



MASTER PLAN FOR THE INTEGRATED DEVELOPMENT OF THE GAMBIA, KAYANGA-GEBA AND KOLIBA-CORUBAL RIVER BASINS

Phase 2 - Sector Plans - 6/6

Knowledge, Management and Governance of Water Resources

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Phase 2 - Sector Plan - Knowledge, Management and Governance of Water Resources

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ABBREVIATIONS

Acronym	Meaning
AAAC	Competent Environmental Assessment Authority of Guinea Bissau
AAC	Adaptation to climate change
AEP	Drinking water supply
AFD	French Development Agency
AIBD	Blaise Diagne International Airport
AIG	Africa Internet Group
ANADS	National Survey Data Archive of Senegal
ANAG	National Aquaculture Agency Guinea
ANASA	National Agency for Agricultural and Food Statistics of Guinea
ANCF	National Railway Agency
ANSO	National Agency for Statistics and Demography
APD	Official Development Assistance
APIP	Private Investment Promotion Agency
APS	preliminary design
ANSO	National Agency for Statistics and Demography
AfDB	African Development Bank
EIB	European Investment Bank
BGGA	Guinean Bureau of Applied Geology
BID	Islamic Development Bank
basin	Basin / catchment area
CAD	Development Assistance Committee
CBG	Compagnie des Bauxites de Guinée
UNFCCC	United Nations Framework Convention on Climate Change
ECOWAS	Economic Community of West African States
CFPT	Vocational and Technical Training Centre
CFS	Chemins de fer du Sénégal
CIMA	Inter-ministerial Water Council (Guinea Bissau)
CIPA	Centre de Investigação Pesqueira Aplicada of Guinea Bissau
NAC	National Water Council (Guinea Bissau)
COS	Strategic Policy Framework
CPE	Standing Committee on Water
CSLP	Poverty Reduction Strategy Paper
CTA	Water Technical Committee
DBF	Dakar Bamako railway
DGERP	Directorate for Water Resources Management and Protection
HRB	Directorate General of Water Resources (Guinea Bissau)
DGPS	Directorate General of Public Health (Guinea Bissau)
DH	Directorate of Hydraulics (Senegal)

Acronym	Meaning
DHAS	Directorate of Agricultural Hydraulics and Soils (Guinea Bissau)
DNA	National Directorate of Agriculture of Guinea
DNGR	National Directorate of Rural Engineering of Guinea
DOOR	Gambia Water Resources Department
EAGB	Public Water and Electricity Company of Guinea Bissau
EDC	Early Childhood Development, Gambia
WAPP	West African Power Pooling System
ENO	Open digital space
ESTIC	Exports of ICT services
ISP	Internet Service Provider
FAO	Food and Agriculture Organisation
EDF	European Development Fund
FENU	United Nations Capital Development Fund (UNCDF)
FER	Road Maintenance Fund
FERA	Autonomous Road Maintenance Fund
GBoS	The Gambia Bureau of Statistics
GIE	economic interest groups
IWRM	integrated water resources management
LPG	Liquefied Petroleum Gas
GUIF	Guinea Investment Forum
HIMO	labour-intensive
IBAP	Institute of Biodiversity and Protected Areas of Guinea Bissau
HDI	Human Development Index
IDI	ICT Development Index
INAS	National Water and Sanitation Agency of Guinea Bissau
INED	Intended Nationally Determined Contribution
INE	National Institute of Statistics of Guinea Bissau
INS	National Institute of Statistics of Guinea
I-PIB	Internet - Gross Domestic Product
LBE	Lower Basic Education, Gambia
LGA	Local Government Area (LGA)
MDRA	Ministry of Rural Development and Agriculture
MEDD	Ministry of the Environment and Sustainable Development
MENA	Ministry of National Education and Literacy of Guinea
MNR&E	Ministry of Natural Resources and Environment of The Gambia
MoBSE	Ministry of Basic and Secondary Education of The Gambia
MoHERST	Ministry of Higher Education, Research, Science and Technology of The Gambia
MOOC	Massive open online course
MTPCU	Ministry of Public Works, Construction and Urbanism (Guinea Bissau)
NAWEC	Gambia National Water & Electric Company
NRI	Network Readiness Index
OECD	Organisation for Economic Co-operation and Development
OFOR	Office des Forages Ruraux du Sénégal

Acronym	Meaning
OLAC	Office des Lacs et des Cours d'eau du Sénégal
MDG	Millennium Development Goals
WHO	World Health Organization
OMVG	Organisation for the Development of the Gambia River
ONAS	Office National de l'Assainissement du Sénégal
NGO	Non-Governmental Organisation
OPTIC	Organisation of ICT Professionals
PAGIRE	Action Plan for Integrated Water Resources Management
PAP	Priority Action Plan (Senegal)
PATMUR	Urban Transport and Mobility Support Project
PDDI	Integrated Development Master Plan
PGIRE	Integrated Water Resources Management and Multipurpose Use Development Programme in the Senegal River Basin
GDP	Gross Domestic Product
SME	Small and medium-sized enterprises
PMI	Small and Medium Industry
NAP	Senegal's National Adaptation Plan
PNDES	National Economic and Social Development Plan
UNDP	United Nations Development Programme
PPP	Public-Private Partnership
PRES	Economic and Social Resilience Programme (Senegal)
PSE	Emerging Senegal Plan
PTB	Light Urban Train
PTE	Guinea Bissau Education Transition Plan
PURA	Public Services Regulatory Authority of The Gambia
R&D	Research & Development
RGPHAE	General Census of Population and Housing, Agriculture and Livestock (Senegal)
RTLBS	Real Time Location Based System
SDC	Swiss Agency for Development and Cooperation
SMB	Boké Mining Company
SNAPE	Water point development service (Guinea)
SNCS	Société nationale des chemins de fer du Sénégal
NSSD	Senegal's National Strategy for Sustainable Development
SONATEL	National Telecommunications Company
SONES	Société Nationale des Eaux du Sénégal
STP	Public Transport Company
ToR	Terms of reference
TER	Regional express train
ICT	Information and Communication Technology
TRIE	Inter-State Road Transit
UCAD	Cheikh Anta Diop University of Dakar
EU	European Union
UEMOA	West African Economic and Monetary Union

Acronym	Meaning
PMU	Management and Planning Units
ITU	International Telecommunication Union
UNCDF	United Nations Capital Development Fund (UNCDF)

1 INTRODUCTION

1.1 BACKGROUND AND OBJECTIVE OF THE STUDY

The *Organisation pour la Mise en Valeur du fleuve Gambie* (OMVG) was created in 1978, and its member states are The Gambia, Guinea, Guinea-Bissau and Senegal. Its main mission is **the rational and harmonious exploitation of the common resources of the Gambia, Kayanga-Geba and Koliba-Corubal river basins**. To this end, the OMVG aims to achieve energy and food self-sufficiency, promote transport channels, reduce the vulnerability of the economies of member states to climate risks and preserve the balance of ecosystems in the sub-region, particularly in the basins of the three rivers.

BRL Ingénierie, in association with COBA and IDEV, has been selected to carry out the Integrated Development Master Plan (PDDI) for the Gambia, Kayanga-Geba and Koliba-Corubal rivers. This project is financed by the United Nations Capital Development Fund (UNCDF) and is part of the Blue Peace initiative, which aims to promote peaceful cooperation in the sharing of water resources.

UNCDF is an agency that puts public and private finance at the service of the poor. It does this by offering innovative financing models that unlock public and private resources - particularly at the national level - with the central goal of reducing poverty and supporting local economic development.

UNCDF has partnered with the Swiss Agency for Development and Cooperation (SDC) to launch the Blue Peace Financing programme (also known as Blue Peace). The programme aims to foster peaceful cooperation in the sharing of transboundary water resources. To this end, Blue Peace encourages "the development of common institutional and legal frameworks that bring countries together in their commitment to peacefully resolve disputes over water resources and to use their water as a basis for broader economic and diplomatic collaboration". (UNCDF, 2020). The aim is thus to transform competition over limited freshwater resources into transboundary cooperation.

The OMVG covers an area in which member states share common objectives and interests in water resources management. The **objectives of the OMVG** are:

- the **creation of economic development opportunities** that enable people to achieve viable and sustainable livelihoods in their communities;
- the **construction of infrastructure that promotes development** and is aligned with the infrastructure projects identified by ECOWAS and the African Union;
- **integrated resource and ecosystem management** based on a sustainable development approach;
- **promotion of large-scale agricultural and rural development programmes** to significantly improve the income and food security of the population.

Currently, OMVG draws its financial resources for its projects mainly from the individual contributions of its four member states. Indeed, there is no financial instrument capable of channelling funding directly to the supranational entity that is OMVG. This funding mechanism is slow and gives rise to a complex web of contracts and conditionalities that make it inefficient. The **Blue Peace** funding mechanism **therefore seeks to innovate and create an enabling framework for funding and technical assistance** to promote transboundary water cooperation. This includes the **development of joint cross-border and multi-sectoral investment plans** that promote cross-border water cooperation.

To implement such joint investment plans, it is first necessary to develop and rely on a basin-wide Integrated Development Master Plan (PDDI) approved by the member countries. This PDDI should enable the OMVG to achieve the objectives listed above. It is in this context that UNCDF is supporting the development of the OMVG basins PDDI. The PDDI will produce an investment plan composed of fundable projects.

The PDDI preparation mission is led by the BRLi-COBA-IDEV Group, from May 2021 to August 2022.

The study is divided into three phases:

- **Phase 1: Diagnostic study**, to assess the baseline situation in the three OMVG basins and pre-identify the issues, threats and opportunities that will be used to develop the sector plans.
- **Phase 2: Development of sector plans**. Six sector plans will be developed:
 - Agro-sylvo-pastoral and fisheries development plan;
 - Energy, industry and mining development plan;
 - Transport and communication development plan;
 - Environmental and ecosystem protection and management plan;
 - Drinking water supply, sanitation, health and education development plan;
 - Institutional development scheme.
- **Phase 3: Preparation of the OMVG basins Integrated Development Master Plan**

An inception report for the study was validated on 15 September 2021 at the Regional Validation Workshop held remotely and a final version of the inception report, incorporating the workshop recommendations, was submitted to OMVG and UNCDF on 30 September 2021.

