWS shall be investigated taking into account the reliability and capacity of the internet for the foreseen users inclusive the VBA.

Output 2.2.2: The Volta Basin Observatory Capacitated to Manage and Use the Updated Water Use/Balance Models (SAP Priority Action D.10)

Expected outcomes of this output relate to the data and analytical services provided by the Volta Basin Observatory and the member States to support effective decision making and sustainable basin planning with appropriate attention to the climate risks and the environmental threats throughout the Volta River basin.

This covers the knowledge and monitoring of the various aspects of the basin's natural resources and include:

- Development of the basin models that make projections of climate change impacts and water resources management and use;
- Reinforcement of the capacities of the national/regional institutions and stakeholders, especially to better protect, manage, monitor and allocate Volta Basin land, water, climate and biodiversity and operationalizing the Volta Basin Observatory, and
- Awareness raising & information sharing and dissemination (Output 4.1.2).

The implemented DEWS will only be successful if the necessary skills and institutional and human resources are in place. The capacity building of the Volta Basin Observatory staff will focus not only on providing theoretical knowledge, but also put high emphasis on learning workflows and operate the DEWS efficiently and competently. A complete capacity building program therefore includes:

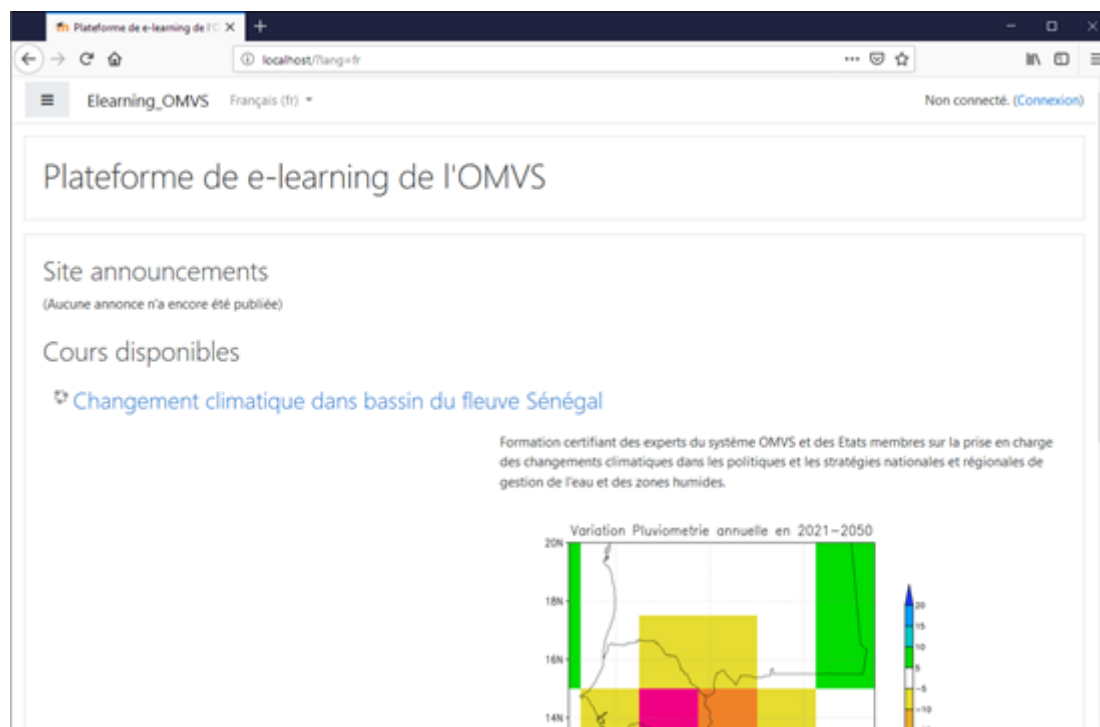
- Formal training courses for key staff who will be operating the early warning system on a regular basis as well as practitioners and designated stakeholders, who will use the system occasionally;
- E-learning enabling stakeholders to embed the training into their daily activities without having to participate in physical workshops;
- On-the job training of staff through active participation in the development and testing;
- Preparation of operational user and reference manuals, online context-dependent help, documented demonstration cases, training materials;
- Facilitation of stakeholder workshops, where the system is presented for relevant stakeholders and the public,
- Introduction to technical support services;
- Preparation of a continued education plan for long-term sustainability and enhancement of the system.

E-learning

E-learning aims to train a greater number of participants from within the Volta River basin. Such online courses can also be used to train people who have already completed in-situ training but want a refresher of important topics. The language of the e-learning course will be English and French. The e-learning sessions will be made available online through the e-learning platform and will cover a range of different topics. Success in evaluation (quiz) will determine whether a candidate has completed the course. At the end of each session the candidates will have to pass a test (quiz) to evaluate their knowledge. Candidates will be able to try the quiz only 3 times, after 3 failures on the same quiz the candidate will no longer be able to validate the session.

The e-learning system will be based on a platform accessible online and hosted on the web server for the drought early warning system. The consultant intends to use the MOODLE online learning platform distributed under the GNU General Public License (open source). In addition to the creation of courses using integrated tools (resources and activities) for the use of trainers, Moodle offers possibilities for organising courses in the form of channels (categories and sub-categories, cohorts...) which also give them characteristics of the implementation of complete teaching devices. Thanks to its modular architecture, Moodle takes advantage of plugins developed by its community to allow the extension of its functionalities and thus meet specific needs. Moodle has many features shared with other online training platforms: forums, resource manager, tests and nine turnkey modules

(homework, corrections, chat, polls, glossaries, journals, labels, lessons, wiki, tests, database, blogs, RSS feeds). It also incorporates a training test creation module. Questions created with this module can be shared and reused in different test contexts. Moodle is modular: it allows to meet the needs of an isolated trainer as well as an academic institution.



Example of e-learning front-end

To reach Output 2.2.2 the following activities will be carried out.

Activity 2.2.2.1: A review and updating of current knowledge on the state of climate change.

This activity will include a characterization of environmental impacts and socioeconomic consequences of climate change. This will be carried out by use of the mathematical modelling framework developed as part of the DSS implementation in Output 1.1.1.

Environmental and socio-economic indicators will be defined and used in the scenario modelling to assess and quantify the impacts of the potential future changes in climate in the Volta River basin.

Activity 2.2.2.2 Providing operational manuals

Under this activity, the entire system will be documented, including the following:

- Overall description of the entire system, with a flow chart setting out the flow of information from the various real-time sources, the processes executed to carry out the forecasting of river flows and reservoir levels, dissemination via various media, and remote entry points to the system;
- Demonstration cases of key scenarios run to simulate the performance of the system on selected historical flood and drought events, with a full description of the system input and outputs;
- User Manuals and Short Guides for each component of the DSS system, including simulation and forecasting model codes;
- Description of the communication systems including automatic processes for downloading weather forecasts and remote sensing, dissemination of forecasts and alerts, and remote entry to the system from local offices, stakeholders and the public;
- Reference Manuals detailing the scientific theory behind the computations used by the mathematical models;
- Operation and Maintenance Manual for the entire system, detailing backup procedures, system diagnostics, software support and upgrades.

Activity 2.2.2.3: Training of Volta Basin Observatory and research Centres' staff.

A training program will be defined and conducted for staff at the Volta Basin Observatory (including, as appropriate, national-level key stakeholders) and relevant research Centres to be able to apply the DSS, including being able to develop and apply specific water resources system models. These models will be used to analyse the impacts of climate change projections on hydrological regimes and produce a map of vulnerable areas (mainly those at risk of drought).

As it appears from the previous Output descriptions, this project will complement other interventions in the region to reinforce the analytical capacity of the Volta Basin Observatory on different aspects: staff skills; availability of technical tool (DSS, models, etc.). The necessary hardware and IT infrastructure to support this is assumed to be in place as a result of previous projects.

Activity 2.2.2.4 Developing supporting procedures for use of the DSS

This activity will develop procedures for data collection, processing and publication; and reinforcing, where possible, equipment and technical instruments. The definition and selection of procedures will be coordinated with VBA, other partners, both international and in-country institutions.

In particular, the work that UNEP is doing for the capacity development, monitoring, information gathering and potential information systems on the global SDG indicators (UNEP is the custodian agency for indicators on IWRM (6.5.1), water quality monitoring (6.3.2) and protection and restoration of water-related ecosystems (6.6.1)) is highly relevant here. The data being gathered for the SDG process could feed into a Volta monitoring system, and potentially vice-versa (data being gathered in the Volta could help countries feed into SDG reporting).

Component 3. Conserving and Restoring Ecosystems for Sustainable Livelihoods in The Volta Basin

Despite their importance, the water resources and associated ecosystems in the majority of basins are increasingly threatened by escalating pressures from fast-growing populations and urbanization process, as well as expanding agricultural and industrial activities into a shrinking number of suitable geographical areas. This is particularly true in recent decades when variability and deficits in rainfall and scarcity of surface water resources have accelerated, exacerbated by climate change. In the push for an accelerated economic growth, many basin-scale and national water and environment policies show clear limitations in their ability to promote equitable and sustainable use of resources. The Volta basin is not an exception, and this calls for an urgent intervention directed at conserving and restoring degraded ecosystems on the one hand, and strengthening the resilience of such ecosystems, as well as vulnerable population, mostly communities at the local level, dependent on these ecosystems and services they provide, on the other. In line with a number of current and recent interventions in the Volta Basin directly addressing the issues of nature-based measures (river bank protection, forest gallery restoration, etc.), e.g. WB-implemented GEF SAP Implementation project, Component 3 of this Project addresses the second aspect – resilience of ecosystems.

Outcome 3.1 “Production systems in key sectors apply integrated water resource management and ecosystem-based approaches at community and sub-basin levels” is targeting crop, livestock and fish sectors in order to improve the production practices. In fact, at national level, major economic sectors in terms of employment generation and revenues are agriculture (which is currently extensive and mostly rain-fed), livestock production, fisheries and forestry. Other significant sectors contributing to revenues and exports are mining in Burkina Faso (mostly gold) and energy (hydropower) in Ghana. All sectors depend heavily on the natural resources of the basin, particularly its water resources. In addition, the extent of these activities and the commodity-based paradigm applied has led to less consideration to the ecosystems these activities depend on. This project will support the application by stakeholders of integrated water resources management and ecosystem-based approaches to crop, livestock and fishery production systems to demonstrate the effectiveness of such approaches as compared to the traditional commodity-based one. The ultimate goal is to mainstream these approaches into sectoral policy planning at national and regional levels.

This outcome will be delivered in the following sub-basins and intervention areas.

Component 3 outputs	Target sites in Sub-basins for the interventions
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Component 3 outputs	Target sites in Sub-basins for the interventions
Output 3.1.1 Measures on sustainable use of water for crop and livestock productions implemented to improve productivity, food security and incomes.	<p>1. Transboundary sub-basins in Burkina, Mali, Togo, Côte d'Ivoire and Ghana</p> <ul style="list-style-type: none"> ●Sourou sites between Mali and Burkina Faso ●Otti sites between Togo and Ghana ●Nakambe sites between Burkina Faso and Ghana ●Bagre sites in the black Volta between Burkina and Ghana ●Chache sites in the black Volta between Ghana and Côte d'Ivoire <p>2. Additional non-transboundary sites along the Volta river bank</p> <p>During the inception workshop, additional critical ecosystems will be identified in Benin and Togo</p> <p>It is expected that additional 5,000 (of which 40% women) crop and livestock producers will benefit from this and additional 10,000 hectares will be put under sustainable use of water for crop and livestock productions.</p>
Output 3.1.2 Sustainable fisheries management practices implemented to improve productivity, food security and incomes.	<p>1. Fisheries in Burkina Faso, Mali, Côte d'Ivoire and Ghana</p> <ul style="list-style-type: none"> ●Sourou sites between Burkina Faso and Mali ●Nakambe sites between Burkina Faso and Ghana ●Bagre sites in the black Volta between Burkina and Ghana ●Chache sites in the black Volta between Ghana and Côte d'Ivoire <p>2. Additional non-transboundary fisheries</p> <p>During the inception workshop, additional critical fisheries will be identified in Benin and Togo.</p> <p>It is expected that additional 10,000 (of which 50% women) fishery value chain actors will benefit from this, 15,000 hectares of fisheries will be managed using ecosystem-based approach and 5,000 hectares of fish farming units will be sustainability managed.</p>

Output 3.1.1: Measures on sustainable use of water for crop and livestock productions (SAP Priority Action B.5)

One of the two key sectors to be addressed by the Component is crop and livestock production. It is common for the Volta Basin that serious damages are caused to the environment and water resources by uncontrolled transhumance through overgrazing, poor pasture management practices, massive pressure on natural habitats, deterioration of water quality, and destruction of crops. Availability of resources, including water, is becoming a limiting factor for the development of this sector of agriculture. Competition for resources between pastoralists and farmers also pose serious risks of violent conflicts between them. Application of sustainable pasture management practices, e.g. the creation and marking of transhumance corridors along with resting sites, etc., will make it possible to avoid these conflicts and limit the degradation of natural resources.

Interventions within this output will address the current and projected future risks with the key focus on selected drought-prone areas. Measures on sustainable use of water for crop and livestock production will be implemented with account of current and future climate change (and climate variability) to support vital local livelihoods. This will be one indispensable component of the Drought Early Warning System to be developed in Output 2.2.1. Optimizing and sustaining transhumance and livestock corridors will contribute to a sustainable management of pasture lands and fodder and to a better management of watering points. These measures shall contribute locally to increase farmer's incomes and food security of the community.

Being a regional governance body, the VBA, according to its mandate, will support, among others, (i) the promotion of the implementation of IWRM and the equitable distribution of the benefits resulting from various water utilizations, and (ii) the contribution to poverty alleviation and the sustainable development of the Parties in the Volta basin, for better socio-economic integration in the sub-region. From the above mandates, VBA will work with actors in the livestock sector in member countries and mainstream transhumance in its IWRM implementation program through the development of sustainable management tools of rangelands and the development of water points. This will lead to sustainable use of water by pastoralist communities through the regulation of the transhumance corridors and the reduction of local conflicts between crop producers and livestock breeders.