A diagnostic report (Phase 1) was validated on 20 November 2021 at the Regional Validation Workshop held in Dakar and a final version of this deliverable, incorporating the workshop's recommendations, was submitted to OMVG and UNCDF on 15 December 2021. This report was the subject of a broad consultation process. It was fed by the work carried out in national workshops in each of the four States from 26 to 29 October 2021, as well as by the contributions of stakeholders from the three catchment areas. In addition to the diagnostic analysis, this report includes an atlas of maps on all the themes covered in the diagnostic study.

A report containing six sectoral plans (Phase 2) was submitted to the OMVG on 9 February 2022, in a provisional version. This version of the report was the basis for consolidation work carried out in National Workshops and then in Regional Workshops, respectively in February and March 2022 (see next section).

Phase 2 of the study is now complete.

Figure 1-1 Timeline for Phase 2

Overall schedule for the elaboration of the Masterplan		Nov-21				Dec-21				Jan-22				Feb-22				Mar-22			
		W25	W26	W27	W28	W29	W30	W31	W32	W33	W34	W35	W36	W37	W38	W39	W40	W41	W42	W43	W44
Phase 2 - Development of sectoral plans																					
Activities	2.1 Additional data collection and consultation of stakeholders																				
	2.2 Agro-sylvo-pastoral and fisheries development plan																				
	2.3 Energy, industrial and mining development plan																				
	2.4 Transport and communication plan																				
	2.5 Plan for the management and protection of the environment and ecosystems																				
	2.6 Drinking water supply, sanitation, health and education master plan																				
	2.7 Compilation of reports and workshops																				
Provisional reports of Phase 2																					
4 national workshops																					
Regional workshop																					
Meeting of the Steering Committee																					
Integration of comments from the Client																					
Final reports of Phase 2																					

1.2 THE PHASE 2 REPORT - PURPOSE AND CONTENT OF THE SECTOR PLANS

The sector plans are the main deliverable of Phase 2 of the study. They aim to summarise the major problems and issues identified in Phase 1, define the vision of the sector in 2040, structure the intervention strategy, define the necessary measures and develop the tools for implementing the action plans (timetable, budget, monitoring and evaluation, risks, social and environmental impacts).

The Phase 2 report thus consists of six volumes, structuring the intervention at the level of the three OMVG basins around the main groups of measures:

- Cross-sectoral measures to **improve water resources management**:
 - Plan for the development of knowledge, management and governance of water resources ¹;
 - Environmental and ecosystem protection and management plan;
- Measures to **strengthen basic services**:
 - Transport and communication development plan;
 - Water, sanitation, health and education development plan;
- **Sectoral socio-economic development** measures:
 - Agro-sylvo-pastoral and fisheries development plan;
 - Energy, industry and mining development plan.

Each of the six plans is structured in a similar way around the elements required by the Terms of Reference:

- **Chapters 1 and 2** are introductory chapters that present the context for the drafting of the PDDI and of the sector in the OMVG area, and **summarize the diagnosis and assess the evolution of the sector**, including the estimated needs of the sector in 2040;
- **Chapters 3 and 4** are the **core of the intervention strategy** for each sector. These chapters cover elaboration of the vision of the sector for 2040, which is then broken down into strategic axes (Chapter 3). They also include a proposal of an intervention strategy with expected results and detailed measures to be undertaken following a logical framework (Chapter 4);
- **Chapter 5** prepares the implementation of the **sector plan**. An action plan proposes a programme of measures up to 2040, an analysis of the assumptions, risks and conditions necessary for the implementation of the action plan, and the definition of monitoring indicators;
- **Chapter 6** is dedicated to an **assessment of social and environmental impacts** and proposals for compensation, mitigation or avoidance measures;
- **Chapter 7** proposes a projection towards the preparation of the PDDI, identifying synergies between sectors and potential impacts that the PDDI will need to address.

This deliverable has been produced in 2 versions:

- **A provisional version**, a working document dated 9 February 2022, supporting the consolidation work carried out in the National Workshops held in February 2022, then at the Regional Validation Workshop held in Dakar on 16 and 17 March 2022, sanctioning the end of Phase 2 of the study;
- **A final version**, integrating the elements produced during the National Workshops and the recommendations of the Regional Workshop.

This report is the **final version of the sectoral plan for water resources knowledge, management and governance**.

¹ The title of this plan, initially dedicated solely to institutional development, has been expanded to include the knowledge, management and development of water resources in the basins.

1.3 DEVELOPMENT METHODOLOGY

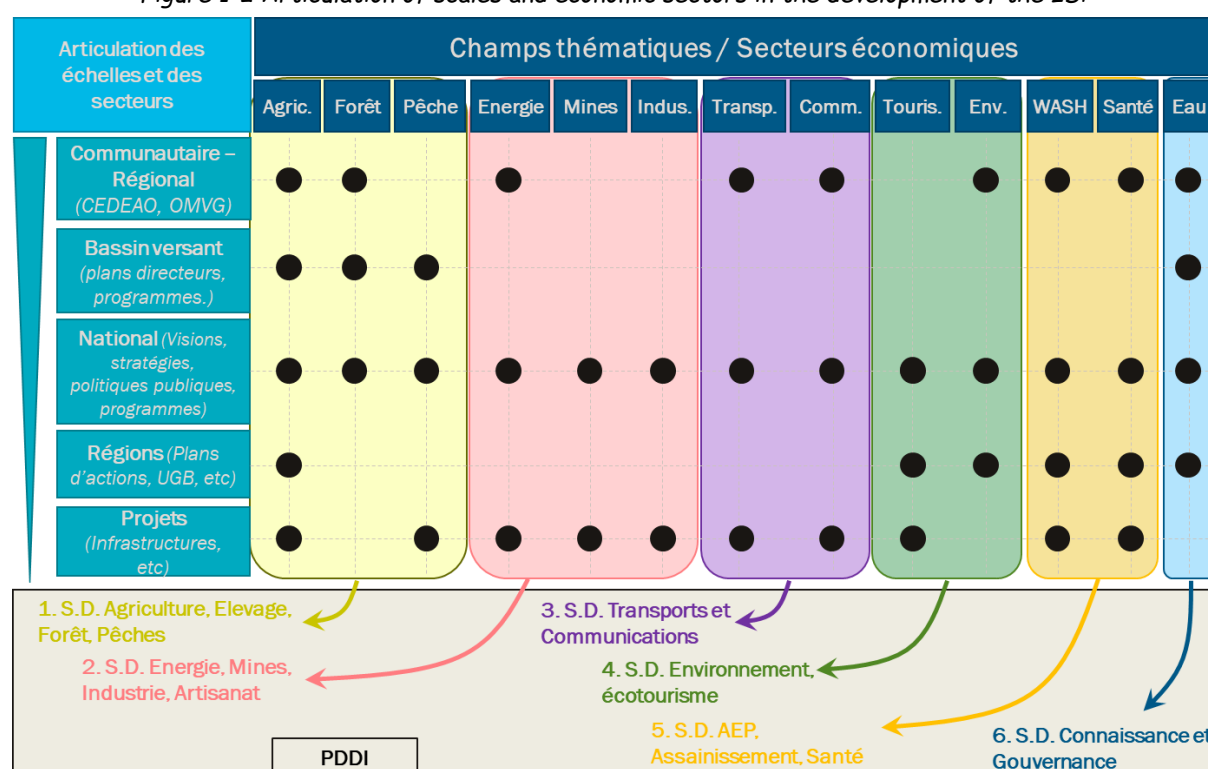
Each of the six sector plans presents the proposed intervention strategy for each sector, as well as the associated implementation tools. These strategies are an **aggregation of national and regional visions, policies and programmes, as well as the recommendations of the consortium.**

The elaboration of the plan for the development of knowledge, management and governance of water resources is based in particular on the following actions:

- Taking into account the conclusions and recommendations of the Phase 1 diagnostic report in terms of strengthening legal, regulatory and institutional frameworks, improving water resources monitoring, development and management of basins and watersheds, and strengthening the capacities of stakeholders in the OMVG area on a transboundary scale;
- Collection and analysis of national sectoral policy and planning documents, as well as regional programming documents;
- Compilation and analysis of existing projects in the three river basins;
- Analysis of existing master plans for the Kayanga-Geba and Gambia rivers (in particular unimplemented actions).

On this basis, the identified actions have been selected and consolidated around priority objectives, in order to form a coherent programming of actions at the scale of the OMVG area. The proposed actions are located (including by country and by sub-basin) and presented/mapped according to a common format harmonised between the different sectors.

Figure 1-2 Articulation of scales and economic sectors in the development of the IDP



Nota bene: The development of a Master Plan such as the PDDI aims at proposing **integrated and transversal solutions** to the technical, legal and institutional issues and challenges related to IWRM at the **basin level**. The level of analysis and planning is therefore the transboundary basins of the OMVG area. This is why the sector plans have been drafted on a regional scale.

The necessary technical, legal and institutional interventions at national level were identified and analysed through the intervention of national experts in each of the 4 countries. The sector plans integrate these elements.

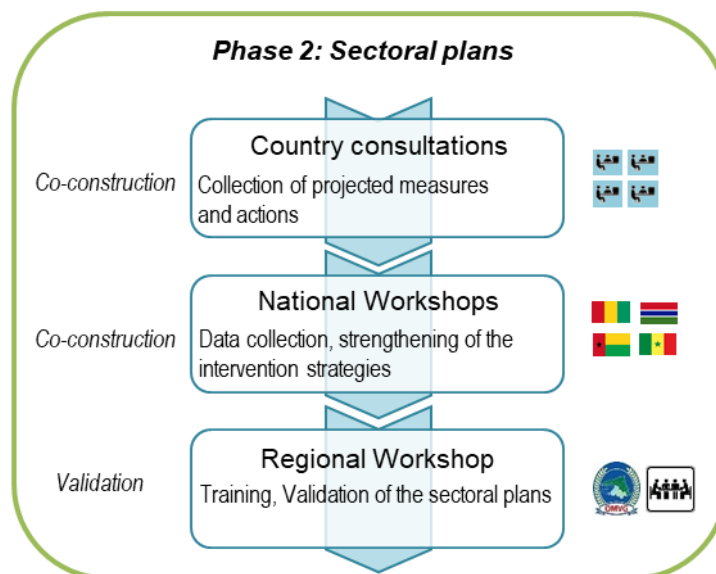
STAKEHOLDER CONSULTATION

The elaboration of the sector plans is largely based on the very broad data collection process carried out by the National Consultants mobilised by UNCDF and OMVG, then during the consultation missions, the national workshops and the regional workshop of Phase 1. In particular, the regional workshop was an opportunity to carry out group work aimed at formulating the need and actions to be planned within the framework of each of the six sector plans. The stakeholders of the river basins proposed the following actions:

- Study and safeguard the aquifers of the three basins;
- Improve knowledge and monitoring of water resources (climate variables, water levels and flows, water quality and piezometric levels);
- Provide the OMVG with a Water Charter;
- Build national laboratories to certify/regulate water quality;
- Strengthen biosecurity (invasive species);
- Strengthen the legal and institutional framework and capacity for IWRM in the Member States;
- Develop hydrological forecasting tools and early warning systems;
- Develop common tools for processing and storing the collected climatological and hydrological data;
- Monitor the impacts of climate change;
- Establish an autonomous energy management company within the OMVG (idem SOGEM, SOMEF).

The development of the plans was also informed by the consultation stages planned in Phase 2 (see Figure 1-3). In addition to the national consultations in the four member states, field investigations and consultations were conducted in the rural areas of the national portions of the three catchments. These took place in November 2021 for The Gambia and in February-March 2022 for Guinea, Guinea-Bissau and Senegal. National Workshops were organised remotely in February 2022 for each of the four member states, to finalise the collection of envisaged actions and to collect suggestions from stakeholders at national level. The process ended with a Regional Workshop, organised face-to-face, to harmonise the sectoral plans, validate their content and prepare the preparation of the Integrated Development Master Plan.

Figure 1-3 Stakeholder consultation steps in Phase 2



Within the framework of the OMVG support programme carried out by UNCDF, a review of the legal, regulatory and judicial framework was to be carried out (Lot 3). The conclusions of this study were to feed into the present sector plan for institutional development. This study could not be carried out before this report was drafted. The provisions of this plan, relating to institutional development, therefore remain preliminary and will be fleshed out and reinforced by the conclusions of the Lot 3 study, when they become available, as well as by the contributions of the OMVG.

6

Consequently, the chapters related to the implementation of the Knowledge Management and Governance sectoral plan have not been detailed. **They will be developed in Phase 3, in connection with the development of the PDDI, once the recommendations of Lot 3 are available.**

2 KNOWLEDGE AND GOVERNANCE OF WATER RESOURCES TODAY IN THE OMVG AREA

2.1 CURRENT STATE OF KNOWLEDGE OF WATER RESOURCES

2.1.1 Surface water

Surface water resources are abundant in the sub-region concerned, due to average to high rainfall. The two major basins (Gambia and Corubal) have their sources and upper basins in the Fouta Djallon, a region that is well watered by the rains of the West African Monsoon. Moreover, recent studies have shown that the water retention capacities of the soils and basins are maintained for the three main rivers that supply the Sahel with fresh water (the Gambia, but also the Senegal and Niger). Concerning the OMVG basins, the evolution of the Gambia basin in terms of soil retention seems more virtuous than that of the Koliba/Corubal basin.

The network for measuring surface water (hydrometric stations) and deep water (piezometers, see below) has been in decline for several years. The available data come from a significant but uneven hydrometric network, with numerous hydrometric data records in the Senegalese catchment area of the River Gambia and more limited availability in the basins located in The Gambia and Guinea Bissau, particularly on the Kayanga-Geba and Koliba-Corubal. **Its state does not allow a satisfactory understanding of the temporal evolution of water resources in all three basins.**

The IPCC projections and many climate models anticipate an increase in rainfall in West Africa until 2030-2035. However, most of the models used predict that, from then onwards, West Africa and in particular the upper basins of the Fouta Djallon will, on the contrary, experience a decrease in rainfall. The three basins of the OMVG could therefore see their rainfall, and consequently their water resources, progressively decrease.

Moreover, global warming is already occurring much faster than predicted in one region: the Sahel, where there has been a very sharp increase in minimum temperatures, particularly during the hottest months of the year, from March to June. These two trends, one, the proven increase in temperature and evapotranspiration, and the other, the predicted decrease in rainfall, are both worrying trends for the Sahel and West Africa. Despite the potential for societies and environments to adapt to climate change, the resilience of upper basins constitutes one of the challenges for the future of water management.

2.1.2 Groundwater

Groundwater resources are relatively abundant and, for the moment, little exploited; but they are **mostly poorly known**. What the three basins have in common is that they share several aquifers that extend over a large part of West Africa and can therefore be of interest to more than one of the basins, often all three.

In particular, there is a lack of information concerning the evaluation of reserves and exploitable potential at the scale of the basins, with a consistency of basic data and their sharing. The vulnerability of the water table to agricultural and mining activities, but also to possible saline intrusions, must also be documented in the next few years; there is also a need for a better understanding of its functioning and its relationship with the rivers and adjacent water tables of the sedimentary basin. In the three basins, it is therefore necessary to better document and map the resources in terms of volume, renewable volume and water quality. Hydraulic relations between the aquifers, and river/ aquifer relations must be better known.

The challenge and priorities concern, in fact, first of all, the evaluation of the needs and exploitable potentials, by basin and by country, whereas the underground resource, by definition, plays with the borders and sometimes also with the dividing lines of surface water. The other challenge is to identify all users and future users of the groundwater resource. Mapping the current state and the expected state in 20 years' time (2040) is also a priority that often comes up.

Other shortcomings, needs or challenges are noted more specifically for the Rio Corubal basin, but can also apply to the other two basins, to varying degrees. The challenges concern in particular the improvement of the rate of access to drinking water, which is still lagging far behind the MDGs and SDGs. This is indeed more serious for the Corubal than for the other basins, as well as the lack of monitoring in water management: for example, there is a frequent lack of control and proliferation of drilling companies that do not respect the regulations, which indicates the shortcomings of sustainable management and protection of groundwater resources; there is also a lack of planning and decision-making capacity for management based on reliable technical data. This is due to the non-application of texts and regulations relating to water and its use. There is also a lack of monitoring of water points with the constitution of a dynamic database and information, in particular for drinking water uses. As for the other basins, part of the deficit is explained by the lack of human resources specialised in hydrogeology. The main need is therefore the installation of a measurement network (quantity, usable quantity and quality) of groundwater as well as surface water.

ISSUES IDENTIFIED ON GROUNDWATER RESOURCES

The challenges described above have led to the identification of ten (10) issues categorised under four (4) major themes.

Groundwater resource quantity issues

These issues, which are found in the three (03) basins, **aim above all to improve knowledge of the potential of groundwater resources in terms of their mode of operation, evaluation of reserves, exploitable potential, groundwater renewal capacity, and exchanges with surface water and between aquifers.** The hydraulic system in the basement zone remains the most problematic because of its configuration but also because of the insufficiency and even lack of monitoring works. These issues in this hydraulic system are closely linked to the relatively low production rates. In the hydraulic system in the sedimentary zone (Senegal, The Gambia, Guinea-Bissau) and its contact zone with the bedrock, the existing data are few at the level of countries such as The Gambia and Guinea to allow an analysis at the scale of the Gambia and Kayanga-Geba basins. Ultimately, these quantitative issues require a priori:

- An inventory of existing hydraulic structures;
- The creation of a harmonised database;
- The construction of monitoring structures, especially in the basement and sedimentary zones, in Guinea-Bissau;
- Monitoring of resources and withdrawals before undertaking a hydrogeological and hydrological study on the scale of the basins.

Issues relating to groundwater quality

These information gaps are crucial for water supply and other uses. This information is critical in the area of the three (03) basins project because of **the impacts induced by human, agricultural, industrial and mining actions but especially the programmes planned within the framework of the sector plans.** As for the quantitative issue, it will be necessary to build monitoring structures and a monitoring programme to evaluate the physico-chemical, bacteriological and pesticide quality on the scale of the basins.

Issues related to the protection of water resources

These are closely linked to the above issues and to future integrated development programmes. In the area of the basins, it is known that the basement aquifers are very vulnerable due to their lithological configuration but also to pollution factors such as agricultural and mining activities. They are very well justified in the framework of the PDDI so that **the resource can be a key element for the success of the projects without having to be impacted.** These issues should enable the OMVG to have an alert system.

Governance issues

These are based on the countries' texts so as to have **a mode of governance and planning** at basin level **that can ensure the security of water supply and other uses while taking into account the IWRM dimension**. For this, it is imperative for the countries to harmonise the legislative texts or to build an OMVG water charter and a functional body for the implementation of the governance of the aquifers.

2.1.3 Water quality

The four countries do not have specific standards for drinking water quality. Thus, the study carried out refers to the main parameters that need to be monitored in surface and groundwater to ensure water quality for human consumption. The 2017 WHO standards and guidelines were used and, in cases where the WHO does not set a guideline, the European Council Directive 98/83/EC was used.

SURFACE WATER

According to the Gambia Water Resources Management Strategy (March 2015), the water of the Gambia River is salty in the lower reaches of the river system and therefore, traditionally, its water has not been considered valuable for drinking water production. However, in the upper reaches of the river system, where the water is fresh, its use as drinking water is also not a common practice.

The areas closest to the Atlantic Ocean have salinities of about 25-35 g/L, indicating sea-like salinity. The high salinities are also confirmed by the electrical conductivity. The North Bank area, the Lower River area and the Central River area are mostly brackish waters with salinities ranging from 0.8 to 25 g/L. Thus, from a water quality perspective, the Gambia River basin is zoned as follows:

- **Saltwater estuarine zone:** Upstream of the river mouth, at the level of the Atlantic Ocean, saltwater intrusion has a major effect on the surrounding landscape in this most densely populated region. The river is tidal and brackish water can penetrate up to 200-250 kilometres from the river mouth during the dry season, but not as far during the rainy season when the river receives an influx of fresh water. The point where these two zones meet is called the salt front. The clay soils support thick tidal mangrove communities along the river and its tributaries. During the rains, these mangroves are inundated with diluted salt water, as is the adjacent land, which is unsuitable for agriculture at this time of year.
- **Freshwater zone:** In the upstream freshwater zone, the thick mangroves are replaced by swampy plains, which extend up to 290 kilometres inland. The riverbanks become more distinct but high water is always present during the rainy season. In this area, the land is flooded with fresh water during the rainy season and the river is fresh water all year round. The soils and land are more fertile and allow for the production of a wide range of agricultural crops, including several varieties of rice, the staple food of the country (the Banto Faros area is the main rice-producing area of the country).