To reach Output 3.1.1 the following activities will be carried out.

Activity 3.1.1.1 Assess the state of degradation of the ecosystems of the Volta River banks

The water resources assessment is a fundamental and important step leading to a sustainable use of water by different sectors eg. the agricultural sector for crop and livestock production. Several studies report on the opportunities and concerns in the Volta, for instance, indicating that the Volta River Basin is experiencing high levels of water quality and flow degradation, coastal erosion, increased sedimentation of rivers, loss of soil and vegetative cover and ecosystem degradation as a result of climate change and livelihood practices among other factors. In the Basin, the most important livelihood practices remain agriculture and livestock production whose implementation fails to comply with the riverbanks' protection. Because of erratic rainfall and land degradation, crop and livestock farmers tend to move closer to the riverbed to improve the productivity and production of their agricultural and livestock activities. Due to inappropriate agricultural and livestock practices, the riverbanks are becoming increasingly degraded, leading to sedimentation of the river, reduction of water flows, and depletion of other aquatic resources and ecosystems. This is particularly prominent in the upper watershed of the Volta River where poor land-use practices such as use of bush fires to clear land, widespread tree cutting for fuel wood and over-cultivation of the land are resulting in loss of vegetative and forest cover. Yet, this situation is not mapped out for the upper watershed nor the whole Basin, constraining any scaling out efforts of best practices of water ecosystem protecting agricultural and livestock activities.

Under this activity, we will utilise the data and information already stored in the VBA database, but also collect and process additional spatial and temporal data required. The objective is to identify areas of critical ecosystems degradation and high potential of compromising the survival of the Volta River and the depending riparian communities. The activities will also provide important knowledge about the shortages in data availability and provide an overview of the spatial and temporal pattern of water availability throughout the basins. We anticipate utilising remote sensing data to supplement ground-based monitoring to provide more reliable assessments and for a spatial characterisation of the basin. We will use scenario assessment to investigate current and projected water availability, and the status and options for improving the water resources monitoring program across the region. The objective of this activity is therefore to produce an analytical assessment and map areas that need urgent intervention to prevent negative impacts of crop and livestock activities on the Volta River. It will provide the project with a reference situation on the impacts of agricultural and pastoral practices on the natural potential of the basin in general and on water resources in particular. It will highlight the strengths and weaknesses of current water use practices, the tried and tested provisions made by administrative and customary authorities, and the populations to mitigate the impacts.

Activity 3.1.1.2 Support riparian communities to implement crop and livestock activities compatible to river banks restoration;

The lack of adequate support for agricultural and livestock income generating activities in communities bordering the Volta River will continue to move farmlands and grazing lands closer to the riverbanks. Yet some national policies have set distance standards for the bank protection strip. These policies are not respected because of, inter alia, the additional costs

of production and breeding they would incur. Experiments conducted in the Volta Basin show that riparian communities can respect these distances if the extra costs are borne in the first years. These experiments used non-engineering measures, such as establishment of the food trees in the river bank and the removal of crop farming beyond the protection band, provision of borehole for livestock watering, promotion of fodder and grassland, etc.

Based on the conclusions and recommendations of activity 3.1.1.1, the project will contribute to strengthening the technical and intervention capacities of Volta Basin stakeholders with the development and implementation of a capacity-building action plan based on the proven good and compatible practices of crop and livestock production with river bank maintenance and/or restoration. This will be done according to the country policy, particularly with respect to the river bank protection policy. It will also consider the social acceptability of selected good and compatible practices in the selected riparian community as selection criteria. The project will also take into account proven provisions / actions developed and implemented by VBA member countries and community institutions in the region.

Activity 3.1.1.3 Develop and implement local convention for the conservation and/or restoration of the riparian forest alongside the Volta River

The SAP clearly identified the degradation of ecosystems, namely the loss of vegetation cover and land degradation, as one of the major transboundary problems. The problem of land degradation in the basin includes soil degradation, intense erosion, and desertification. The loss of vegetation cover encompasses the loss of habitats and biodiversity. Actions were identified to reverse the problem of ecosystems degradation at national and transboundary level. The development of culturally-adapted improvements to land tenure systems/property rights in the region was identified as one of the actions which has the potential to involve stakeholders at all level of decision-making of sustainable ecosystems management in the Basin. Experiences in some locations within the Volta Basin showed that major ecosystems can be conserved and/restored by local communities (main users of the ecosystems) if their rights are fully recognised by the governments. Local conventions are defined as legitimate agreements negotiated between multiple stakeholders from the perspective of regulating natural resources (control, access, appropriation, use and exploitation) and the environment. In the Sahel, although they are popular and receive more attention among policymakers, they are still little used in the current context of decentralization. These by-laws appear as important management instruments that can be used for conserving and restoring ecosystems, such as gallery forest, in order to improve water quality for sustainable livelihoods in the Volta Basin.

This activity aims at performing investigation of the policy, legal, and cultural basis for land tenure policies in the Volta River Basin to identify those indigenous land tenure systems that are compatible with gallery forest restoration and/or conservation and identify culturally-accepted incentives to protect and restore degraded forest gallery. It will support the development and implementation of by-laws such as local conventions for the conservation and/or restoration of the gallery forest alongside the Volta River. This will contribute to the Volta SAP environmental quality objective of sustainable land use within the Basin. This work will build on top of existing studies/knowledge including what was achieved in the WB funded VSIP study.

Output 3.1.2: Introduction of Sustainable Fisheries Management Practices (SAP Priority Action B.8)

Fisheries is a sector of high social importance in the Volta Basin, particularly artisanal fisheries. Significant part of the local population is dependent on fisheries (including aquaculture) as the main livelihood. Fisheries, including fish farming, is a rapidly growing sector within the Volta Basin. In some areas, notably Lake Volta, fishery resources have already been exploited, while along the Oti River in Togo and Benin, fish stocks are currently an underexploited resource. Fisheries may contribute substantially to poverty reduction and economic development if more systematically developed. Such a situation justifies the need of a regional approach to fisheries development and planning.

Similarly, to resources for crop and livestock production sector, fishery resources of the Volta Basin are under excessive pressure through the degradation of habitats, on the one hand, and overuse/over catch of fishery population (overfishing), on the other hand. Direct forecasted impacts are further declining of fish abundance, including the risk of extinction of certain species, and, related to this, further pressure on communities, dependent on fisheries. A recent study in sub-Saharan Burkina Faso (Meulenbroek et al., 2019)[14]¹⁴ revealed

that human pressures and loss of natural fish habitats led to a decline in fish populations in terms of abundances, biodiversity, and average size. The study also reported that little knowledge exists about fish assemblages regarding their composition, their habitat preferences, or their sensitivity to or tolerance of human pressures. Resolving this situation is essential for conserving biodiversity and ecosystem functioning as well as maintaining economic productivity (i.e., through the sustainable production of fish).

In addition to the above constraints at the production level, Béné and Russel (2007) [15]¹⁵ also pointed out several aspects that need improvement to properly address the poverty issues in the Volta Basin population. In fact, for most of the households, both farming and fishing activities are characterised by extremely low productivity levels (Béné and Russel, 2007) putting smallholders into a vicious cycle of poverty. The authors therefore recommended four ways of improving water (or fisheries) productivity in a pro-poor manner in the Volta Basin:

- community-based fish stock enhancement in small and medium reservoirs
- improved post-harvest management, diversification and marketing
- improved access to financial credit for the poorest
- non-farm livelihood diversification.

Fishing (including fish farming) is a growing industry in the Volta Basin despite pressure on fisheries resources due to habitat degradation and overfishing. The prospects for its development, at the country level, are marked by the strengthening of achievements and the initiation of major innovative activities consistent with the needs and opportunities for technical development, and / or by technologies adapted to the national context. Thus, in terms of strengthening the achievements, the main actions to be developed by the project are in the area of intensification and diversification of fish production and the improvement of the fish value chains with a view to increasing production and increasing the contribution of this sector to national economy and rural development. In a drive to improve the productivity of the sector, the project will lead the following activities in order to significantly support the development of sustainable management of fisheries at the basin scale and the associated value chains.

Activity 3.1.2.1: Conduct a diagnosis to characterize the fisheries and for the identification of the fish production areas in the basin

A diagnosis study conducted by the World Fish Centre (2007) revealed that Burkina Faso and Ghana are the main countries where people practice fishing in the Basin. In the four other countries of the basin (Cote d'Ivoire, Togo, Mali, Benin), only limited fisheries activities take place within the basin. In Burkina Faso, two main types of fisheries are distinguished, based on their hydrological nature: riverine and non-riverine (ponds, lakes, floodplains, and reservoirs). To this, one can add a very shy fresh water aquaculture. In Ghana, three types of fisheries exist: marine, inland capture fisheries and freshwater aquaculture. Fishing in the Volta river and its tributaries has been described as a partially known activity within the whole Volta Basin. However, the fragmented studies and long-term statistics that have been collected in the past suggest a need to thoroughly assess the fisheries in order to improve the water productivity of the three types of fisheries, reduce poverty in the local populations, and preserve the ecological sustainability of fish resources. Recent studies in Burkina Faso (Fofana, 2018; Dicko, 2018) showed that fishery management has been driven by market demand leading to overfishing and the degradation of the fishery ecosystems. This called on the development and implementation of ecosystem-based fishery management plans.

This activity aims at strengthening the contribution of fisheries and fishermen to the conservation and restoration of ecosystems for sustainable livelihoods in the Volta Basin. It will link up with the outputs of the activity 3.1.1.1 to identify the most degraded riverine fisheries in Burkina Faso and Ghana. Based on this, it will select the most important fisheries in term of fishermen and provide support to the development and implementation of ecosystem-based fishery management plans. This will imply consultations with fishermen, central

and local governments, civil societies and other fish value chain actors to come out with a common vision, and plan for activities including ecosystem restoration and the establishment of biological resting periods for fish. To ensure the effectiveness of the ecosystem-based fishery management plans, the project will also support the participatory development and implementation of a local convention for ecosystem-based fishery management. This will imply bringing together fish value chains actors to discuss and adopt code of conduct on fishing, fishing processing and marketing that is compatible to the restoration of the fishery ecosystem while improving the energy-efficiency of fish drying and smoking to reduce the post-harvest losses and the demand for fuelwood. In practice, the project will contribute to the promotion of fish drying or cooling techniques and/or any other improved processing that is socially, environmentally and economically sound. To ensure the overall sustainability of the fish value chains, the project will work to connect actors to micro-finance through the documentation of the cost-effectiveness of the ecosystem-based fish value chain. In the selected fisheries, workshops will be organised to share the information with microfinance actors and help develop their engagement in the fish value chains. Finally, an exchange visit will be organized between those ecosystem-based fisheries and the conventional ones to share experience and promote scaling out of the ecosystem-based approach to fisheries in the Volta Basin.

Activity 3.1.2.2: Introduce the ecosystem-based approach into fish farming systems

Several local areas in the two countries of the Volta Basin suffer severely from overfishing and deteriorating ecosystems. Local government authorities pilot fish farming techniques and incorporate them into their communal development plans and fisheries investment plans to meet this challenge. Currently, fish farming is community-oriented without consideration to the fishing farm ecosystems which are impacted by and in turn also impact the fishing productivity.

In view of the development of the ecosystem-based fish farming sector, the project will support studies and field work to assess the potentials and threats of the existing fish farming sites and mainstream ecosystem-based approach. The objective is to develop an ecosystem-based fish farming management plan that will address the negative environmental impacts of the conventional fish farming approach and contribute to improving the environmental quality in the Basin. The Project will provide technical and financial support to those fish farms willing to transform conventional fish farming into ecosystem-based fish farming. The project will also support the development of business plans for fish farming and connect them with the microfinance sectors with the view of facilitating their access to finance for implementation the ecosystem-based fish farming. Finally, to prepare the whole Basin for scaling out and up the ecosystem-based fish farming systems, the project will support exchange visit(s) between sites within countries and between countries as well.

Activity 3.1.2.3: Support the establishment and operation of an information system on safeguarding the fishing and fishing resources of the basin

This activity will lead to the establishment of an information system on the fishery resources of the basin in support of the Observatory of the Volta Basin Authority. The Volta Basin Strategic Action Program (SAP) has made it clear that it is important to know about resources and that it is very difficult to have reliable and comprehensive data on the fishing and fishing potential of the basin. The need to set up a database, a methodology and a data collection network based on the sampling of representative areas is a priority action for the basin.

The interest in exploiting scientific and empirical data recommends associating researchers and resource persons within fishing communities to produce these data and information. It is also and above all to continue to permanently feed the database thus constituted. To this end, the project, in consultation with the VBA and the countries, will understand the existing data collection before identifying resource persons and establish a formalization of their collaboration in the implementation of the information system and its operation. The roles and responsibilities of each key actor in the collection and dissemination of information and the procedures for sharing information must be defined in advance.

In terms of operationalization, the project will strengthen the technical capacities and the operational means of the collection, processing and feedback mechanisms of the countries; to provide logistical support and technical expertise to ensure the effective operation of the information system.

Component 4. Knowledge Management and Sharing, and Effective M&E

This component combines a set of outputs, which will increase knowledge and facilitate exchange of information and best practices in the Volta Basin countries and beyond, and also ensure an effective implementation of activities to achieve the articulated outcomes and impacts on the ground. Being diverse in terms of stakeholders, areas and levels of interventions, as well as nature and thematic focus and targeted audiences, an effective project coordination, M&E plan, and system are considered instrumental for a successful implementation.

Output 4.1.1: Communication Strategy for SAP Implementation

A communication strategy has been developed under the recently completed VSIP Project. The REWarD project will design its communication activities based on this strategy including reporting, sharing findings and progress on the promotion of an environmentally sustainable water management in the Volta River basin and cooperation among stakeholders in the riparian countries.

Some of the indicators under this outcome will include:

- Documented collaborations and resource sharing shows commitment to common vision on sustainable water management shared amongst stakeholders
- Regular results of effective transboundary water governance
- Community involved sustainable water management awareness conducted and behaviour change
- Publications and communications material of progress in made transboundary water governance

Audiences

Types of Audiences

It will be important to identify those audiences with whom the SAP needs to communicate to achieve its objectives through stakeholder workshops. Knowing who the audience is makes it possible to plan communication logically. Different messages will be needed for different groups, as well as different channels and methods to reach these groups.