With regard to biochemical oxygen demand (BOD), according to the same study, the values are around 2.0 mgO₂/L, which seems to show good quality water for drinking water production, and the coliform content seems to be quite low, with averages below 40 NMP/100 mL for total faecal coliforms. In any case, it should be noted that we did not have access to data by sample and an average may hide a different reality.

On the basis of the main cations and anions measured, the study says that the quality of the water should also be considered fairly good, but this reference is only qualitative.

GROUNDWATER

In the framework of the mentioned study, a set of water quality parameters were tested on selected boreholes and for several years. In comparison with the WHO guidelines, on average, **the water in the tested boreholes and rural wells is of fairly good quality for drinking**. However, there were chloride, TDS and fluoride values in the Banjul sample above WHO standards (this area is however outside the OMVG zone and is representative of saline intrusion in areas close to the sea). The waters of the shallow sand aquifer (SSA) are those with the best drinking quality.

MAIN SOURCES OF POLLUTION

The Gambia, Kayanga-Geba and Koliba-Corubal rivers flow through urbanised, industrial, mining and agricultural development areas, which contribute to water quality impairment, with possible ecological implications for river quality in the study area through drainage.

- **Urban areas** - the concentration of the population is responsible for the discharge of wastewater, often untreated, either directly into surface waters or by infiltration into the groundwater.
- **Industrial discharges** - although not a major sector, some industrial units (notably agro-industry) have polluting discharges with potentially significant concentrations of heavy metals and nutrients.
- **Extensive and intensive agriculture** - the use of agro-toxics, pesticides and fertilisers is responsible for diffuse pollution of the basin, mainly associated with phosphates and nitrates (with particular emphasis on rice production, the basis of the population's diet, and livestock farming). The effects on soil erosion, responsible for an increase in sediment in the water bodies, should also be noted.
- **Mining exploration** - In addition to legal concessions (including bauxite mines and mineral production of building materials: clay, laterite, sand, gravel, etc.), there are many informal artisanal mining areas, particularly for gold ore (known locally as "orpaillage"). It is impossible to know how big they are or what extraction methods they use, but as a whole this activity is a major source of mercury and other heavy metals.

It is also important to highlight the salinisation resulting from saline intrusion, where uncontrolled water exploitation could considerably aggravate the problem by increasing its upstream coverage area.

2.1.4 Data, modelling, facilities and projects

To date, the current regime of the three basins can be considered almost natural (Oréade-Brèche and ISL, 2015) with very few hydro-agricultural developments and very limited abstraction by pumping. The OMVG Energy project developed by the four member states aims to reduce dependence on fossil fuels and exploit the hydroelectric potential of the Gambia, Kayanga-Geba and Koliba-Corubal rivers. It is based on three components: a) Sambangalou hydroelectric dam (projected on the Gambia, Guinea-Senegal border); b) Kaléta hydroelectric dam (on the Konkouré, Guinea and therefore located outside the basin); and c) a 1700 km interconnection line to link the 4 countries. A second phase of the energy programme includes the following dam projects: Saltinho on the Corubal in Guinea Bissau, Digan on the Gambia in Guinea, Fellou Sounga on the Tominé in Guinea and Kourawel Guinea on Komba, a tributary of the Corubal. **Initial studies have made it possible to simulate the influence of the Sambangalou hydroelectric scheme in terms of downstream flows, electricity production, changes in the average saline concentration and strategies to minimise its impact downstream (floods and artificial low water levels).** However, they do not take into account the evolution of rainfall and flows since 2001 (post-drought rainfall recovery and future scenarios), nor the evolution of the hydraulic capacity of the upstream river basins and do not provide an integrated analysis of the multiple issues (agriculture, fisheries, ecosystems, salt front, groundwater recharge), nor of the multiple structures (8 in progress or planned) in these basins.

The studies also confirm the weakness of data on current and future water needs in the basins, particularly downstream of the developments. On the Gambia River, the needs in terms of withdrawals for off-season irrigation, flood hydrographs for flood recession crops remain relatively unquantified, and the role of flooding in the hydrological balance of wetlands (e.g. Niokolo ponds) remains uncertain. Finally, the diagnosis establishes **the need for tools to discuss and arbitrate the impact of development and management scenarios (e.g. flood support, flow releases) on the basis of economic and ecological priorities and sectoral indicators (hydroelectric productivity, irrigated hectares, ecological instream flows) or economic indicators.**

2.1.5 Summary of the SWOT matrix

Table 2-1 SWOT matrix on strengthening knowledge of water resources in the OMVG basins

Strengths	Weaknesses	Opportunities	Threats
<ul style="list-style-type: none"> • Abundant water resources • Hydroelectric potential • Knowledge and data on the Gambia River (notably 1970-2001, stations in Senegal) • Existing studies and models on parts of the system 	<ul style="list-style-type: none"> • Uneven and declining hydrometric network • Weak means (technical, human) for monitoring/analysis of BRs • Lack of data on BRs and water needs of sectors 	<ul style="list-style-type: none"> • Investment programme (8 works in progress or planned) • Aquacoope/OIEAU programme on databases • Satellite data (P, ETP, cultivated areas, flooded areas, land use, etc.) for the observation and modelling of WRs 	<ul style="list-style-type: none"> • Decrease in rainfall / CC scenarios • Sharp increase in water needs for agriculture, energy, water supply... • Poor management of structures and impacts on ecosystems, salinity, agriculture

2.2 CURRENT STATE OF WATER RESOURCES GOVERNANCE

[A summary of the institutional, legal and regulatory review planned under Lot 3 will be inserted here when available].

2.3 EVOLUTION OF THE SECTOR

2.3.1 Trend scenario

If there is no change in this sector, the following evolution of the water resources sector can be envisaged:

- **Very limited knowledge of water resources, following the decline and then abandonment of a growing number of hydrometric stations.** This evolution has been observed for more than 20 years in many African basins (and elsewhere) in the absence of investments to renew and consolidate the observation network, and to train competent personnel for the installation, maintenance of hydrometric monitoring equipment and data collection (gauging, profiles, etc.).
- **Increased water needs of sectors such as agriculture due to population growth,** diets (meat consumption), industry, water supply, etc. and occasional water supply problems. On a local scale, the increase in irrigated areas will lead to increased competition for blue water (from rivers) in the dry season when rivers are at low water and withdrawals reach their peak.
- **Absence of hydroelectric facilities** (leading to more frequent load shedding or recourse to hydrocarbons) and absence of reservoirs on the major rivers allowing the storage of sufficient volumes for the development of irrigated agriculture to provide low water support in the dry season. If structures are developed, the lack of updated knowledge on water resources, on water needs and on the influence of development and management scenarios on the multiple sectors (nexus of water-food-energy-ecosystems) will not allow for an efficient and optimal regulation of water resources by these structures.
- A relative resilience of soils, watersheds and thus water resources, due to the large proportion of water coming from the upper basins of the Gambia and Corubal, as well as the Badiar massif (for Geba-Kayanga). Indeed, these regions, which are often populated (except perhaps the Badiar, but probably preserved precisely because of its low level of development), have been developed for a long time and agrarian practices there seem largely resilient. The overall lithology, made up of resistant rocks, also explains the low erosion observed in the high basins and the relative preservation of their capacity to limit immediate runoff, the capacity of the soils compensating for a lithology that is not very conducive to storage.

2.3.2 Key issues

The priority issues can be summarised as follows:

- **Better knowledge and monitoring of water resources.** This issue, which is found in all three (03) basins, aims above all to improve knowledge of the potential of surface and groundwater resources and how they function. The weakness of the network limits knowledge of reserves, processes (runoff, infiltration, surface and groundwater exchanges, low water levels) and the evolution of water resources in the face of climatic and anthropic changes (withdrawals, development of works, etc.) as well as the capacity of managers to plan and manage resources and prevent their evolution (floods, droughts, etc.).

- **Protection and management of water resources.** The integrated development of the three basins must be accompanied by measures to ensure that the resource is protected in terms of quantity and quality. Indeed, the increase in agricultural and mining activities can directly affect the quality of the resource, while the conversion of land for agriculture or the development of works can profoundly modify hydrological regimes and water availability. The challenge is to ensure the future of the resource, including during possible future droughts, by preserving or even improving the storage and filtration capacities of the soil, but also by developing storage/retention facilities in order to best meet the growing water needs of the various sectors.
- **Governance.** Effective resource management must be supported by an appropriate institutional and legal/regulatory context. Transboundary management also requires a set of measures to harmonise legislation, and/or build a common water charter for the OMVG, as well as the constitution of functional bodies for monitoring and planning water resources, data sharing, etc.

2.3.3 Alternative scenarios

The alternative scenarios:

- Investment (multiannual, multiparty...) on water resources knowledge in the 3 basins and 4 countries. Capacity building of national directorates, training, equipment, reinstallation of hydrometric stations, monitoring, etc. Consolidation of data, scientific and technical knowledge through environmental studies; knowledge transfer and capacity building. Development of tools and models for water resources planning and management.
- Protection and preservation of resources.
- Concerted management of transboundary water resources, integrated development.

A range of projects and programmes contribute to this objective:

- Aquacoope Programme: a data platform born from a data digitisation and visualisation initiative of the Geneva Water Hub and UNCDF and IOWater;
- OMVG programme which has enabled the installation of water level meters, 5 in Senegal and 6 in Gambia, notably outside the main river course (eg PNNK Park);
- Hydroweb/THEIA CNES programme: spatial altimetry providing data on 12 virtual stations on the Gambia River (4 in Gambia and 8 in Senegal) and 7 virtual stations on the Corubal River (3 in Guinea and 4 in Guinea-Bissau);
- WMO, GRDC, FRIEND/UNESCO programmes etc;
- Research on the evolution of the Guinean high basins (REPECHAO, Resilience and Perennialisation of the West African Water Tower), on the critique of hydro data, on the WEFE nexus, on climate scenarios (IPCC, Cordex) and their impacts in West Africa, on satellite products/rainfall... (Bader et al., 2020; Bodian et al., 2018; Descroix et al., 2020; Lamagat et al., 1990; Sambou et al., 2018b);
- Development of models and studies by research and design offices that allow quantifying and modelling certain components of the system (reduction of the level at different points, hydroelectric producibility) that need to be deepened and updated (Simulgamb, Salnstat, MikeBasin OMVG, Sambangalou studies, Coteco 2006, Oréade Breche and ISL 2015);
- Ongoing studies for very recent impact studies on the Digan (Gambia), Kourawel (Komba) and Saltinho (Corubal) dam projects;
- World Bank Hydromet/SAP programme, UNDP etc;
- EU DeSIRA MALMON programme (led by the University of Lisbon) on the resilience of mangrove rice production in Guinea Bissau.

3 VISION AND STRATEGIC OBJECTIVES

3.1 VISION TO 2040

The OMVG and the competent national institutes of the Member States shall ensure the protection and integrated management of transboundary water resources of the OMVG area in order to meet the water needs of the populations and ecosystems.

3.2 STRATEGIC OBJECTIVES/AXES OF THE SECTOR

The strategic axes defined below aim to address the weaknesses and challenges identified in the chapter 2.

Strategic Axis 1: Improve knowledge and monitoring of water resources

The integrated development of the 3 basins must be based on a set of in-depth and updated data and knowledge on water resources. Given the weaknesses of the surface and groundwater monitoring network, both in quantitative and qualitative terms, one provision deals with the improvement of these networks. The objective is for the OMVG countries to have a dense and adequate hydrometric and water quality control network, enabling *precise and monitored resource management*. In parallel, a second provision aims to develop national knowledge and skills on water resources, and a third aims to provide the OMVG with water resources planning and management tools.

This axis aims to provide data, knowledge and tools to the OMVG through the strengthening of networks, studies and databases. It also concerns the reinforcement of the skills of national institutes in order to promote a growing autonomy in the water resources sector. It concerns both the OMVG and the national directorates, but also the higher education and research institutes, in order to develop centres of excellence capable of responding at national and regional level to the requests of the OMVG, the ministries and donors on the issues of planning, development, management and allocation of water resources in the three basins.

Strategic Axis 2: Develop rivers and their basins for multi-objective and sustainable management of the resource

Based on the knowledge gained in Axis 1, Axis 2 aims to translate the virtuous and sustainable development of the water resources of the 3 basins into action.

One provision deals with the challenges of multi-objective management of water resources. The OMVG and the member states must, on the basis of data and scenarios, enable the implementation of the development and management choices made following discussions/consultations with all the stakeholders. This requires in particular the development of new facilities and the optimisation of existing facilities in order to meet the (updated) needs of the sectors of the water-food-energy-environment nexus.

Finally, there is a provision on flood forecasting and management which aims to translate the knowledge gained from Axis 1 on extreme phenomena (floods) into operational terms in order to develop responses to prevent floods and reduce the hazard (amplitude) and the risk of flooding.

Strategic AXIS 3: Strengthen governance

The management of the resource in three neighbouring and transboundary basins implies a strengthening of governance, both at the institutional level and at the legal and regulatory level, which also requires a strengthening of training and communication adapted to the multinational context.

This reinforcement aims to make supranational management rules and planning logic operational, which leads each country to share its sovereignty over the resource, and to validate management at the level of basins and basin agencies. This requires the adoption of common and accepted rules, around a water charter and probably a permanent water commission.

The importance of the hydroelectric potential encourages the establishment of an autonomous energy management company. Interconnection is a sharing tool but must also become a management tool to improve electricity supply by sharing knowledge, resources and associated risks in the context of climate change. The basin logic must prevail over the upstream/downstream logic and lead to an integrated management at basin level, with interconnection making it possible to envisage trans-basin management.

4 INTERVENTION STRATEGY - EXPECTED RESULTS AND ACTIONS TO BE UNDERTAKEN

4.1 LOGICAL FRAMEWORK FOR SECTOR INTERVENTION UP TO 2040

The following Table 4-1 recalls the strategic axes and provisions of Chapter 3, and lists the measures that will be detailed in the following sections.

Table 4-1 - Logical Framework for Intervention in Governance and Knowledge of Water Resources to 2040

Strategic axes	Provisions	Measures
1. Improve knowledge and monitoring of water resources	1.1 Improve the monitoring of water resources	1.1.1 Instrument, repair and consolidate the surface and groundwater monitoring network in the three basins
		1.1.2 Control sources of pollution and establish a water quality monitoring programme
		1.1.3 Train and equip national institutes for data collection, installation and maintenance of hydrometric, piezometric and water quality monitoring networks
	1.2 Develop national knowledge and skills on water resources and the environment	1.2.1 Consolidate knowledge, tools and data on water resources and the environment
		1.2.2 Creation of a water and environment observatory within the OMVG
		1.2.3 Establish a database of water resources, ecosystems and their uses, and a geographic information system
		1.2.4 Promote the emergence of national centres of excellence on water resources and the environment
	1.3 Equip OMVG and national institutes with decision-making tools	1.3.1 Provide OMVG and the states with effective decision-making tools for planning and managing surface and ground water resources
		1.3.2 Equip OMVG and the states with effective early warning tools on floods, droughts and shortages
2. Develop rivers and their basins for multi-objective and sustainable management of the resource	2.1 Improve multi-objective water resources management	2.1.1 Optimise the management of existing facilities according to common objectives
		2.1.2 Increase the mobilisation of water resources through reservoirs
	2.2 Improve flood management and forecasting	2.2.1 Reduce risk through the development of structures and nature-based solutions
		2.2.2 Strengthen operational flood management
3. Strengthen governance based on integrated water resource management	3.1 Strengthen the institutional framework	3.1.1 Sustain the status of the Local Coordination and Monitoring Committees, established under the energy project
		3.1.2 Strengthen the National OMVG Units so that they can carry out their mandate effectively and sustainably
		3.1.3 Operationalise a Permanent Water Commission, a consultation body for stakeholders, including users and riparian communities, in the management of water resources in the river basins

		3.1.4 Operationalise the autonomous energy management company within OMVG (SOGESART)
		3.1.5 Define a strategy for mobilising financial resources
		3.1.6 Establish a coordination and monitoring unit for the implementation of PDDI measures within the OMVG HC.
	3.2. Strengthen the legal and regulatory framework	3.2.1 Revise the provisions of the existing international conventions (establishing the status of the river, creating the OMVG and defining its common works), and establish effective water legislation in order to integrate the adjustments necessary for the management of Blue Peace funding, to frame the procedures for prior notification, definition of target flows, etc
		3.2.2. Harmonise national legal frameworks for water resources management (Water Codes)
		3.2.3 Establish and implement protocols for sharing data and information from Member States with the OMVG
		3.2.4 Develop procedures for implementing the principles of prior notification of planned measures
	3.3. Strengthen the capacity of the OMVG HC and stakeholders at national and local level	3.3.1 Train HC staff and experts from Member States in the principles of riparian community participation, as well as in communication and outreach methods.
		3.3.2 Fill vacant positions in the revised organisation chart of the OMVG HC
	3.4 Structure OMVG communication within the organisation (its bodies), towards decision-makers, towards users and populations of the basin	3.4.1 Define an external institutional communication strategy, including an action plan, a graphic charter and the setting up of an OMVG institutional website
		3.4.2 Develop advocacy for Member State parliaments and decision-makers to disseminate IWRM principles and facilitate the implementation of the PDDI
		3.4.3 Develop and implement an outreach and awareness raising strategy for riparian communities and users of OMVG basins on IWRM principles (including water quality), PDDI implementation, climate change impacts, flood/drought risks

4.2 STRATEGIC AXIS 1 - IMPROVING KNOWLEDGE AND MONITORING OF THE WATER RESOURCES SECTOR

4.2.1 Provision 1.1 - Improve monitoring of water resources

GENERAL PRINCIPLE

The diagnosis and the previous sections have highlighted the existence of a monitoring network that is both uneven in its spatial coverage and suffering from a general decline for surface water, but also for groundwater.

This axis and this provision aim to compensate for the lack of sufficient data to enable effective monitoring of the water resources of the 3 basins, and *ultimately* to support the development of solid and up-to-date knowledge on water resources.

EXPECTED RESULTS

Updating the surface and underground hydrometric monitoring network to standard and setting up a water quality monitoring programme. By 2040, the existing stations will have been rehabilitated, and the network will be extended to cover all the rivers, lakes and wetlands in the basins. The sources of pollution are identified and circumscribed, and the quality of water resources is continuously monitored.

AREA OF INTERVENTION

Rivers and tributaries of the 3 basins, reservoirs (lakes, ponds), wetlands, and main water tables (surface and deep).

PROPOSED MEASURES

Three measures are proposed. They aim to repair and consolidate the network for monitoring the quantity and quality of surface and groundwater and to train and equip the national services in order to ensure the sustainability of the network and quality observations over the long term.

Measure 1.1.1 – Instrument, repair and consolidate the surface and groundwater monitoring network in the three basins

The hydrometric network developed in the 1970s has been in gradual decline since the 2000s. Currently, out of a sample of 27 stations on the Gambia River, nearly half no longer provide data. The renewal of the network must be supported and accelerated in order to have a sustainable and quality observation network. This includes the establishment of missing basic data (gauges, rating curves, station histories, etc.), exchange protocols, and the operationalisation of those that already exist. Concerning the network, it is necessary to envisage the restoration and the reinforcement of this network of measurement of surface and ground water, and in particular the flows of the following basins, following on three axes:

- 1- main rivers: in Fouta Djallon (Guinea, Guinea-Bissau) and other less documented areas (Rio Geba)
- 2- Main tributaries: Gambia, Sahelian tributaries of the Gambia, Kayanga/Geba and Koliba/Corubal
- 3- High elementary basins to be equipped to operationalise a flood/drought EWS