There are two main types of audiences, priority and influencing. To determine who the priority audience is, one needs to answer the question of whose actions are most critical to achieving our mission of reversing ecosystem and water degradation in the Volta Basin. The priority audiences are thus:

Riparian countries in the Volta Basin and mandated institutions: VBA, Ministries of Water, Environment, etc.

Local communities and industries (specifically, certain communities/sectors targeted by projects).

To determine who the influencing audiences are, one needs to answer the question of whose actions can help facilitate these actions in our priority audiences. The influencing audiences are therefore:

Donors

Partners: NGOs, academic institutions, other UN agencies/programmes, etc.

Tools, Activities, and Resources

With the audience and messages identified, the next step will be to determine the tools and activities through which messages will be delivered to the audience. Below is a list tools to be used:

- Website
- Quarterly newsletters
- Weekly news round-up
- Publications
- Events/Campaigns
- Social Media/Infographics
- Traditional media (press releases, news articles, radio, television etc.)
- Partner newsletters
- Videos, project posters, drawings, cartoons etc.

Below is an example of a matrix that can be used during the stakeholder workshops to aid develop the communication strategy and plan.

Medium	Objective	Timeline
Website		
Listserv (newsletter, round-up, etc)		
Publications		
Workshops and campaigns		

Awareness campaigns and outreach		
Reviews and reflection meetings		
Satisfaction polls and pledges		
Public participation and feedback		

Communication activities are not effective, if they are not strategically planned. For this reason, the Project will support VBA to go beyond the general publicity and awareness approach, and to develop a programmatic approach sequencing communications intervention in a strategic manner:

- identify key stakeholders (stakeholder mapping) and beneficiaries of the basin resources
- identify their information and communication needs
- develop key messages considering these needs targeting specific stakeholder groups
- identify best channels of information dissemination for each stakeholder group
- disseminate information and materials to stakeholders through appropriate channels, particularly through national awareness raising workshops, using good practices and socio-economic benefits
- follow up and evaluate.

Thus, a bespoke meeting specifically on communications will be organized. A communications planning team will be identified from the stakeholders involved in the workshop. A specific project communication strategy, including all the above elements, will be developed at the start of the project and implemented throughout the project life-span.

Communications under this output will differ from similar types of activities under Output 4.2.3, as the main focus will be to communicate messages related to the implementation of the Volta SAP rather than the project supporting this process. It is important to assure sustainability of these efforts beyond the project. A series of public awareness campaigns and stakeholder awareness raising workshops will be implemented in the Volta Basin countries to raise the currently insufficient level of environmental awareness in the basin, particularly in a transboundary context.

Based on results of the stakeholder mapping exercise (Output 2.1.1) in each of the six countries, key groups of stakeholders will be identified, as well as government agencies to be involved in the communications and awareness activities, starting from the development of strategies, through the design of individual activities, down to participation in public campaigns. It is vital to engage with stakeholders in each of the countries at every stage to make sure the campaigns and other activities are fully fine-tuned to the need of the Volta Basin and targeted to the key stakeholder groups in the region.

Output 4.1.2: Development of International Water Knowledge Products Using Existing Global Information and Knowledge Sharing Platforms, e.g. GEF IW:LEARN

The development of the International water knowledge products require the establishment of an effective knowledge management strategy. This help projects learn from successful examples in order to scale up their results or address challenges in implementation. Taking advantage of the established GEF IW Learn system and approaches, this project will set up a learning-based knowledge management plan at the onset. The objective is to assure that relevant experiences across sister projects are used and that from this project are also shared with the sister projects. The project participation in the IW Learn aims at gradually building its capacity to achieve the common IW end and to work with other projects to (i) implement more effectively the project; (ii) systematically learn about the conditions under which strategies work best and why; and (iii) improve the capacity of the members of the project team to do adaptive management.

Therefore, lessons learned from this project will be disseminated within, and also beyond the project intervention zone, through the existing information sharing networks and forums. The project will identify and participate, as relevant and appropriate, in scientific, policy-based and/or any other networks, which may be of benefit to project implementation through lessons learned. A more detailed set of activities will be developed within Output 4.2.3. The project will identify, analyse, and share lessons learned that might be beneficial in the design and implementation of similar future projects. Finally, there will be a two-way flow of information between this project and other projects of a similar focus.

Sufficient funding will be provided by the Project to supporting information and knowledge sharing within a broader GEF IW community through supporting adequate participation of the Volta Basin representatives in relevant activities of GEF IW:LEARN. At least 1% of budget of Component 4 will be allocated for pertinent activities. The project will participate in the International Waters Conferences and regional thematic workshops and meetings. It will also carry out information exchange activities with the Niger-ITTAS project, and GCLME project.

Activity 4.1.2.1 Identify and document new lessons from local and international water management and governance

This transboundary project set out three different and complementary levels of intervention: local, national and regional. It is expected to demonstrate that changes in local and national water resources management and governance can contribute to transboundary or international outcomes. The project will support the identification, documentation and sharing of locally and nationally emerging lessons that service the international water governance and management. It will also identify, document and share lessons on what and how regional governance and management mechanisms influence national and local ones. These learning materials shall be user-friendly and applicable to the whole Volta Basin to ensure that successes are replicated, and failures avoided by other stakeholders working in the Basin. They will be made accessible through the iwlearn.net.

Activity 4.1.2.2 Participate in cross-basins International Water lessons learning events at the regional and international level

Participation in cross-basins learning events will be key to raising the Volta Basin voice at the regional and international level. These events are opportunities to interact with various stakeholders working on the governance and management of transboundary water resources. The project will participate in at least one cross-basin international water lessons learning events per annum to share its experiences and build partnership for scaling out and up innovative solutions on the governance and sustainable management of the Volta Basin resources.

Output 4.2.1: Project Monitoring & Evaluation Plan and System

The project will follow UNEP standard monitoring, reporting and evaluation processes and procedures. Reporting requirements and templates are an integral part of the UNEP legal instrument to be signed by the executing agencies and UNEP.

The project M&E plan is consistent with the GEF Monitoring and Evaluation policy. The Project Results Framework indicators (Annex A) for each expected outcome as well as mid-term and end-of-project targets. These indicators along with the key deliverables and benchmarks will be the main tools for assessing project implementation progress and whether

project results are being achieved. The means of verification and the costs associated with obtaining the information to track the indicators are summarized in Appendix A. Other M&E related costs are also presented in the Costed M&E Plan and are fully integrated in the overall project budget.

The M&E plan will be reviewed and revised as necessary during the project inception workshop to ensure project stakeholders understand their roles and responsibilities vis-à-vis project monitoring and evaluation. Indicators and their means of verification may also be fine-tuned at the inception workshop. Day-to-day project monitoring is the responsibility of the project management team but other project partners will have responsibilities to collect specific information to track the indicators. It is the responsibility of the PMU to inform UNEP of any delays or difficulties faced during implementation so that the appropriate support or corrective measures can be adopted in a timely fashion.

The project Steering Committee will receive periodic reports on progress and will make recommendations to UNEP concerning the need to revise any aspects of the Results Framework or the M&E plan. Project oversight to ensure that the project meets UNEP and GEF policies and procedures is the responsibility to the Task Manager in UNEP-GEF. The Task Manager will also review the quality of draft project outputs, provide feedback to the project partners, and establish peer review procedures to ensure adequate quality of scientific and technical outputs and publications.

Project supervision will take an adaptive management approach. The PMU will develop a project supervision plan at the inception of the project that will be communicated to the project partners during the inception workshop. The emphasis of the PMU supervision will be on outcome monitoring but without neglecting project financial management and implementation monitoring. Progress vis-à-vis delivering the agreed project global environmental benefits will be assessed with the Steering Committee at agreed intervals. Project risks and assumptions will be regularly monitored both by project partners and UNEP. Risk assessment and rating is an integral part of the Project Implementation Review (PIR). The quality of project monitoring and evaluation will also be reviewed and rated as part of the PIR. Key financial parameters will be monitored quarterly to ensure cost-effective use of financial resources.

Output 4.2.2: Mid-term and Final Project Evaluations

In-line with the GEF Evaluation requirements the project will be subject to an independent Terminal Evaluation. Additionally, a Mid-Term Review will be commissioned and launched by the project manager before the project reaches its mid-point.

Terminal Evaluation. This will be managed jointly by UNEP and IUCN Evaluation Offices. The UNEP Evaluation Office will, however, lead the Terminal Evaluation (TE) and will liaise with the IUCN Evaluation Office throughout the process. Key decision points in the evaluation process will be made jointly by both Evaluation Offices in a collaborative manner [finalisation of Evaluation ToRs, Selection of independent evaluation consultants and acceptance of draft and final reports]. The TE will provide an independent assessment of project performance in terms of relevance, effectiveness and efficiency, and determine the likelihood of impact and sustainability. It will have two primary purposes: (i) to provide evidence of results to meet accountability requirements, and (ii) to promote learning, feedback, and knowledge sharing through results and lessons learned among UNEP, IUCN and executing partners. The direct costs of the evaluation will be charged against the project evaluation budget.

The UNEP Task Manager will inform the UNEP Evaluation Office of the approaching Terminal Evaluation one year before the operational completion of the project.

The TE report will be sent to project stakeholders for comment. Formal comments on the report will be shared by the Evaluation Offices in an open and transparent manner. The project performance will be assessed against standard evaluation criteria using a six point rating scheme. The final determination of project ratings will be made by the Evaluation Offices of UNEP and IUCN when the report is finalised. The evaluation report will be publically disclosed and may be followed by a recommendation compliance process

Mid-term Review. An implementation review will be scheduled during the third quarter of the second implementation year. The aim will be to look back on the project implementation mechanisms and progresses, likelihood of achieving project objective and outcomes. In order to improve efficiency of the project implementation, recommendation for improvement of project implementation and execution will be carried out.

Output 4.2.3: Awareness Campaigns on Management of Natural Resources

The REWarD project will contribute to the dissemination of messages on requirements regarding the technical aspects of project implementation as well as messages related to the management of natural resources based on the results of the projects. The messages will be disseminated through several appropriate channels (e.g. radio, Internet, messages in schools) to be defined during the initial phase of the project. The implementing agencies, with their clearly articulated comparative advantages and targeted audiences, will build on their experience in supporting the preparation and dissemination of manuals linked to best practices in the management of environmental resources.

The national institutions to be involved in the communication, awareness strategies and campaigns will be identified among the inventories made as part of the “National Institutional Diagnosis and Consultations” carried out as part of the preparation for this project. Reference is made to the reports prepared by the national and regional consultants as presented in Annex S.

It is considered critical for the project to establish, from the onset, an effective system of communicating key messages to the project stakeholders and beneficiaries, and to provide required mechanisms for timely feedback.

One (1) percent of the GEF budget for the outputs 4.1.1, 4.1.2, 4.2.1 and 4.2.3 will be allocated to IW:Learn related activities. Reference is made to the overall budget for the GEF Budget in Annex F.

4. Incremental/Additional Cost Reasoning and Expected Contributions from the baseline, the GEFTF, LDCF, SCCF, and co-financing;

As mentioned in the beginning of Section 3 on the proposed alternative scenario, there are a number of actions under the SAP that have not yet been substantially addressed and thus remain challenges and contribute to the continued pressure on the environmental resources of the Volta basin. This Project will pick up and implement some of these priority actions. Likewise, other actions have been addressed but remain challenges – in some cases because available resources have been insufficient to deal with all relevant issues. This Project will strengthen and consolidate achievements towards the SAP already obtained by the baseline.

In the framework of implementing the SAP, the GEF funding will enable the consolidation of country and VBA efforts to reverse the trends of degradation of the Volta Basin resources through the adaptive ecosystem-based management by implementing a full range of sectoral interventions and establishing financial mechanisms contributing to the sustainable use and the maintenance of freshwater, ecosystem and biodiversity resources. The GEF resources will support incremental activities including:

- Component 1 will strengthen knowledge management and support the development and installation of a transboundary decision support system to *deliver up-to-date information for effective decision making and sustainable basin planning* to respond to environmental threats at basin, national, and local levels through: the development of water resource management and use models in the basin and related analytical tools investigating the climate change impacts within the VB-ISS, improved knowledge on values of the environmental capital, the ecosystem services and functions and the socio-anthropological impacts in the Volta basin, inventorying and assessments of shallow groundwater quality for pollution abatement.
- Component 2 has been designed to *support strengthening of transboundary governance*, planning, and capacity, also during extreme events related to climate change and variability. This will be achieved through: the establishment of an effective regional platform(s) for inter-ministerial dialogue, capacity building of the Volta Basin Observatory and

key national stakeholders on the VB-ISS modeling tools, information products delivered by early-warning systems aiming at strengthening local communities' preparedness and resilience, and a regional programme to fight against, and benefit from, aquatic invasive species.

- Component 3 will *implement practical measures on sustainable ecosystem management and alternative livelihoods* and will focus on activities directed at strengthening of resilience of vital ecosystems for sustainable livelihoods in the Volta basin, as well as a series of sectoral interventions, namely: minimization of climate risks posed to sustainable use of water for crop and livestock productions (through the Drought Early Warning system), as well as direct measures for sustainable fisheries management.
- Component 4 will work on *knowledge management and sharing, as well as effective M&E provisions* and systems. This will be achieved through the development and implementation of SAP-related and project-related communication strategies, an effective system of Project monitoring and evaluation, including mid-term and terminal evaluations, and the development and dissemination of International Water knowledge products using existing global information and knowledge sharing platforms, e.g. GEF IW: LEARN.

The GEF funding will work in synergy with and complement Government baseline programs and programs funded by other sources as described in the section 2b) of the Baseline Scenario.

National initiatives, strategies and projects have been discussed with the GEF National Focal Points to ensure that these processes were recently finalized, or under execution, or they will be executed over the lifespan of the REWarD project. In all cases, the outputs and outcomes of these processes will be contributing to and reinforcing the environmental benefits generated by REWarD. The contribution of co-financing is described in section C of Part 1 (page 4) of this document.