Measure 1.1.1	Instrument, repair and consolidate the surface and groundwater monitoring network in the three basins
Origin (institution / project / programme)	Needs regularly expressed by states, donors e.g. UNDP/GEF early warning projects in Guinea, Guinea-Bissau; WMO network
Objective	Consolidate a network of hydrometric and piezometric stations of sufficient quality and coverage in the 3 basins
Location	All three basins together
Description of the action	<ul style="list-style-type: none"> ▶ Network diagnosis ▶ Identification of needs ▶ Rehabilitation of existing stations ▶ Strengthening and extending the measurement network by setting up surface and groundwater measurement stations, in particular the flows in the following basins <p>1- main rivers: in Fouta Djallon (Guinea, Guinea-Bissau) and other less documented areas (Rio Geba)</p> <p>2- Main tributaries: Gambia, Sahelian tributaries of the Gambia, Kayanga/Geba and Koliba/Corubal</p> <p>3- high elementary basins to be equipped to operationalise a flood/drought EWS</p> <ul style="list-style-type: none"> ▶ Operationalisation of existing exchange protocols, and establishment of additional protocols if necessary; ▶ Establishment of missing basic data: gauging, rating curves, station history ▶ Maintenance and monitoring of the network
Ownership and implementation arrangements	National directorates responsible for water resources in the 4 states.
Duration	10 years for rehabilitation and expansion; ongoing maintenance of the network
Costs and funding	Total estimated cost of <i>[To be determined]</i> CFA francs Funding through projects including early warning (droughts, floods), and climate change monitoring.
Risks envisaged	Faulty installation (unsuitable sites, materials or facilities) Unsustainability of the network (lack of maintenance/repairs)
Expected results	Hydrometric and piezometric stations rehabilitated Monitoring network extended to the main rivers, tributaries, reservoirs, wetlands, water tables (surface and deep)

Measure 1.1.2 - Control sources of pollution and establish a monitoring programme for water quality

In addition to domestic effluent discharges, which are responsible for diffuse or area-limited contamination (leaking septic tanks, sewage infiltration structures and livestock activity, with or without stables), agro-industry accounts for most of the developed activities, which require intensive use of organic and inorganic fertilisers and pesticides. The most widespread and common contamination comes from microbiological contamination and subsequent contaminants from agricultural and livestock activity.

Agricultural activity, which gives rise to mainly diffuse contamination, is responsible for the increase in ions derived from fertilisers, highlighting nitrates. In addition to fertiliser use practices, it is necessary to consider the contamination caused by the irrigated area itself, which is responsible for the general increase in water mineralisation, due to the recycling of salts in the soil.

Mining, especially when carried out in an artisanal manner (gold), determines significant amounts of contaminants in the river environment, both in water and sediment. Larger operations also have problems of pollution of water resources and effects on the environment, biodiversity and human health, due to the lack of treatment of the effluents generated.

The recommended control measures aim to establish, by sector of activity, best practice in the use of water resources and appropriate treatments to reduce pollutant loads discharged into the basin's watercourses.

It is therefore recommended to develop a programme to act at the source, by identifying the situations and characterising the actions to be implemented, as well as to intervene in case of critical pollution.

Critical situations for water quality can occur in the event of uncontrolled pollutant discharges (spills, aggravated contamination) or in episodes of qualitative degradation of the water due to the accumulation of phosphates or nutrients, with situations of eutrophication (lack of oxygen - anaerobic conditions), algal blooms, among others. Interventions on these occasions must have a curative role aimed at resolving or mitigating the environmental and ecological consequences generated, intervening in a directive manner in the treatment of water quality.

These actions will be accompanied by the implementation of a water quality monitoring programme.

Measure 1.1.2	Control sources of pollution and establish a water quality monitoring programme
Origin (institution / project / programme)	Needs regularly expressed by states and OMVG MEA/DGP/PEAMIR Water quality mapping study in the Groundnut Basin Area
Objective	Identify sources of pollution and generate data for monitoring the water quality of water bodies
Location	All three basins together
Description of the action	<p>The measure will be broken down into three separate actions:</p> <p>Identification of pollution sources:</p> <ul style="list-style-type: none"> ▶ Mapping of pollution factors and environmental pressures on water resources with reference to development issues ▶ Characterisation and mapping of the intrinsic vulnerability of water resources ▶ Establishment of quality standards with definition of parameters and limits for discharges, evaluation and revision of the national legal framework for discharges related to the different agents and uses of the water system ▶ Structuring sanitation systems in settlements and providing primary treatment systems in dispersed housing ▶ Improvement of agricultural practices with rational use of agro-supplements ▶ Evaluation and recommendation of wastewater treatment for various industries. Integrated management of industrial waters and their effluents ▶ Assessment of licensed mining units (assessment of their wastewater treatment systems) and control of illegal and artisanal activities ▶ Include a provision on the protection and conservation of recharge areas. <p>Control of critical pollution sources:</p> <ul style="list-style-type: none"> ▶ Establishment of action procedures (structured in an action plan) for different types of critical situations concerning river water quality ▶ Empowering regional entities, both in terms of equipment and support structures ▶ Training of technicians in regional and national entities to respond to these critical situations <p>Creation of national laboratories for monitoring the quality of water resources</p> <p>Establish a water quality monitoring plan:</p> <ul style="list-style-type: none"> ▶ Establish an integrated action plan for monitoring the basin

	<ul style="list-style-type: none"> ▶ Establish common standards and regulations on the collection, storage, treatment, analysis and reporting of water quality parameters ▶ Establish the location of measurement points, taking into account the location of existing water quality measuring stations and existing historical data measurement points (consider diversity and representativeness in the basins) ▶ Definition of the parameters to be measured in order to monitor the existing historical data and the most significant water quality problems that characterise this environment ▶ Definition of the equipment to be installed in the measuring stations and the equipment to be used for stand-alone measurements (to be carried out by the technicians) ▶ Establish a water quality monitoring network at key stations with mostly and preferably automatic stations
Ownership and implementation arrangements	National directorates responsible for water resources in the 4 states.
Duration	10 years
Costs and funding	
Risks envisaged	
Expected results	

Measure 1.1.3 - Train and equip national institutes for data collection, installation and maintenance of hydrometric, piezometric and water quality monitoring networks

The existence of quality data on water resources depends on the presence of a measurement network (equipment) but above all on a network of competent, trained and equipped personnel to maintain/maintain this network and complete it with regular measurements and observations (gauging, profiles, etc.)

Measure 1.1.3	Train and equip national institutes for data collection, installation and maintenance of hydrometric, piezometric and water quality monitoring networks
Origin (institution / project / programme)	Needs regularly expressed by states, donors e.g. UNDP/GEF early warning projects in Guinea, Guinea-Bissau; WMO network
Objective	Consolidate national capacity to collect hydrometric, piezometric and water quality data
Location	Guinea, Senegal, The Gambia and Guinea-Bissau
Description of the action	<p>Training activities and purchase of equipment for hydrometric, piezometric and water quality monitoring for:</p> <ul style="list-style-type: none"> ▶ Capacity building of national services for installation, management and maintenance of stations. Should include flow monitoring by gauging (ADCP, reel) and setting of rating curves, renewal in case of decommissioning and maintenance of stations; ▶ Capacity building of national services for the collection, transmission and archiving of data and observations;
Ownership and implementation arrangements	National directorates responsible for water resources in the 4 states.
Duration	5 years; ongoing investment in services
Costs and funding	<p>Total estimated cost of [To be determined] CFA francs</p> <p>Funding through projects including early warning (droughts, floods), and climate change monitoring.</p>
Risks envisaged	Staff mobility; brain drain; no recurrent budget
Expected results	National water resources monitoring services trained and equipped

4.2.2 Provision 1.2 - Develop national knowledge and skills on water resources and the environment

GENERAL PRINCIPLE

The Gambia, Kayanga-Geba and Koliba-Corubal basins have a relatively limited body of knowledge on the water resources sector compared to neighbouring basins (Niger, Senegal). There is therefore a need to strengthen knowledge in this sector, on topics such as the evolution of water resources (surface/underground), land use, deforestation, the influence on runoff/infiltration, water uses (in particular withdrawals, drainage practices of small and large farms, pollution), the influence of hydro-agricultural developments, flooding dynamics in the alluvial plains, etc.

To this end, this provision recommends strengthening knowledge through (i) studies on the environment, (ii) the creation of observatories, (iii) the establishment of databases and (iii) the emergence of national centres of excellence in order to monitor and understand the evolution of the 3 basins, particularly in the face of global change.

Several studies are needed to provide the knowledge necessary for the integrated development of the 3 basins' water resources. These studies will also enable the data collected to be analysed, interpreted and valorised through a rehabilitated and densified monitoring network. They will also have to be completed by other observations and measurements obtained notably in the field and from satellite imagery.

This knowledge will be shared and disseminated within a body integrated into the OMVG (such as the OMVS/ABN observatory) and which would support a group of experts from the OMVG, technical departments, specialised institutes (e.g. CSE in Senegal) or national universities. Finally, national expertise on water resources must be consolidated in order to create centres of excellence within national institutes and/or universities, with a view to increasing specialisation and autonomy in the monitoring, management and modelling of water resources and their evolution.

EXPECTED RESULTS

Organisations and institutes specialised in the field of water resources in the 3 states to monitor, manage and anticipate the evolution of water resources in the 3 basins. Creation of a water and environment observatory within the OMVG and of a database, as well as a GIS.

Strengthening the capacities of national services to analyse data and observations, in order to monitor, manage and anticipate the evolution of water resources and water uses in the basin

AREA OF INTERVENTION

Guinea, Senegal, The Gambia, Guinea-Bissau

PROPOSED MEASURES

Four measures are proposed to consolidate national knowledge and expertise. These include (i) the consolidation of knowledge on a set of subjects essential to the understanding of water resources and their evolution through studies; (ii) the creation of an observatory and (iii) a database on water and the environment in order to allow the permanent compilation of data and knowledge on the basins, and (iv) support for the emergence of national centres of excellence on water resources and the environment in order to allow greater autonomy of the States in the study, modelling and monitoring of water resources.