The required total co-financing from the basin countries is 4,2 mill USD. VBA will be in charge of coordinating this co-financing among the basin countries as per their normal procedures.

5. **Global environmental benefits (GEFTF) and/or adaptation benefits (LDCF/SCCF)**

The Global Environmental Benefits to be gained through the project are:

- Enhanced cooperation between Volta Basin Member States to reduce threats to transboundary water resources;
- Reinforced regional cooperation framework, and capacity i.e. Volta Basin Authority for the implementation of the associated Convention;
- Sustained freshwater ecosystems goods and services;
- Increased resilience to the adverse impacts of climate change and variability.

Under the guidance of the proposed project, it is expected that improvements in transboundary waters management will be realized. The implementation of the proposed SAP actions will contribute to the reduction of stress on the Volta basin's water and ecosystem resources and the improvement of the basin's environmental and water resources status. Implementing policy, legal and institutional reforms agreed to under the Volta Basin SAP, and providing VBA and riparian countries relevant, information, capacity and management tools, would facilitate achievement of these stress reductions and environmental status improvements. National budgets will increase to allow VBA to implement restoration and

management actions already planned. This will help countries to meet relevant commitments under the relevant components of the SAP and increase the viability of the basin's ecosystems through sustainable harvesting of environmental resources and good management of changes in climatic trends.

6. Innovativeness, sustainability and potential for scaling up.

The project is designed to strengthen the VBA and riparian countries to enable implementation of the SAP and the longer-term goals of ecosystem-based management within the basin. It will support the functioning of the VBA through the implementation of selected SAP actions.

In recognition of the significant investments needed to fully implement the SAP, the project will, as an innovative first step, support the reinforcement of hydro-meteorological networks and associated climate predictions tools, studies to identify Volta Basin investment opportunities and pilot possible elements of these investments through demonstration project and small grant programmes to facilitate community stress reduction activities. These actions will demonstrate to the countries and VBA technical and financial partners' effective means within the region to initiate the significant SAP investments and provide both a potential for sustaining the support (and strengthening local livelihoods) for the SAP.

In addition, the project is supporting the VBA to implement a coherent monitoring, data and information system to strengthen decision making for the management of Volta Basin. This will be developed to assist the process of disseminating environmental information to stakeholders within the region, where information is currently limited. By improving access to information, the local community projects and management activities will be better understood and, the sustainability of the project interventions ensured.

[1] The term 'hotspot' is adopted from the Volta Basin SAP where it is not further defined. In the context of this project it refers to a geographic location of high importance under pressure or threat. For example, a biodiversity hotspot is a biogeographic region with significant levels of biodiversity that is threatened by human habitation. A pollution hotspot is a location where emissions from specific sources may expose people or environmental assets to elevated risks of adverse health or environmental effects.

[2] For biodiversity projects, in addition to explaining the project's consistency with the biodiversity focal area strategy, objectives and programs, please also describe which [Aichi Target\(s\)](#) the project will directly contribute to achieving..

[3] Zambezi Water Resources Information System (ZAMWIS) Enhancement 3: Hydro-meteorological Database and Decision Support System, Implemented by the ZAMCOM Secretariat 2017-2019. Funded by the World Bank

[4] Operational Decision Support System through Enhanced Hydro-Meteorological Services. Shire River Basin Management Program (Phase 1), Malawi, Final Report, August 2018. Funded by the World Bank

[5] Zambezi Water Resources Information System (ZAMWIS) Enhancement 3: Hydro-meteorological Database and Decision Support System, Implemented by the ZAMCOM Secretariat 2017-2019. Funded by the World Bank

- [6] Development of the Ayeyarwady Decision Support System and Basin Master Plan. Directorate of Water Resources and Improvement of River Systems, Myanmar. September 2019. Funded by the World Bank
- [7] UNEP-GEF Volta Project, 2014. Volta Basin Strategic Action Programme UNEP/GEF/Volta/RR, 1/2014, p. 24.
- [8] Personal communications with VBA leadership during a workshop held in Ouagadougou, Burkina Faso, in Feb 2017.
- [9] Optimization of operation of infrastructure, e.g. dams, is beyond the scope of the current project.
- [10] GEF WB Volta River Basin Strategic Action Programme Implementation Project, GEF ID 6964, Project Document, p.20.
- [11] UNEP-GEF Volta Project, 2013. Volta Basin Transboundary Diagnostic Analysis. UNEP/GEF/Volta/RR 4/2013, p. 96.
- [12] Five aquatic weeds are especially problematic in West Africa: water hyacinth, *Eichhornia crassipes* (Mart), Solms-Laubach (*Pontederiaceae*); red water fern, *Azolla filiculoides* Lam. (*Azollaceae*); parrots feather, *Myriophyllum aquaticum* (Vell.) Verdc. (*Haloragaceae*); water lettuce, *Pistia stratiotes* L. (*Araceae*) and *Salvinia*, *Salvinia molesta*, Mitchell (*Salviniaceae*) (Cilliers et al., 2003).
- [13] BioControl (2012) 57:263–276, Daniel Simberloff, 2012- Risks of biological control for conservation purposes.
- [14] Meulenbroek, P., Stranzl, S., Oueda, A., Sendzimir, J., Mano, K., Kabore, I., Ouedraogo, R. and Melcher, A. 2019. Fish Communities, Habitat Use, and Human Pressures in the Upper Volta Basin, Burkina Faso, West Africa. Sustainability 2019, 11, 5444; doi:10.3390/su11195444.
- [15] Béné C., and Russell, A.J.M., 2007.- Diagnostic study of the Volta Basin fisheries. Part 1 - Livelihoods and poverty analysis, current trends and projections. Volta Basin Focal Project Report No 7. WorldFish Center Regional Offices for Africa and West Asia, Cairo Egypt, and CPWF, Colombo, Sri Lanka, 67 p.

A.2. Child Project?

If this is a child project under a program, describe how the components contribute to the overall program impact.

Not applicable

A.3. Stakeholders

Please provide the Stakeholder Engagement Plan or equivalent assessment.

A part of the project is to support the dialogue between “water stakeholders” in the basin. As described under activity 2.1.1.1 VBA has an annual Basin Stakeholders Forum, which is an information, awareness and exchange platform for the main players in the water sector, to improve water governance in the Volta Basin. In order to ensure that national policies and institutions support the sustainable management of water resources in the basin, the project will work to strengthen the current objectives of the Annual Basin Stakeholders Forum so that this platform effectively integrates results and planning initiatives at country level in a process of transboundary management of water resources.

The project will also support VBA in the establishment and operationalization of the Inter-parliamentary Committee of the Volta Basin enshrined in the Basin Water Charter adopted in May 2019 by the 7th Ordinary Session of the Council of Ministers of the VBA. Reference is made to activity 2.1.1.1 for more detailed information on this support.

The principal stakeholders of this Project are identifiable at three major levels (regional, national, and local):

- The primary stakeholder is the VBA and its organs in charge of managing the basin water resources along with identifying, designing and implementing related regional projects; At the regional level, the Water Resources Coordination Centre of ECOWAS and the Global Water Partnership for West Africa are also the relevant partners,
- At the national level, the principal stakeholders include the six national governments, the six ministries responsible for water resource management, the six ministries responsible for environmental protections and sustainable development, the six national VBA Focal Structures, the civil society organizations and the research institutions and universities,
- At the local level, the stakeholders include the local authorities, local decision-makers, and rural communities including organizations dedicated to advancing the agendas of vulnerable groups.

Despite significant range of activities to be implemented at the local level, there have not been indigenous groups identified as stakeholders or beneficiaries of the Project.

During the design of this Project, the VBA has compiled a directory of NGOs and civil society in the Volta basin. This inventory will be reviewed and, if necessary, updated in the initial phases of the Project implementation.

Documents

Title	Submitted
In addition, provide a summary on how stakeholders will be consulted in project execution, the means and timing of engagement, how information will be disseminated, and an explanation of any resource requirements throughout the project/program cycle to ensure proper and meaningful stakeholder engagement.	

Select what role civil society will play in the project:

Consulted only; Yes

Member of Advisory Body; Contractor;

Co-financier;

Member of project steering committee or equivalent decision-making body;

Executor or co-executor;

Other (Please explain)

A.4. Gender Equality and Women's Empowerment

Please briefly include below any gender dimensions relevant to the project, and any plans to address gender in project design (e.g. gender analysis).

A commonly used indicator is the World Economic Forum's (WEF) Global Gender Gap Index (GGGI). It measures the size of the gender inequality gap in four key areas: health and survival, educational attainment, economic participation and opportunity and political empowerment. It is clear that there is a wide array of socio-economic conditions among the participating VBA countries, with several shared challenges in regards to gender equality and women's empowerment. The VBA countries also have gaps in gender equality. The biggest disparities are in education outcomes, followed by health. However, economic participation is considered to be more gender equal than any other field. This suggests that women make a significant contribution to economic activities and income generation.

Documents

Title

Submitted

Does the project expect to include any gender-responsive measures to address gender gaps or promote gender equality and women empowerment?

Yes

If yes, please upload document or equivalent here

If possible, indicate in which results area(s) the project is expected to contribute to gender equality:

Closing gender gaps in access to and control over natural resources;

Improving women's participation and decision making Yes

Generating socio-economic benefits or services or women Yes

Will the project's results framework or logical framework include gender-sensitive indicators?

Yes

Gender mainstreaming will be promoted at the earliest stages of the project cycle (e.g. implementation of water management measures, participation in VBA stakeholder fora, contribution in policy development, etc.). Men and women will participate in the initial stages of project conception, approval and implementation. The needs assessment will be done at the project development phase and be used to define the roles of women and men early in the project. This will help to minimize conflict among different stakeholders during and after the project cycle with respect to roles in project activities and sharing of project benefits. It is planned to document the contribution of women to project activities in key areas where women already figure prominently.

Field activities/initiatives will be developed and implemented taking into consideration gender equality and disparities aspect. Furthermore, the socioeconomic benefits and gender mainstreaming will serve to strengthen the impacts of the interventions on the management of the Volta basin. There is a mutually reinforcing effect between and among the objectives of improving the environment, optimizing economic benefits and improving the role of women in project formulation and implementation. In practice, each component will be implemented using a gender-sensitive approach.

Thus, the first component of the project is expected to improve the knowledge base and develop management tools for informed decision-making process. The generated knowledge and developed management tools should be accessible to both men and women groups within the Volta with the aim of improving women's participation in decision making. To do this, the generated information will be made accessible and user-friendly. It will communicate to appropriate local language to facilitate their use by both men and women.

In component 2, the project is aiming at strengthening the transboundary planning, and regional and in-country coordination and capacity. This is to ensure stakeholders at regional, national and sub-national have enough capacity to plan development taking into consideration the transboundary nature of the available resources in the basin. Efforts will be made to ensure that in the various regional and country level dialogue, both men and women are represented to ensure gender-sensitive deliberations from these dialogues. It is the responsibility of the executing agencies and partners to ensure balanced representation of men and women in the regional and national dialogues, and that deliberations are gender-sensitive.

Under component 3, the project intends to conserve and restore ecosystems for sustainable livelihoods in the Volta Basin. This is critical for both women and men who depend on healthy ecosystems to sustain their livelihood. The project will provide women and men with knowledge on ecosystem-based approach to crop, livestock and fishing activities. It will also ensure that women and men have access to ecosystem-based practices and technologies for cropping, livestock rearing and fishing activities. In doing so, the project will support women and men to generate socioeconomic benefits from restored ecosystems, improving their livelihood.

In order to achieve this, the following steps will be taken during the Inception phase:

- (i) During design of individual activities of the Project a special effort will be put into including men and women from the beginning of project design, development approval an implementation. This will bring out the different perspectives and roles and responsibilities with regard to water use and water management at regional, national, sub-national, and community level. Furthermore, this will provide a better understanding on how these roles will impact or have impacted on the interventions for managing the Volta basin.
- (ii) Given that a needs assessment will be carried out, a gender and water experts will be involved as a part of the assessment team. These experts will guide and assist in collecting the relevant sex disaggregated data and analysing it so as to provide a better understanding of the gender dynamics in water management. The information gathered and analysed ought to fit into Component 3 (Conserving and restoring ecosystems for sustainable livelihoods in the Volta basin).
- (iii) Most countries in the Volta basin are committed to promoting the gender issues. The project will build on the existing national strategies to ensure that all deliveries are complying with and create appropriate framework for gender-sensitive transboundary management of the Volta river and its natural resources.

During implementation, the project team will address, among others, the four criteria of the Corporate Gender Marker and visibly reflect gender perspectives in 1) context analysis, 2) implementation and individual actions, 3) indicators, and 4) budget, if possible.

A.5. Risks

Elaborate on indicated risks, including climate change, potential social and environmental risks that might prevent the project objectives from being, achieved, and, if possible, the proposed measures that address these risks at the time of project implementation.

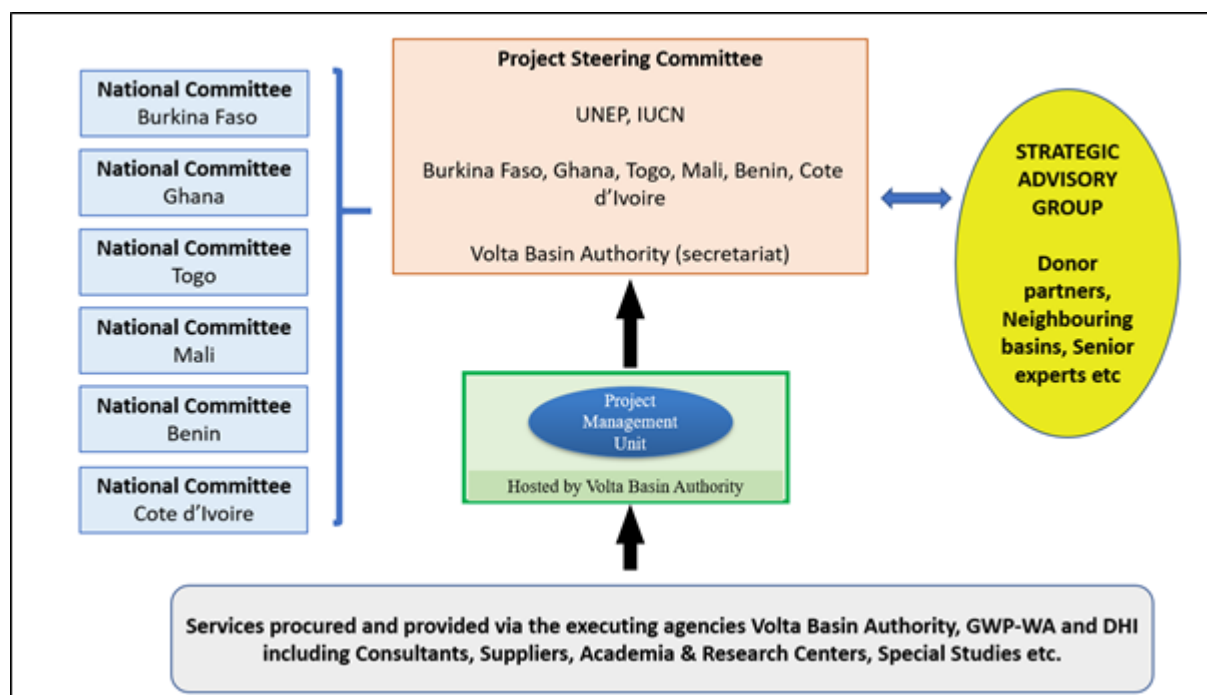
RISK	PROBABILITY	RISK MITIGATION
Delays/obstacles to project implementation due to the regional nature of the project and involvement of 6 countries	Low to medium	Special efforts will be put into close engagement with national-level authorities and stakeholders, including private sector and grass-root community-based organizations. Timely engagement and an effective communication strategy will be designed to assure buy-in and ownership of key stakeholder and beneficiary groups.

RISK	PROBABILITY	RISK MITIGATION
Population growth and unregulated industrialization might result in additional pollution loads to the Volta River so that the implementation of SAP will not result in improvement of the ecosystems status	Medium	Constant monitoring of the progress in the implementation of the activities coordinated by VBA and constant monitoring of the status of the Volta Basin during the project will provide an assessment of whether SAP implementation will result in the desired improvement of ecosystem status. Under adaptive management, the SAP needs to be updated to take increased pollution loads into due consideration. This would be done hand in hand with the incorporation of climate variability and change issues into the SAP.
Low level of environmental awareness in the basin, particularly in a transboundary context	Medium	The project will promote the participation of interested stakeholders through cultural and educational activities and improve environmental communication with Volta Basin communities. A series of public awareness campaigns will support strengthening of environmental knowledge among stakeholders.
Limited institutional coordination and unclear institutional responsibilities at regional, national, sub-national, and local level	Low to medium	National institutions of the Volta Basin countries are relatively consolidated with defined powers. The project design also provides activities that will support institutional strengthening, and training of human resources for the implementation of the SAP, as well as a series of communications and public awareness activities.
The SAP PA B.3 (IAS) mentions the use of living control agents and the risk of them spreading out of control. The following risks have been identified: (i) Direct and indirect effects on non-targets, (ii) Dispersal of a bio-control agent to a new area, either autonomously or with deliberate or inadvertent human assistance, and (iii) Changed relationships between a control agent and a native species, particularly as generated by global climate change	Low to medium	A special IAS spread prevention strategy will be developed at earlier stages of work related to alien species and closely followed during the implementation process. The strategy will include four key aspects (wherever relevant): 1. Prevention. 2. Early detection and rapid response. 3. Control and management. 4. Rehabilitation and restoration.
Basin states not willing to release their data and be subjected to the quality assurance measures that have been proposed to ensure confidence in the quality of the data in the database(s).	Low to medium	The countries have a long-standing history of joint coordination, including data exchange in a number of previous projects, also evidenced by their contributions of data to the VBA. The project will provide the technical support to further strengthen the information sharing and data exchange. The progress of strengthening of the Volta Basin Observatory at will provide additional capacity and engagement of individual countries.
There is a risk of unintended negative impact on fragile ecosystems, since the project area is a site of global significance in terms of biodiversity, particularly in Component 3, within which restoration activities and sectoral interventions (pilots) are planned.	Low to medium	Project team will give special care for restoration and sustainability of the ecosystem in order not to bring “unintended” or “indirect” negative consequences to the fragile ecosystems. A corresponding analysis and environmental impact assessment will be carried out during the design of measure but prior to implementation. Social surveys will also be conducted.

RISK	PROBA-BILITY	RISK MITIGATION
A lack of political will to implement the legislation (a Master Plan, a Regional Invasive Species Programme, etc.) in the basin countries and to integrate basin-wide management/ monitoring frameworks and administrative procedures.	Low	Through VBA, countries have a history of coordination and willingness to implement joint management activities. The proposed activities of developing basin-wide frameworks are proposed by the countries themselves and have involved stakeholders from key sectors to be engaged with in the Project. The project will provide the necessary technical support to strengthen these frameworks through the enhanced institutional capacity of VBA, as well as national institutions in the countries.
Poor coordination among various projects supported by different entities, leading to sub-optimal results delivery or duplication or work.	Low	VBA has demonstrated a strong programme coordination capacity since the establishment and continues to coordinate the various projects and regional initiatives in its portfolio. The project will maintain close collaboration and coordination with all relevant initiatives under the guidance of VBA, as well as other international and national interventions in the Volta Basin.
Staff to be trained (e.g. in the use of water resource tools) will not have sufficient basic skills to be able to fully benefit from the training. The staff to be trained will not be the persons responsible for carrying out the respective tasks in their respective countries after the training	Low to medium	Profiles shall be prepared for the course participants with detailed requirements to the qualifications and functions of the participants.
The security situation in some parts of the basin will not allow for the planned field work to take place.	Medium	The selection of locations for field work shall take into account the security aspects. The security situation for the selected pilot sites /field work shall continuously be monitored.
The staff trained in the operation and maintenance of the water resource tools will be promoted or leave their respective organisations (VBA or national ministries) without being replaced by trained staff.	Medium	A sustainability plan addressing this risk shall be prepared and adopted by VBA and the national ministries.

A.6. Institutional Arrangement and Coordination

Describe the Institutional arrangement for project implementation. Elaborate on the planned coordination with other relevant GEF-financed projects and other initiatives.



Project Management Structure for the REWarD Project

The VBA is the obvious regional anchor point for this project. Given its role and mandate, including to coordinate projects like REWarD, VBA will have a key role in the execution of the project, particularly coordination of the national project support mechanisms, namely inter-ministry Coordinating Committees, organisation of project Steering Committee and reporting to the VBA Council of Ministers. The VBA will also facilitate and ensure coordination of all interventions including those supported by its Group of Technical and Financial Partners.

The Volta Basin Authority (VBA) will host the Project Management Unit (PMU) for the REWarD Project. The staff of the PMU will be located at the VBA Head Office in Ouagadougou.

The Project Management Unit will be guided by the Project Steering Committee (SC) having representatives of UNEP and IUCN[1] as well as representatives from the six basin countries. As accredited GEF agencies, UNEP and IUCN will function as Implementing Agencies for this project. These two organisations will collaboratively oversee the implementation of the project. Both agencies will report on the progress of the implementation to the GEF secretariat.

The Project Steering Committee (SC) will be the project level decision making mechanism, deciding on the project implementation direction and overseeing the implementation progress. The SC will guide the PMU and approve the inception report as well as the following progress reports and workplans. The SC will meet at least once a year. The SC will have an opportunity to comment on the TORs for the mid-term review and the terminal evaluation. UNEP will lead the mid-term review and the terminal evaluation. IUCN Evaluation Office will contribute and be kept informed and involved as appropriate.

The Steering Committee may establish and seek advice from a Strategic Advisory Group consisting of donors, other transboundary basin organisations, individual experts or universities/research centres. VBA will serve as secretariat for the Steering Committee and will be assisted by the PMU in this function.

At the national level, Inter-Ministry Coordinating Committees will be formed based on the existing national structures. These national committees will serve as the national coordinating mechanisms as the activities will involve relevant ministries and institutions. The national committees will provide input through the VBA national focal points to the Project Steering Committee.

When there are needs for political decisions, VBA and its member countries will bring such issues to the Council of Ministers.

The Project Management Unit (PMU) is responsible for the efficient and timely execution of the project activities as well as proper technical and financial reporting. The staff of the PMU will include:

- Project Coordinator/ IWRM Specialist (full time)
- Admin assistant (fulltime)
- Procurement Officer (part time)
- M&E Specialist (part time)

Above staff will be recruited by VBA and paid by the REWarD project. UNEP and IUCN shall approve the Project Coordinator before his/her contract can be signed.

The specific tasks of the PMU are:

- Project management
- Overall planning of the project activities

- Support VBA in its secretarial function for the Project Steering Committee

- Monitoring, evaluation and reporting

- Preparation of TOR for basin (regional) activities

- Procurement of consultancy services for basin (regional) activities

- Supervision of the basin (regional) activities

- Support the preparation of TOR for consultancy services for national activities in collaboration with national counterparts and executing agencies

- Support national counterparts in relation with planning and execution of national activities including M&E activities.

- Supervision of national activities

The Executing Partners of the project will include:

- VBA as the host of the PMU for executing regional activities

- DHI for development of water resource management tools and capacity building[\[2\]](#)

- GWP-WA for executing national activities funded by GEF via UNEP

- IUCN-Burkina Faso Country Office for executing national activities funded by GEF via IUCN

GWP-WA and IUCN Burkina Faso Country Office will ensure flow of respective funds to relevant entities in the basin countries for the national activities.

Service providers will be those entities (consulting firms or contractors) to be selected for the various basin or national tasks based on specific TOR and procurement procedures.

Coordination with other relevant GEF-financed projects and other initiatives.

The project will link with ongoing and future initiatives to be undertaken by key donors by supplying necessary knowledge and tools on adaptive ecosystem-based management. In the inception phase, in-depth consultations will be undertaken to establish partnerships and practical modalities for linking and collaborating with the relevant initiatives so that the GEF resources build on the already available achievements.

A strategy and plan for collaboration with relevant ongoing and planned initiatives will be prepared during the initial phases of the project, including defining the roles and responsibilities of critical stakeholders.

Consultation between the other ongoing related initiatives (see list in Project Justification section) will be continued to ensure that duplication is avoided, and synergies are maximized. The REWarD project will seek to learn from the experiences gathered by other projects. Also, MoUs or collaboration frameworks will be pursued with other initiatives (mainly WISE-UP, WACDEP, WASCAL, GWP/WA, OSS and the Integrated Flood and Drought Management and Early Warning Project) in view of the coordination and implementation of joint activities.

Several projects are being implemented or developed by IUCN in the Volta Basin. Among the ongoing projects led by IUCN, the world bank-funded Dedicated Grant Mechanism to support forest dependent communities in Burkina Faso (PAPF). This project runs from 2015 to 2020 and cover five administrative regions, of which four are in the Volta Basin. The objective of this project is to strengthen the capacity of targeted local communities (CLs) to facilitate their participation in the forest investment programme and other REDD + programs at local, national and global levels. In Ghana, IUCN is implemented a project on Stabilising Land use (PLUS) whose objective is to demonstrate conservation and development benefits in landscapes. This project runs from 2017 to 2020; and is funded by the German Federal Ministry for the Environment, Nature Conservation and Nuclear Safety (BMU). The European Union funded Global project Biodiversity and Protected Area Management (BIOPAMA II) is implemented by IUCN from 2017 to 2023. Its overall objective is to contribute to improving the long-term conservation and sustainable use of biodiversity and natural resources in Africa, Caribbean and Pacific regions in protected areas and surrounding communities through better use and monitoring of information and capacity development on management and governance. Its covers all protected areas within the Volta, and other African protected areas. The project on Regional Governance and Security of Protected Area is being implemented by IUCN from 2019-2023 and funded by the European Commission. This project focus on protected areas, including those in the Volta Basin and aims at contributing to the integrated protection of diversity and fragile ecosystems and enhanced resilience to climate change in West Africa. IUCN is also implementing a project on West African Mangrove ecosystems, including Ghana, Benin and Togo as Volta Basin Member countries. This project est funded by the European Commission and run from 2019-2023 with the objective of achieving integrated protection of the diversity and fragile ecosystems of Mangrove in West Africa and enhanced their resilience to climate change. The portion of the intervention areas in Ghana for this project entitled “Management of mangrove forests from Senegal to Benin” is linked the Reward Project. Finally, IUCN is about to start the implementation of a project funded by the Embassy of Sweden in Burkina Faso from 2020-2023. This project entitled “Regional Partnership on Water and Environment in West and Central Africa-PREE” aims at strengthening institutional capacities of sub-regional basin authorities, including the Volta Basin Authority to effectively implement the Integrated water resources management approaches in order to reduce natural resources related conflicts and climate change effects.

[1] IUCN will be represented by IUCN Regional Office West Africa in the Steering Committee.

[2] Contract to be signed directly between UNEP and DHI.

Additional Information not well elaborated at PIF Stage:

A.7. Benefits

Describe the socioeconomic benefits to be delivered by the project at the national and local levels. How do these benefits translate in supporting the achievement of global environment benefits (GEF Trust Fund) or adaptation benefits (LDCF/SCCF)?

Socio-economic benefits for the target communities in the riparian countries will be realized from a number of interventions proposed in the project. By promoting adaptive management and providing opportunities for livelihood improvement, it is envisaged that the Project will contribute to improve living conditions of the inhabitants of the Volta Basin countries. The Project will also contribute to countries' progress towards achieving several of the Sustainable Development Goals (SDG). Through innovative actions on water management, the project will increase opportunities for improving livelihoods and provide concrete benefits to smallholder farmers and pastoralists, both men and women. By enhancing access to water and ecosystem goods and services and using them in a sustainable manner, local communities will benefit from increased food production, enhancing food security and restoring productive natural resources.