Measure 1.2.1 - Consolidate knowledge, tools and data on water resources and the environment

Measure 1.2.1	Consolidate knowledge, tools and data on water resources and the environment
Origin (institution / project / programme)	
Objective	To have an enriched and updated knowledge on water resources and environment
Location	The 3 basins
Description of the action	<ul style="list-style-type: none"> ▶ In-depth studies on the state of water resources in the 3 basins (localized balances, availability, pollution, climate change impact, droughts, floods...) ▶ In-depth studies on water use (crop mapping, etc.) ▶ In-depth studies on the environment (land use, deforestation, etc.) ▶ Integrated analysis of the impact of multiple works on sectors (water-food-energy-ecosystems nexus) ▶ Inventory and harmonisation of databases based on an inventory of aquifers ▶ Geophysical study for the design and implementation of monitoring structures (piezometers) ▶ Hydrogeological, hydrochemical and hydrological investigations including abstraction surveys and requirements, levelling for the definition of the conceptual model of the functioning of hydraulic systems
Ownership and implementation arrangements	OMVG
Duration	10 years to consolidate a body of knowledge on the water resources and environment sector in the 3 basins. 30 years to deepen these studies
Costs and funding	Total estimated cost ?? CFA francs Funding through projects including early warning (droughts, floods), and climate change monitoring.
Risks envisaged	Lack of sufficient/quality data; poor quality studies
Expected results	Enriched and updated knowledge

Measure 1.2.2 - Creation of a water and environment observatory within the OMVG

Measure 1.2.2	Creation of a water and environment observatory within the OMVG
Origin (institution / project / programme)	OMVS SDAGE and OMVS Environmental Observatory
Objective	Have a specialised unit/institute for water resources and environment monitoring
Location	OMVG headquarters with national experts
Description of the action	<ul style="list-style-type: none"> ▶ Creation of a Water Resources (and Ecosystems) Observatory at OMVG ▶ Diagnosis of national competences and selection of experts for a scientific and technical committee

Ownership and implementation arrangements	OMVG; National institutes (technical directorates and universities/specialised centres)
Duration	5 years to create and structure an observatory. Recurrent budget for operation
Costs and funding	Total estimated cost ?? CFA francs Funding through projects including early warning (droughts, floods), and climate change monitoring.
Risks envisaged	Staff mobility; brain drain; no recurrent budget
Expected results	Water and Environment Observatory

Measure 1.2.3 - Establish a database of water resources, ecosystems and their uses, as well as a geographical information system

Measure 1.2.3	Establish a database of water resources, ecosystems and their uses, as well as a geographic information system
Origin (institution / project / programme)	SDAGE OMVS, OIEAU/AQUACOOPE
Objective	To have a database on water resources and environment for the OMVG area
Location	OMVG Headquarters
Description of the action	Development of tools to be housed within the observatory: <ul style="list-style-type: none"> ► Collection and archiving of data collected by national institutes ► Establish a database of climatological, hydrological, piezometric and water quality data at the scale of the OMVG area, including the monitoring of climate change ► Establish a database of abstractor and non-abstractor uses ► Establish an observatory of ecosystems in the OMVG area (land cover, forest monitoring, etc) ► Consolidating a database and a geographic information system ► OMVG training and experts from each state ► Dissemination of the database (online, open/restricted access)
Ownership and implementation arrangements	OMVG
Duration	5 years to set up a database and GIS. Recurrent budget for operation (database expert, servers)
Costs and funding	Total estimated cost ?? CFA francs Funding through projects including early warning (droughts, floods), and climate change monitoring.
Risks envisaged	Staff mobility; no recurrent budget
Expected results	Database and GIS

Measure 1.2.4 - Promote the emergence of national centres of excellence on water resources and the environment

Measure 1.2.4	Promote the emergence of national centres of excellence on water resources and the environment
Origin (institution / project / programme)	
Objective	Increase national competences and autonomy of states in the study, modelling, management, planning of water resources Create and improve training courses in hydrology, hydrogeology and hydrometry, including management and including data analysis and interpretation.
Location	Guinea, The Gambia, Guinea-Bissau, Senegal
Description of the action	<ul style="list-style-type: none"> ► Creation of national centres of excellence specialising in water resources ► Funding for mobility, research and university training
Ownership and implementation arrangements	Ministries of Research and Education, Ministries of Water
Duration	20 years to structure and finance national centres of excellence in water resources
Costs and funding	Total estimated cost ?? CFA francs Funding through projects including early warning (droughts, floods), and climate change monitoring.
Risks envisaged	Staff mobility; brain drain; no recurrent budget
Expected results	National centres of excellence for the conduct of specialised studies, initial and further training, and the development of tools and knowledge on water resources

4.2.3 Provision 1.3 - Provide OMVG and national institutes with planning and management tools for water resources and basins

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GENERAL PRINCIPLE

The monitoring networks and all the knowledge consolidated by the previous provisions should ultimately enable the development of operational tools for planning and managing the water resources for these three basins. These tools should in particular enable the OMVG, the national directorates, but also donors, consultancy firms and NGOs to plan the development and implementation of facilities and actions to (i) mobilise the basin's water resources, (ii) manage extreme phenomena, particularly floods and droughts.

EXPECTED RESULTS

Decision support tools based on sound and up-to-date knowledge and data.

AREA OF INTERVENTION

The 3 basins.

PROPOSED MEASURES

The two measures aim to develop and transfer planning and management tools for the development and management of water resources and extreme phenomena, in particular via structures.

Measure 1.3.1 - Provide the OMVG and the States with efficient decision-making tools for planning and management of surface and ground water resources

Measure 1.3.1	Provide the OMVG and the states with effective decision-making tools for planning and management of surface and ground water resources
Origin (institution / project / programme)	SDAGE OMVS, PDDI
Objective	To have decision-making tools for the development and management of water resources
Location	The 3 basins
Description of the action	<p>Develop a water allocation modelling tool for water resources development planning, informing hydrological, environmental, social and economic indicators:</p> <ul style="list-style-type: none"> ▶ Summary of knowledge on water resources and structures ▶ Development of hydrological, hydraulic and allocation models ▶ Development of satisfaction indicators ▶ Development of planning scenarios, management priorities ▶ Development of water resource allocation modelling tools (such as WEAP) for water resource development planning, providing information on hydrological, environmental, social and economic indicators ▶ Training HC staff and experts from Member States in the use or exploitation of OMVG's decision-making tools
Ownership and implementation arrangements	OMVG, National Directorates, Works Management Company
Duration	10 years to improve knowledge on water resources and develop tools adapted to the needs of the 3 basins
Costs and funding	Total estimated cost ?? CFA francs Financing through hydropower development projects
Risks envisaged	Lack of sufficient/quality data; poor quality studies
Expected results	Effective water resources management and virtuous/reasonable development of basins

Measure 1.3.2 - Equip OMVG and the States with effective tools for early warning on floods, droughts and shortages

Measure 1.3.2	Equip OMVG and the States with effective tools for early warning on floods, droughts and shortages
Origin (institution / project / programme)	OMVS SDAGE, PDDI, UNDP/WMO SAP projects
Objective	Decision support tools for early warning of floods, droughts and shortages
Location	The 3 basins
Description of the action	<ul style="list-style-type: none"> ▶ Synthesis of knowledge on water resources and climate change ▶ Development of hydrological and hydraulic models ▶ Development of indicators for floods, droughts, shortages ▶ Development of flood and drought modelling tools ▶ Development of flood/climate hazard forecasting tools ▶ Setting up structures for the management and dissemination of information on floods and droughts
Ownership and implementation arrangements	OMVG, National Water and Meteorological Directorates
Duration	10 years to improve knowledge of water resources and develop tools adapted to the needs of the 3 river basins
Costs and funding	Total estimated cost ?? CFA francs

	Funding through projects including early warning (droughts, floods), and climate change monitoring.
Risks envisaged	Lack of sufficient/quality data; poor quality studies
Expected results	Climate hazard forecasting Improved management of extreme events (floods, droughts) Flood and drought risk reduction

4.2.4 Means for implementing the actions and measures of Strategic Axis 1

Most of the actions will be led by the OMVG, but in order to support the strengthening of the states, the ministries of each country should be involved. Given the cross-sectoral nature of water resources, several ministries linked to water resource issues will be involved (water, agriculture, energy) as well as the Ministry of Higher Education and Research for training and centres of excellence.

4.3 STRATEGIC AXIS 2 - DEVELOP RIVERS AND THEIR BASINS FOR MULTI-OBJECTIVE AND SUSTAINABLE MANAGEMENT OF THE RESOURCE

4.3.1 Sustaining and preserving water resources through the preservation of basins

[This provision is covered by the Environment and Ecosystems Sector Plan.]

GENERAL PRINCIPLE

The three basins are an area of very rich biodiversity and one of the last preserved sites in West Africa:

- The Gambia's (the country) long territory is largely made up of the banks and mangroves of the Gambia River, which is one of the most beautiful and best preserved in West Africa. The Gambia (the country) is also characterised locally by very good village management of the forests, which are preserved by the population and managed by the villages, and are indeed well preserved and even extended, while bringing the community money annually from the sale of timber and non-timber forest products;
- The Niokolo Koba and Badiar NPs as a whole constitute a centre of biodiversity and wildlife despite the looting and poaching that has long been carried out by certain nearby villages (west of the NPNK in particular) or by professional poachers, which has considerably depleted its wildlife population (elephants, lions, gazelles, chimpanzees, etc.). There are still beautiful open and gallery forests in KNP, Badiar and their surroundings, even if some noble species are overexploited (*Khaya senegalensis*) or even endangered on the Senegalese side (*Pterocarpus erinaceus*..);
- The Fouta Djallon has been densely populated for a long time and no longer has too many preserved ecosystems. On the other hand, the populations have been able to maintain clear forests and gallery forests which are the guarantees of the quality of the water downstream, both in terms of quality (limitation of solid transport) and flow and regime (significant storage of water in the high rainfall basins during the monsoon season and gradual release during the dry season);
- Above all, all the NPs, reserves and MPAs in the South East of Guinea Bissau: the Boe-Quebo corridor, the Floresta de Cantanhez, the Lagoas de Cufada NP, the Rio Grande de Buba valley, constitute both the largest reservoir of biodiversity in West Africa and a vast, relatively preserved area. This is all the more remarkable as it is threatened by the extension of the "Bauxite front" which is spreading very quickly, south of the border with Guinea, where explorations affect in recent years the Tominé basin, the main constituent (in flow) of the Rio Corubal. In April 2022, official exploitation does not yet concern the OMVG catchment areas.