A.8. Knowledge Management

Elaborate on the Knowledge management approach for the project, including, if any, plans for the project to learn from other relevant projects and initiatives (e.g. participate in trainings, conferences, stakeholder exchanges, virtual networks, project twinning) and plans for the project to assess and document in a user- friendly form (e.g. lessons learned briefs, engaging websites, guidebooks based on experience) and share these experiences and expertise (e.g. participate in community of practices, organize seminars, trainings and conferences) with relevant stakeholders.

It is suggested to develop a detailed knowledge management and communication plan during the inception phase of the project. To facilitate knowledge exchange and establish network between the project partners and basin stakeholders and, links will be established with the IW-Learn Project and Volta Basin Observatory activities. Project documents, including policy briefs, briefing notes lessons learnt, good practices, policy, planning and management tools, training materials, studies and workshops reports will be widely disseminated, primarily through the project website, project information leaflets, stickers and brochures, and presentation of the project at different international and regional meetings as well as during courtesy visits to project partners. Several radio and TV interviews will be conducted, and documentaries prepared in collaboration with the VBA during various regional and national workshops.

Also, various workshops, trainings and awareness creation sessions planned in the framework of the project will offer the opportunity to share and disseminate knowledge with basin's stakeholders at all levels. In addition to that, the project will establish mechanism for experience and knowledge sharing with; i-) ongoing initiatives related to international waters and climate change, ii-) transboundary river basin authorities, African network of basin organizations, International network of basin organizations, iii-) national, regional and international institutions and, civil society.

The project will study and learn from the lessons learned during the previous GEF-supported project to the Volta Basin: ‘Addressing Transboundary Concerns in the Volta River Basin and its Downstream Coastal Area’, implemented 2007-13. The design of the REWarD project has benefited from the lessons learned from that project in at least the following aspects:

- *“Engaging an existing regional basin organization (VBA) in the execution of project activities and for future SAP implementation is a very effective strategy to help achieve the objectives, strengthen country ownership, and sustain project outcomes following project closure”*: VBA is a key executing partner of the REWarD project.
- *“In projects that have a strong technical focus (development of TDA and SAP in the case of the GEF Volta project) provisions must be made to ensure the availability of adequate technical support in addition to managerial capacity.”*: REWarD has strong technical focus (particularly the DSS development) and to support this aspect, DHI is an executing partner.
- *“Unrealistic co-finance pledges particularly cash co-finance, and overestimation of countries’ ability to mobilize funds can seriously threaten progress at the national level, with potential repercussions on overall achievement of project objectives.”*: Countries have pledged co-financing to the tune of almost USD 80 million, but all in the form of in-kind support by other projects, i.e. the implementation does not hinge on availability of cash funding from national governments.
- *“The time required for completion was under estimated. Regional projects of this scope and complexity require many adjustments, revisions, and, ultimately, extensions, etc. during implementation, which can have significant cost implications even though extensions are labelled ‘no-cost’.”*: The duration of the REWarD project (five years) is estimated to be on the safe side for most outputs and activities.
- *“Demonstrating that concrete benefits to stakeholders could be derived from specific management measures greatly increases stakeholder buy-in during project implementation and the prospects for uptake and sustainability of results after the project ends.”*: Particularly component 3 adopts this approach in engaging stakeholders and local communities.

B. Description of the consistency of the project with:

B.1. Consistency with National Priorities

Describe the consistency of the project with nation strategies and plans or reports and assessments under relevant conventions such as NAPAs, NAPs, ASGM NAPs, MIAs, NBSAPs, NCs, TNAs, NCSAs, NIPs, PRSPs, NPFE, BURs, INDCs, etc.

The ratification of the Convention on the Status of the Volta River and the Establishment of the Volta Basin Authority and the on-going development process of a Water Charter for the Volta river basin are clear indications of the basin’s riparian countries willingness to promote international cooperation for the rational and sustainable management of the water resources of the Volta Basin and for socioeconomic integration between the neighbouring countries. The proposed IW project will enhance this cooperation among the Volta basin

countries by supporting reform of regional and national water governance, strengthening national inter-ministerial coordination, building national and regional capacities, and improving public participation for better achievement of the Volta Basin environmental stewardship.

Developed in the framework of the UNEP-GEF Volta Project entitled Addressing Transboundary Concerns in the Volta Basin and its Downstream Coastal Areas, the Volta Basin Strategic Action Programme (SAP) was endorsed by riparian countries in 2014. The SAP is the final output of a regional consultation process, which involved the Volta Basin riparian countries, the VBA and International Partners, together with contributions from academics and members of various NGOs active in the region. The SAP evolved from the goals and objectives that are articulated in the basin vision, as stated in the VBA Strategic Plan (2010-2014): “a basin shared by willing and cooperating partners managing the water resources rationally and sustainably for their comprehensive socioeconomic development”.

The proposed project is anchored firmly in the priorities identified in the SAP and will address the following Environmental quality objectives (EQO):

- EQO 1: water is optimized among primary users (domestic, agricultural, ecosystem and hydroelectric power) so that they receive adequate and sustainable supplies
- EQO 3: the proliferation of invasive aquatic species is contained, especially in five priority biodiversity hotspots
- EQO 4: sedimentation in five key hotspots is reduced by 20 per cent by 2025
- EQO 5: critical ecosystem functions are conserved, restored and managed for sustainable use in at least five priority areas
- EQO 6: water of sufficient quality is available to support ecosystem needs at four pollution hotspots

The most important international agreements applicable to the management of water resources in the Volta Basin are the Convention on Biological Diversity, the United Nations Framework Convention on Climate Change, the United Nations Convention to Combat Desertification and the Convention on Wetlands (the Ramsar Convention). All six basin countries are signatories to these conventions. Another key convention is the Convention on the Law of Non-Navigational Uses of International Watercourses but of the six basin countries, only Benin and Burkina Faso and Cote d’Ivoire have ratified it.

All six basin nations are also members of ECOWAS. The mission of ECOWAS is to promote economic integration in "all fields of economic activity, particularly industry, transport, telecommunications, energy, agriculture, natural resources, commerce, monetary and financial questions, and social and cultural matters". Three major documents adopted by ECOWAS are particularly pertinent: the policy document of water resources in West Africa (2007), the West Africa IWRM Action Plan and the ECOWAS Environment Policy (2008). ECOWAS has also developed a regional agricultural policy for West Africa (2008), and a sub-regional program of actions to reduce the vulnerability of West Africa to climate change (PASR-RV-AO) under the auspices of ECOWAS. These provide guidance and a framework for necessary regional cooperation.

Riparian countries have completed their National Adaptation Programmes of Actions (NAPA), National Adaptation Plan (NAP), Intended Nationally Determined Contributions (INDCs), National action plan to combat desertification, IWRM action plans and other tools related to biodiversity conservation/restoration and climate change, and projects are on-going to ensure the resilience of livelihoods. The project will support countries to meet their commitments. Linkages with Poverty reduction strategies and Sustainable development goal are expected in the view of investment aiming to demonstrate sustainable ecosystem management and alternative livelihood approaches. Further clarification on linkages will be done at CEO Endorsement.

This project is consistent with GEF’s International Waters as described in the Final GEF-6 Programming Document. The project focuses on the implementation of the Volta Basin SAP which is anchored on integrated, ecosystem-based approaches to the sustainable management of the basin. It will establish conditions for adaptive ecosystem-based management. Through (i) the improvement of knowledge and information on natural resources at basin scale, (ii) the promotion of investments that improve water quality and quantity, protect

biodiversity, restore ecosystem functions and services and sustain livelihoods, the project aims at reversing ecosystem and water degradation and supporting integrated ecosystem-based development in the Volta River Basin. Based on priorities identified in the SAP and existing regional Plans, the project will implement innovative transboundary actions to improve water efficiency use and promote IWRM, including through local, community-based actions. The potential impacts of climate change will be embedded in the management actions directed towards ecosystem carrying capacity as the central theme of the project. The project will also deliver additional outputs such as enhanced public awareness and strengthened stakeholder capacity to carry out actions.

C. Describe The Budgeted M & E Plan:

Type of M&E activity	Responsible Parties	Budget from GEF	Time Frame
Inception Meeting	Project Management Unit	25,000 USD	Within 3 months of project start-up
Inception Report	Project Management Unit	Part of Project Management Costs	1 month after project inception meeting
Measurement of project indicators (outcome, progress and performance indicators, GEF tracking tools) at national and global level	UNEP & IUCN based on reports prepared by the Project Management Unit	Part of Project Management Costs	Outcome indicators: start, mid and end of project Progress/perform. Indicators: annually
Semi-annual Progress/ Operational Reports to UNEP and IUCN	Project Management Unit	Part of Project Management Costs	Within 1 month of the end of reporting period i.e. on or before 31 January and 31 July
Project Steering Committee (PSC) meetings	VBA with support from PMU	15,000 USD per PSC meeting = 75,000 USD	Once a year / 5 years
Reports of PSC meetings	VBA with support from PMU	Part of Project Management Costs	Annually
PIR	Project Management Unit	Part of Project Management Cost	Annually
Monitoring visits to field sites	Project Management Unit	Part of Project Management Costs	As appropriate
Mid Term Review/Evaluation	UNEP and IUCN possibly via external consultants	45,000 USD	At mid-point of project implementation

Terminal Evaluation	UNEP and IUCN possibly via external consultants	75,000 USD	Within 6 months of end of project implementation
Audit	UNEP & IUCN to minitor this is done by external auditor booked by the PMU	Part of Project Management Costs	Annually
Project Final Report	Project Management Unit based on TA inputs from the project components	Part of Project Management Costs	Before the project completion date
Co-financing report	Project Management Unit	Part of Project Management Costs	Within 1 month of the PIR reporting period, i.e. on or before 31 July
Publication of Lessons Learnt, Guielines and other Project Pocuments	Project Management Unit based on TA reports	Part of budget for knowledge products	As per implementation schedule of the technical tasks
Total M&E Plan Budget		220,000 USD	To be covered by budget for component 4.

PART III: Certification by GEF partner agency(ies)

A. GEF Agency(ies) certification

GEF Agency Coordinator	Date	Project Contact Person	Telephone	Email
Kelly West, UNEP	12/18/2019	Takehiro Nakamura	254207623886	Takehiro.nakamura@un.org
Sheila Aggarwal-Khan, IUCN	12/18/2019	Jacques Somda	22625313154	Jacques.somda@iucn.org

ANNEX A: PROJECT RESULTS FRAMEWORK (either copy and paste here the framework from the Agency document, or provide reference to the page in the project document where the framework could be found).

Component 1: Improvement of knowledge base and development of management tools for informed decision making					
Outcomes	Outcome indicators	Baseline	End of project targets	Means of verification	Assumptions
Outcome 1.1 The transboundary network of data collection/processing/modelling delivers up-to-date information for decision making and basin planning to respond to environmental threats at basin, national, and local levels.	Capacity/frequency of VBA to prepare evidence-based decision support to facilitate an informed dialog between the basin countries on the management of the transboundary water resources (e.g. water allocation/sharing, environmental concerns, water efficiency)	Insufficient tools and guidelines to support decision making in relation to water resource management and environmental protection in the basin. Lack of common and trusted tool(s) shared by all basin countries	VBA and national beneficiaries are trained and use the developed tool(s) to support the basin dialogue and decision making.	Functional tools. Training Reports. Study Reports. See details under output 1.1.1, 1.1.2 and 1.1.3. Minutes of high-level meetings in VBA	Support and commitment from national authorities. See details under output 1.1.1, 1.1.2 and 1.1.3.
Outputs	Output Indicators	Baseline	End of project targets	Means of Verification	Assumptions

<p>Output 1.1.1</p> <p>Annual surface water resources models and Decision Support Tools made available to support optimization of water use and flows to minimize negative environmental impacts (link to output 2.2.1)</p>	<p>The Decision Support Tool is being used as well-respected common reference during planning discussions among stakeholders and authorities in the basin.</p> <p>The Decision Support Tool is efficiently contributing to the final decisions taken by the national water resource authorities in the VBA context.</p>	<p>No operational transboundary water resource Decision Support Tool to assist national and basin authorities in their water resource management including serving the purpose of “common reference”.</p>	<p>At least two staff members of VBA have demonstrated that they are able to operate and maintain the Decision Support Tool.</p> <p>At least one staff member of the national water resource authorities in each basin country has demonstrated that they are able to operate and maintain the Decision Support Tool.</p> <p>The establishment of the Decision Support Tool has been launched in order for national water managers from relevant sectors (e.g. water, agriculture, energy, nature protection) to know purpose and functionalities of the tool.</p> <p>Sustainability plan for maintaining knowledge within the respective institutions (e.g. training of new employees, maintenance costs)</p>	<p>Training reports including test cases to be verified by Final Review Team.</p> <p>Minutes of meetings from VBA high-level meetings or similar documents reveals that the decision support tool is supporting the dialogue between the basin countries and the decisions taken. Reports on launch events including participants.</p> <p>VBAs own monitoring and evaluation of the sustainability plan.</p>	<p>Countries willing to collect and share relevant national data, information and plans (e.g. Master plans for the various water depending sectors)</p> <p>The Decision Support Tool is appreciated and respected by the national water resource authorities.</p> <p>Basin countries will allocate staff with sufficient technical skills for the training events.</p> <p>Allocated national staff will have the aspects of transboundary water management as part of his/her job description.</p> <p>Resources will be allocated to maintain knowledge level at the basin and at the national level (e.g. replacement of staff)</p>
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Outputs	Output Indicators	Baseline	End of project targets	Means of Verification	Assumptions
Output 1.1.2 Indicators (linked to the Decision Support Tool) taking into account the environmental capital, ecosystem services and functions. Socio-anthropological impact developed, tested and integrated into the Decision Support Tool.	The developed indicators have been tested/calibrated during case studies and proven operational, valid and robust. .	Studies that relate environmental and socio-economic impacts caused by climatic/hydrologic and socioeconomic drivers or from development interventions have been carried out in the basin/region, but the results need to be adapted for the Decision Support Tool. .	Indicators related to the value of ecosystem services in selected sub-basins (case studies) systematically developed and integrated into the Decision Support System .	Case study reports. Systematic storage of data, models and indicators (including rules and heuristics) in the established DSS. Interviews of stakeholders. To be verified by external review team.	Requested data for modelling and scenario analysis purposes available and timely shared with project team. Key ecosystem services in the basin can be modelled as rules/heuristics.

Output 1.1.3 Guidelines on management of shallow groundwater developed, validated and disseminated within the basin countries.	The guidelines are being applied at irrigation schemes based on shallow groundwater ensuring sustainable use of the shallow groundwater and resulting in reduced number of conflicts. .	Existence of unsustainable abstraction of shallow groundwater for agricultural purpose resulting in loss agricultural productivity Studies were carried out approximately 15 years ago. Results hereof not formalized into guidelines at basin level	Guidelines on irrigation based on shallow groundwater validated by national stakeholders and VBA. The guidelines are known by relevant water resource authorities and water users. The guidelines are applied in (at least) the pilot areas supported during the project.	Existence of document describing the guidelines and targeting authorities as well as user level Validation Workshop Report Evidence that the guidelines have been disseminated among national water resource authorities. Evidence that the guidelines have been disseminated among national water users (water users associations based on shallow ground water) Field visits to pilot areas.	Relevant local and national authorities will support this initiative and provide needed data and information in a timely manner. Local user associations for selected pilot areas will support this initiative.
Component 2. Strengthening of transboundary planning, regional and in-country coordination and capacity, also during extreme events related to climate change and variability					
Outcomes	Outcomes Indicators	Baseline	End of Project Targets	Means of verification	Assumptions

Outcome 2.1 Transboundary coordination improved through the capacity strengthening, development and installation of modern tools in accordance with Priority Actions of the SAP.	Number of basin-wide dialogue events discussing water and environmental issues based on common data, tools and methods	Limited possibilities for constructive dialogue events due to lack of funding and funding for capacity building of stakeholders (e.g. national authorities, water users)	Procedures for constructive dialogue events among the basin countries have been established including securing funding mechanisms for continued dialogue. The representatives of the basin countries have been trained in water and environmental aspects	Reports from dialogue events including work plans and decisions Training reports.	The basin countries support the initiative and allocated required staff and resources Decisions taken at the basin level will be respected at the national level
Outputs	Output Indicators	Baseline	End of Project Target	Means of Verification	Assumption
Outcome 2.2 Capacity of VBA and national authorities strengthened through the development and implementation of a capacity building programme and early warning system(s) at basin, national, and local levels	VBA and national authorities apply the developed systems resulting in improved efficiency and quality of their work.	Lack of updated water resource tools to support VBA and national authorities in their work.	.Representatives from VBA and national authorities are able to operate and maintain the developed water resource tools	System manuals Testing results / Demonstrations by trained staff Workshop reports	Basin countries will support this initiative by providing qualified staff and resources. .

Output 2.1.1 Functional regional coordination and national water user inter-sectoral/inter-ministerial committees established to assure formal dialogue between countries and sectors	Number of national inter-ministry coordination mechanisms that can be proven to be functional.	During the previous GEF project national inter-ministry committees were developed. However, they are currently dormant.	Six national inter-ministerial coordination committees are functional and make recommendations on the project implementation and SAP implementation	Reports from the national coordination committees. Minutes of meetings.	Ministries related to water resources and catchment management in the six basin countries are willing to cooperate for the implementation of the SAP.
Output 2.1.2 A regional programme to fight against invasive species including early warning system for available for the Volta Basin established	<p>The number of locations and areas impacted by invasive species is considerably reduced.</p> <p>The negative socio-economic consequences of invasive species are considerably reduced.</p>	<p>Ecosystems negatively impacted by IAS.</p> <p>Socio-economic development (e.g. navigation, water intakes, hydropower) negatively impacted by IAS</p> <p>Non-existence of programme to fight the increasing number and uncontrolled growth of populations of IAS, particularly aquatic weeds, is becoming a limiting factor in sustaining ecosystems of the Volta Basin.</p> <p>Furthermore, aquatic weeds create problems in relation to navigation, water intakes and hydropower systems.</p>	<p>Key personnel of VBA are able to operate and maintain the system.</p> <p>Stakeholders from relevant sectors (e.g. environment, energy, water supply) from all six countries in the Volta basin introduced to the system and able to use it as well as train others in doing so.</p>	<p>Inspection of dedicated website, user guide and feedback from stakeholders.</p> <p>System manuals</p> <p>Study reports.</p> <p>Workshop reports.</p> <p>Verifications to be done by the review mission.</p>	<p>Basin countries will support this initiative by providing qualified staff and resources.</p> <p>Relevant authorities, and key stakeholders provide information on local problems in relation to IAS and information regarding already implemented or planned mitigating IAS actions</p>
Outcomes	Outcomes Indicators	Baseline	End of Project Targets	Means of verification	Assumptions

Output 2.2.1 Community oriented early-warning system(s) for droughts developed and operational	Relevant stakeholders (e.g. farmers, hydropower, environment) can plan/ optimize their socio-economic activities based on the results from the early warning drought system.	Drought early warning systems to support VBA and national authorities in their work is lacking. Drought is occurring with increased frequency and impact within the basin. National and regional organisations are lacking proper tools for monitoring and warning as well as for making impact assessment.	Relevant stakeholders (e.g. farmers, hydropower, environment) benefit from drought early system and DSS VBA and national stakeholders are trained and capacitated for evaluating and using the established operational drought early warning system. A sustainability plan has been agreed and adopted by the basin countries.	Existence of operational and validated web-based early-warning system for droughts. Training reports. Sustainability plan	National and local authorities will participate in planned training events. The developed systems are efficiently used by the national and local authorities.
Outcomes	Outcomes Indicators	Baseline	End of Project Targets	Means of verification	Assumptions

Output 2.2.2 Staff of the Volta Basin Observatory capable of operating the Decision Support System including Drought Early Warning System	The systems are being operated efficiently by VBA and the results are being demanded and used by relevant stakeholders.	The Volta Basin observatory is today lacking a basin wide water resource model for assessments of national and transboundary impacts related to investments, climate related hazards or climate change impacts.	The Volta Basin Observatory staff trained and capacitated for efficient operation and maintenance of Decision Support System including Drought Early Warning System	Documented training sessions. Course evaluations Number of staff members trained in the operation and maintenance of the DSS including Drought Early Warning System. Existence of approved sustainability plan	Volta Basin Observatory to support by providing staff to participate in training sessions and take responsibility for maintaining the DSS including Drought Early Warning System. VBA to take lead in securing sustainability.
Component 3. Strengthening of resilience of ecosystems for sustainable livelihoods in the Volta basin.					
Outcomes	Outcomes Indicators	Baseline	End of Project Targets	Means of verification	Assumptions

Outcome 3.1 Production systems in key sectors apply integrated water resource management and ecosystem-based approaches at community and sub-basin levels	I3.1.1: Number of sectors (crop, livestock and fishery) where ecosystem-based approaches are developed for I3.1.2: Additional number of sub-basins and communities where ecosystem-based approaches are applied to reduce pollution and increase water use efficiency	No previous similar activities I3.1.1: 0 I3.1.2: 0	I3.1.1: 3 sectors (crop, livestock and fishery) I3.1.2: 4 sub-basins and 12 riverine communities	Evaluation reports	Countries willing to mainstream ecosystem-based approach into their sectoral policy Communities are committed to apply ecosystem-based approach in their production activities
Outputs	Output Indicators	Baseline	End of Project Target	Means of Verification	Assumption

Output 3.1.1	I3.1.1.1: Additional number of crop and livestock producers implementing selected measures on sustainable use of water in the intervention communities, disaggregated into men and women	No previous similar activities	I3.1.1.1: 5,000 crop and livestock producers (of which 40% are women)	Baseline and Monitoring reports.	Crop and livestock producers are engaged in selected measures on sustainable use of water
Measures on sustainable use of water for crop and livestock productions implemented to improve productivity, food security and incomes		I3.1.1.1: 0		Final Review Report	
Transboundary sites identified in sub-basins:	I3.1.1.2: Additional number of hectares with the applied measures on sustainable use of water				Relevant national authorities will support the initiate
· Sourou sites between Mali and Burkina Faso		I3.1.1.2: 0	I3.1.1.2: 10,000 hectares with applied measures		
· Otti sites between Togo and Ghana					
· Nakambe sites between Burkina Faso and Ghana					
· Bagre sites in the black Volta between Burkina and Ghana					
· Chache sites in the black Volta between Ghana and Côte d'Ivoire					
During the inception workshop, additional critical ecosystems will be identified in Benin and Togo					
Outputs	Output Indicators	Baseline	End of Project Target	Means of Verification	Assumption

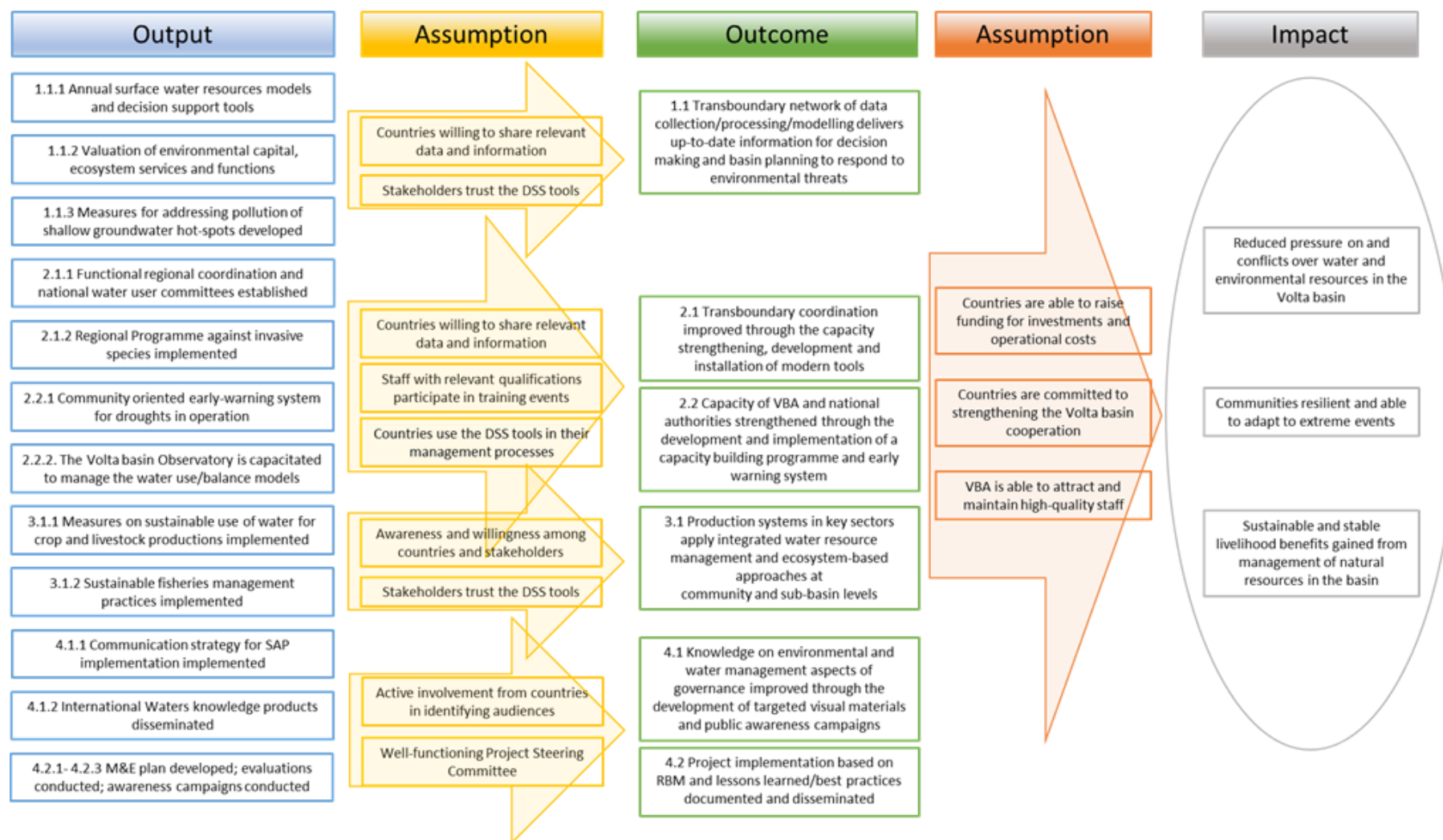
<p>Output 3.1.2</p> <p>Sustainable fisheries management practices implemented to improve productivity, food security and incomes</p> <p>Transboundary sites identified</p> <ul style="list-style-type: none"> · Sourou sites between Burkina Faso and Mali · Nakambe sites between Burkina Faso and Ghana · Bagre sites in the black Volta between Burkina and Ghana · Chache sites in the black Volta between Ghana and Côte d'Ivoire <p>During the inception workshop, additional critical fisheries will be identified in Benin and Togo</p>	<p>I3.1.2.1: Additional number of fisheries actors trained in sustainable fisheries practices</p> <p>I3.1.2.2: additional number of hectares of fisheries under sustainable fishing practices</p> <p>I3.1.2.3: Additional hectares of sustainable fish farming units established</p>	<p>No previous similar activities</p> <p>I3.1.2.1: 0</p> <p>I3.1.2.2: 0</p> <p>I3.1.2.3: 0</p>	<p>I3.1.2.1: Additional 10,000 fishery actors (of which 50% are women)</p> <p>I3.1.2.2: Additional 15,000 hectares of fisheries</p> <p>I3.1.2.3: Additional 5,000 hectares of sustainable fish farming units</p>	<p>Baseline and Monitoring reports</p>	<p>Fisheries actors and fish farmers are committed to sustainable fishery management</p> <p>Relevant national authorities will support the initiate</p>
<p>Component 4. Knowledge management and sharing, and effective M&E</p>					
<p>Outcomes</p>	<p>Outcomes Indicators</p>	<p>Baseline</p>	<p>End of Project Targets</p>	<p>Means of verification</p>	<p>Assumptions</p>

Outcome 4.1 Knowledge on environmental and water management aspects of governance improved through the development of targeted visual materials and public awareness campaigns	Documented collaborations and resource sharing. Regular results of effective transboundary water governance. Community involved sustainable water management awareness conducted and behaviour change. Publications and communications material of progress made in transboundary water governance.	Present communication activities are in-efficient	Agreed communication strategy approved and implemented.	Existence and status of: Website Quarterly newsletters Weekly news round-up Publications Events/Campaigns Social Media/Infographics Traditional media (press releases, news articles, radio, television etc.) Partner newsletters Videos, project posters, drawings, cartoons etc.	Active involvement from basin countries in relation to identification of national audiences
Outcome 4.2 Project implementation based on RBM and lessons learned/best practices documented and disseminated	Project implemented according to the workplan agreed at the regional steering committee	Ongoing baseline activities implemented but not under overall SAP implementation framework	The project achieves its objectives and completed according to the workplan	Project Implementation Reports, mid-term review and terminal evaluation	The project monitoring mechanisms, particularly the project steering committee functions.
Outputs	Output Indicators	Baseline	End of Project Target	Means of Verification	Assumption
Output 4.1.1 Communication strategy for SAP implementation is developed and implemented, also through a series of public awareness campaigns	a) Existence of Communication Strategy for SAP implementation b) Number of awareness campaigns executed	a) There is no communication strategy for SAP b) There is ongoing water related awareness campaigns in the basin	The communication strategy was fully implemented, and more stakeholders engaged in the project related activities	a) Communication strategy b) Project reports	There are effective and functioning networks of stakeholders that are used for awareness raising purposes.

Output 4.1.2 International Waters knowledge products are generated and disseminated using existing global information and knowledge sharing platforms, e.g. GEF IW: LEARN	I4.1.2.1: Number of knowledge products disseminated through external platforms	I4.1.2.1: 0	I4.1.2.1: 4	Inventory of relevant platforms	Relevant knowledge is generated by the project stakeholders
Output 4.2.1 Project Monitoring & Evaluation Plan and system developed and in place	Existence of approved M&E plan	There is no project Monitoring and Evaluation mechanism existing.	The Monitoring and Evaluation mechanism is functional through the regional steering committee and national inter-ministry coordination committees	Steering Committee reports and Mid-term and terminal evaluation reports	There is sufficient participation of the relevant stakeholders in the Monitoring and Evaluation activities.
Output 4.2.2 Mid-Term and Final Project Evaluations	Existence of Mid-Term and Final evaluations	No Mid-term review or terminal evaluation of the project	Mid-term review recommendations are fully incorporated into the project implementation and the terminal evaluation shows achievement of the project objective	Mid-Term and Final evaluation reports	Both midterm review and terminal evaluations are organized in timely manner involving relevant project stakeholders.
Outputs	Output Indicators	Baseline	End of Project Target	Means of Verification	Assumption

Output 4.2.3 Awareness Campaigns on Management of Natural Resources (related to 4.1.1)	Reduced number of cases where the natural resources are unsustainably exploited or contaminated	Frequent cases of unsustainable use of natural resources. Limited public awareness with respect to the importance of the natural resources	Increased awareness on protection and sustainable use of the natural resources by the general public and by the water users in particular	Number of authorities/institutions/ water users/persons reached through the various channels. Feedback from target groups	Optimal and qualified selection of target groups, messages, channels and timing in order to maximise impact. Collaboration from relevant partners (e.g. educational institutions, ministries, water user associations).
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Theory of Change for the REWarD project



ANNEX B: RESPONSES TO PROJECT REVIEWS (from GEF Secretariat and GEF Agencies, and Responses to Comments from Council at work program inclusion and the Convention Secretariat and STAP at PIF).

Response to GEFSEC comments at the time of the PIF approval

GEF ID:	9910		
Country/Region:	Regional (Burkina Faso, Benin, Cote d'Ivoire, Ghana, Mali, Togo)		
Project Title:	Reversing Ecosystem and Water Degradation in the Volta River Basin (REWarD-Volta River Basin)		
GEF Agency:	UNEP and IUCN	GEF Agency Project ID:	
Type of Trust Fund:	GEF Trust Fund	GEF Focal Area (s):	International Waters
GEF-6 Focal Area/ LDCF/SCCF Objective (s):	IW-1 Program 1; IW-2 Program 3;		
Anticipated Financing PPG:	\$200,000	Project Grant:	\$7,122,566
Co-financing:	\$79,665,636	Total Project Cost:	\$86,788,202
PIF Approval:		Council Approval/Expected:	
CEO Endorsement/Approval		Expected Project Start Date:	
Program Manager:	Astrid Hillers	Agency Contact Person:	Takehiro Nakamura

PIF Review			
Review Criteria	Questions	Secretariat Comment	Agency Response
Project Consistency	2. Is the project consistent with the recipient country's national strategies and plans or reports and assessments under relevant conventions?	<p>BY ENDORSEMENT:</p> <p>Please provide details on alignment with specific country level policies and strategies and governance frameworks especially as relevant to on the ground investments, e.g. on groundwater and conjunctive management, efficient use of water and regulations on water abstractions, land and livestock management, freshwater fisheries and aquaculture, and invasive species.</p>	<p>Being a regional project involving six countries, the most comprehensive and coordinated strategic policy document to align with is the Strategic Action Programme (SAP) for the Volta Basin. The SAP is endorsed by all six governments and thus represents the best possible and available match with national priorities, strategies and plans. It has been made clear and explicit in the description of project objectives how the current project contributes to implementation of the SAP.</p>

<p>Project Design</p>	<p>3. Does the PIF sufficiently indicate the drivers² of global environmental degradation, issues of sustainability, market transformation, scaling, and innovation?</p>	<p>AT ENDORSEMENT:</p> <p>- We appreciate that national agencies now have been indicated as being among executing agencies in some of the measures to be funded. During project design, please provide additional detail on how the project will involve the relevant national agencies as well as build on and strengthen local government and traditional mechanisms for resource management (incl. those involving pastoralist groups and interaction with sedentary farming communities).</p> <p>As indicated in the PIF, it will be important during project design to take stock in more detail on related investments on national level (both GEF and non-GEF) on which the national and regional investments can build on both in terms of lessons to take on during the design and coordination and/or cooperation in their implementation.</p>	<p>Particularly Component 3 addresses direct involvement of local stakeholders and communities in activities on the ground. Activity descriptions under outputs 3.1.1 (sustainable use of water for crop and livestock production) and 3.1.2 (sustainable fisheries management practices) have been amended to describe approaches for stakeholder involvement.</p> <p>One example of a tool that will be applied in order to both protect the environment and acknowledge traditional resources management mechanisms is local conventions. Local conventions are legitimate agreements negotiated between multiple stakeholders from the perspective of regulating natural resources (control, access, appropriation, use and exploitation) and the environment.</p> <p>The baseline section has been updated to provide more detail on related investments and activities at national level.</p>
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5. Are the components in Table B sound and sufficiently clear and appropriate to achieve project objectives and the GEBs?

BY ENDORSEMENT:

- Please define 'hotspots' (components 1 and 2)
- Please take note of the WMO Volta Hycos among the regional initiatives. The cooperation noted with WMO is appreciated.

- Groundwater: please take note of ongoing country level investments (e.g. such as the large IDA loan to Burkina Faso on groundwater; and a number of other) as well as regional investments (such as the WB Sahel Irrigation Initiative which is baseline for the WB water security and groundwater project (submitted for WP inclusion)). In terms of pollution, please note considerable existing knowledge of likely pollution (natural and anthropogenic) that will aid to narrow down possible type and location of pollution/pollution hotspots.

- Please eliminate the confusion in wording under component 2 with regard to drought early warning systems. Bullet 2 on page 21 appears to restrict access to early warning, while we clearly understand from discussion and the overall description that this to mean the projects effort to make special efforts to address/include specific vulnerable groups (but not to exclude others).

- Within the work on drought resilience, drought early warning, groundwater access, and measures on sustainable crop and livestock management, please address the specific needs to mitigate potential use

Hotspots have been defined in Section A.1.

The 'Integrating Flood and Drought Management and Early Warning for Climate Change Adaptation in the Volta basin (VFDM; funded by the Adaptation Fund)', implemented by WMO and executed by WMO and VBA (2018 to 2021), has been included in the baseline description. Also output 2.2.1 description makes explicit reference to linkages with that project.

Under activity 1.1.3.1 it is mentioned that the selection of pilot sites and the definition of activities to be carried out shall be made taking into account other existing and planned activities related to groundwater in the respective countries being Burkina, Ghana and Togo. (The validation workshop, Nov 2019, concluded that Burkina should be part of the groundwater assessment in order to be able to cover the Sahelian part of the basin.)

Wording has been changed to avoid implicit exclusion of any groups from the warning system alerts.

Text has been amended and now specifically addresses this issue for the sections requested.

Responses to the STAP review comments at the time of PIF approval

STAP review	
STAP Comment	Agency Response
1. Provide clear and plausible project targets for contribution to corporate targets 1 (management of landscapes for biodiversity and ecosystem goods and services), 2 (sustainable land management in production systems), and 3a (transboundary river basin management). Further specification of the rationale underpinning the quantitative estimate of the scale of benefits is expected during the next stage of project development.	We have included project indicators and contributions to corporate targets in section E.
2. Though fisheries in some parts of the basin are characterized as not over-exploited, during further project development it would be good to consider whether there is a quantified estimate that can be targeted with regard to corporate target 3b (% of globally over-exploited fisheries brought to more sustainable levels). The value may not be large in global terms, but quantification could help improve political will towards transboundary protection of ecosystem services at regional and national levels. (Note this relates as well to the project output 1.1.2 on valuation.)	We have not been able to quantify and commit to a concrete target for contribution to reducing globally over-exploited fisheries.
3. The M&E approach gives appropriate attention to specifying links between ecosystem change and livelihood outcomes/vulnerabilities. This aspect is likely critical in building awareness and sustaining commitment to implementation beyond the project period. The project could consider whether any further explicit framing around livelihood security/environmental security goals would further contribute to stakeholder commitment.	We take note of the importance of securing livelihoods in order to ensure stakeholder commitment. Component 3 to a high degree builds on this approach.
4. Among risks, consider the appropriateness of including general risks related to political stability and security, along with appropriate monitoring measures during project implementation.	We have amended the risk assessment to include political stability and security issues.

ANNEX C: STATUS OF IMPLEMENTATION OF PROJECT PREPARATION ACTIVITIES AND THE USE OF FUNDS.

A. Provide detailed funding amount of the PPG activities financing status in the table below:

PPG Grant Approved at PIF: 100,000 (UNEP) and 100,000 (IUCN)			
<i>Project Preparation Activities Implemented</i>	<i>GEF/LDCF/SCCF Amount (\$)</i>		
	<i>Budgeted Amount</i>	<i>Amount Spent To Date</i>	<i>Amount Committed</i>
Expert travel (UNEP)	13,000	11,656	0
PPG coordinator consultant (UNEP)	30,000	22,902	7,098
Conference support (translation and interpretation) (UNEP)	17,000	8,809	8,191
Regional workshop – support to country participants (UNEP)	40,000	20,242	19,758
Project preparation consultants and national consultation (IUCN)	60,000	46,697	12,622
Regional Workshop (IUCN)	40,000	8,590	11,426
Total	200,000	118,896	59,095

ANNEX D: CALENDAR OF EXPECTED REFLOWS (if non-grant instrument is used)

Provide a calendar of expected reflows to the GEF/LDCF/SCCF/CBIT Trust Funds or to your Agency (and/or revolving fund that will be set up)

Not applicable

ANNEX E: GEF 7 Core Indicator Worksheet

Use this Worksheet to compute those indicator values as required in Part I, Table G to the extent applicable to your proposed project. Progress in programming against these targets for the program will be aggregated and reported at any time during the replenishment period. There is no need to complete this table for climate adaptation projects financed solely through LDCF and SCCF.

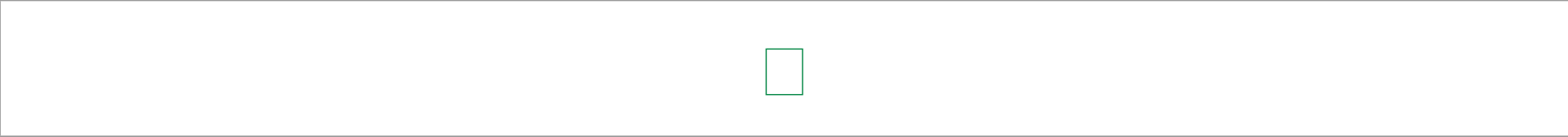
ANNEX: Project Taxonomy Worksheet

Use this Worksheet to list down the taxonomic information required under Part1 by ticking the most relevant keywords/topics//themes that best describes the project

Level 1	Level 2	Level 3	Level 4
Influencing Models	Transform policy and regulatory environments Strengthening institutional capacity and decision making Convene multi-stakeholder alliances Demonstrate innovative financial instruments		
Stakeholders	Private Sector Beneficiaries Local Communities Civil Society Type of Engagement Communications	SMEs Community based organisations Non-government organisations Academia Information Dissemination Partnership Consultation Participation Awareness raising Education Public Campaigns Behavior change	

Capacity, Knowledge and Research	<p>Capacity Development</p> <p>Knowledge Generation and Exchange</p> <p>Learning</p> <p>Knowledge and Learning</p> <p>Stakeholder Engagement Plan</p>	<p>Adaptive Management</p> <p>Knowlegde Management</p> <p>Innovation</p> <p>Capacity Development</p> <p>Learning</p>	
Gender Equality	<p>Gender Mainstreaming</p> <p>Gender Result Areas</p>	<p>Beneficiaries</p> <p>Women Groups</p> <p>Access and control over natural resources</p> <p>Participation and Leadership</p> <p>Access to benefits and services</p> <p>Capacity Development</p> <p>Awareness raising</p> <p>Knowlegde generation</p>	

Focal Area/Theme	International Waters	Fresh Water	Aquifer River Basin Lake basin
		Fisheries Pollution	Nutrient pollution from all sectors except wastewater
	Climate Change	Strategic Action Plan Climate Change Adaptation	Climate Resilience Climate information Adaptation Tech Transfer
Rio Markers			



Submitted to HQ

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