Hence Strategic Axis 2, which is similar to, but more proactive than the Axis ASE 1 of the OMVS SDAGE ("Thinking of river development as an opportunity for the environment"): preservation of sensitive resources and natural environments. This concerns in particular the following regions: Fouta Djallon, the water tower of the whole of West Africa, and the mangroves, gallery forests and wetlands of continental interest. The general measures that can be recommended at the regional level, as well as at the national and basin levels are, for example:

- Promote ecotourism, which creates a lot of jobs and preserves natural environments;
- Favour "virtuous" dams in Fouta Djallon to avoid dams with strong negative impacts on estuaries (Gambia, Geba) or with very strong negative impacts on the unique site of the Saltinho rapids;
- Preserve existing protected areas, NPs, MPAs, etc. and therefore relocate the Buba deep sea port project;
- Favour energy uses (hydroelectricity to be qualified as virtuous despite the negative impacts because it emits practically no GHGs in operation), water supply and irrigation; seriously study the interest of navigability, which is useless for the time being given the volumes to be transported: pinnaces and large transport pirogues already pass everywhere! (Avoid the mistakes made in Senegal, where the colonists blew up the locks, dramatically lowering the water table, and where the Diama dam has evolved and no longer corresponds to the initial needs and is permanently subject to hydraulic constraints that were not foreseen at the outset and a risk of downstream extraction);
- Improve the control and management of mines, mining and industrial waste, mine-related deforestation and land clearing, and the application of phyto-sanitary products;
- Limiting deforestation, accelerating spontaneous revegetation.

The objective is to maintain (or restore where threatened) the water flows necessary for the environment and its biodiversity.

Soils and wetlands are the natural storage and filtration areas for rainwater. They also support crops and natural habitats, and play a key role in the water cycle, both quantitatively (temporary storage) and qualitatively (filter). The upper basins, made up of plutonic or metamorphic rocks, are not very prone to erosion, but the soils are rather thin and poor outside of the shallows and rare plateaus. The storage and filtering capacity of the basins must be maintained, preserved and even improved in order to preserve their agro-pastoral production capacity and prevent erosion, and thus protect water resources, biodiversity and limit the risk of flooding. Watercourses and wetlands, which are small but very numerous in the upper basins (confluence plains, flood plains, springs, gallery forests), are also sites of high biodiversity.

These environments and their functionalities (storage, filtering) have ecological water needs to be satisfied, particularly during the monsoon season, so that they continue to provide good quality and sufficient quantity of runoff during the long dry season.

The protection of these functions and services can be improved by:

- Improving knowledge (see Strategic Axis 1);
- Where necessary, restoration and management programmes for key ecosystems;
- Consolidation of existing protected areas, strengthening of targeted and emerging 'corridors', creation of new protected areas;
- The consideration of key elements (or elements at stake), watercourses, soils, wetlands, water towers, gallery forests, in all hydraulic development projects (dams or intakes, canals and perimeters) or other civil engineering projects (roads) or mining projects; if the projects are carried out because they are a priority, provide for broad compensation in order to maintain but as far as possible strengthen the functions and services of the soils and basins;
- Maintain (or restore if threatened) the water quality necessary for human health and biodiversity.

The OMVG basins are mainly located in areas where trypanosomiasis and onchocerciasis are or were endemic. Onchocerciasis (a priori eradicated) is directly linked to running fresh water, which seems to be the most beneficial, unlike malaria, which thrives more in stagnant or slow-moving water. The upper basins are relatively spared due to their altitude (but global warming could call this advantage into question). However, it is important to continue monitoring these endemic diseases and others that may appear.

Agriculture is locally intensive to very intensive (tapades) in the upper Gambia and Corubal basins, but the major area of semi-industrial potato cultivation is in the upper Kakrima and Konkouré basins. This being the case, water quality is a major issue in these upper basins, since they constitute the area with the highest water availability, and they constitute a huge part of the total freshwater supply to the Sahelian countries, a huge issue for the health of the inhabitants there and downstream, and for the ecosystems whose density is linked to these important inputs.

The control of water quality is complex because it results from many factors. The sustainable improvement of water quality also requires a **more global consideration of the role of ecosystems and their resilience** (preservation and enhancement of the self-purification capacities of environments).

EXPECTED RESULTS

Preservation of surface and groundwater resources through the preservation of basins.

Improving the well-being of the populations of the 4 countries concerned.

Securing water resources for local populations by 2040.

Improved management for downstream areas due to the regulation of the watercourses as a result of improved water retention in the soils and basins.

Describe the current hydrological regime of the basins and what to expect from it in the light of climate change and planned development in a 'sustainable' scenario.

AREA OF INTERVENTION

All the basins, starting with the upstream basins: Fouta Djallon and the Badiar plateau, where most of the available flows are generated.

PROPOSED MEASURES

Two measures are proposed:

- a) Preserve existing natural areas and ecosystems
- b) Restore ecosystems that have been degraded.

The aim is to preserve the resources in such a way as to make them sustainable and to facilitate water management in the decades to come, by preserving and even increasing the natural storage of water in the slopes.

This means proposing developments that improve or preserve the infiltration/filtration capacities of the basins.

It is also necessary to assess the impact of this type of development on the future of the resource in the event of a return to drought, and in the light of global warming and the current and expected increase in extreme events.

Hence the importance of a scenario improving natural storage to take account of these expectations.

4.3.1.1 Measure a) - Preserve existing natural areas and ecosystems

It is a question of preserving the basins in their water retention capacity, or even increasing this capacity by promoting development that allows the infiltration of all the water that falls. This priority appears in the development plans of the 4 countries concerned, in the priorities of the OMVS (the agency of the neighbouring Senegalese basin), of the SDAGE of this basin, of ECOWAS and of the UEMOA.

Financing: IUCN, FFEM, FRB, CTCN ?

Measure a)	Preserve: 1- An ecosystem: the Boe Cantanhez Buba Lagoas de Cufada Corridor by Saltinho 2- An agrosystem: The highlands of Fouta Djallon
Origin (institution / project / programme)	1- GB Southern Corridor: Terra Ranka IBAP/IUCN research projects in Guinea Bissau 2- Fouta Djallon: OMVG + FPDF + ECOWAS "Fouta Djallon" project + consultant
Objective	Strengthening the preservation of the vast corridor in the SE of Guinea Bissau in the face of the "bauxite front" Supporting the resilience of the Fouta Djallon (FD) highlands and the decline of slash and burn
Location	1- Tominé Basin and Bas Corubal including the mangroves of the estuary 2- Corubal and Gambia High Basins
Description of the action	<ul style="list-style-type: none"> ► Strengthen governance of Guinea-Bissau protected areas in the face of mining investors and interconnection deforestation ► Study alternatives to the Saltinho dam project (tidal turbines, tidal plant?) ► Support to farmers to develop lowland areas and agro-forestry in bowls
Ownership and implementation arrangements	1- IBAP/IUCN for the SE axis of Guinea-Bissau 2- FPDF for the upper Corubal Gambia basins in FD
Duration	5 years
Costs and funding	Total cost estimated at 57 million FCFA (SE Guinea-Bissau) over 4 years (training of 4 training engineers and 20 additional ecoguards) and 892 million GNF over 4 years (consultant estimate) for 4 half-time engineers to train 200 farmers in agroecology (492 million FG for the engineers' salaries, 400 million GNF for support to 200 trained farmers) Funding to be identified. FFEM, IUCN for Guinea-Bissau GRET + CCFD for FD
Risks envisaged	SE Guinea-Bissau protected corridor: pressure from bauxite producers Pressure from national institutions ? of Guinea-Bissau for the construction of the Saltinho dam and the Buba deep water port Fouta Djallon: resistance from a possible "industrial potato lobby"
Expected results	Institutional, scientific and field strengthening in situ of the governance of the conservation of ecosystems and protected areas, with the concretization of the corridor to be protected as the Boe-Saltinho-Buba-Cantanhez-Lagoas de Cufada ecological corridor A strengthening of the resilience of the agrosystems of the Fouta Djallon high plateau and a virtuous and ecological intensification of the foothills of the massif leading to a decline in the practice of slash and burn

4.3.1.2 Measure b) - Restore ecosystems that have been degraded

This involves restoring the original infiltration function in agrosystems by stopping deforestation, controlling bush fires and charcoal burning, as well as gold panning, for reforestation and greening. Propose new activities or changes in practices that increase infiltration and water retention in soils and watersheds.

Measure b)	An ecosystem: NK NP + Badiar Two agrosystems: one degraded: Gambia Estuary Corridor One threatened: Tominé Basin
Origin (institution / project / programme)	OMVG
Objective	Restore ecosystem functions and services degraded by deforestation (deforestation, bush fires, coal mining, etc.) as well as by gold mining and the bauxite front,

Location	The protected area of Niokolo Badiar NP
Description of the action	Strengthen control of the factors that degrade ecosystems: deforestation and mining, agricultural exploitation
Ownership and implementation arrangements	MEDD DEEC Senegal MEDD Gambia ME Guinea
Duration	5 years
Costs and funding	Total cost estimated at 40 million FCFA (PNNK) and 500 million GNF and 6 million Dalasi over 4 years (training of 8 training engineers and 40 additional ecoguards) 500 million GNF to better control the "Bauxite front" and monitor it and list its degradation (areas of soil denuded by mining, by geomatics) FFEM ? CTCN ? FVC ?
Risks envisaged	Resistance from poachers Inventory impossible due to the bauxite miners' lobby
Expected results	Improved functions and services through management and monitoring in NK + Badiar NPs and their peripheral areas Improved functions and services through improved management in the mangroves of the Gambia estuary Monitoring the progress of the bauxite front in the Tominé basin

4.3.2 Apply ecological intensification practices in agro-pastoral and agro-forestry activities and evaluate their effects

[This provision is covered by the Agriculture Sector Plan.]

GENERAL PRINCIPLE

The aim is to apply agro-ecological measures to intensify rural activities on an experimental basis and to ensure that the proposed measures and practices promote water infiltration and storage.

Indeed, the upper basins, particularly in Fouta Djallon (but also in the secondary water tower of Badiar) are not very permeable: it is therefore the wetlands, soils, water tables, weathering mantles, etc., which constitute the natural water storage areas.

EXPECTED RESULTS

- Anticipating the needs of hydroelectric development
- A reduction in runoff during rainfall, with the aim of achieving 100% infiltration of water in order to:
 - Increase natural water storage in soils and water bodies
 - To regulate downstream flows, facilitating the management of irrigation water and hydroelectric works
- Better knowledge of the impacts of measures on resources, flows and water quality.

AREA OF INTERVENTION

The whole OMVG area, starting with the upstream areas

PROPOSED MEASURES

- I. Encourage agroecological and agroforestry practices that favour water infiltration in agrosystems
- II. Establish a monitoring of the hydrological cycle (from rainfall to flows/regimes at the outlets via the water tables) integrating climate change and its impacts

(and therefore improve knowledge of water resources in this context, with monitoring of certain representative basins, piezometry, water quality, which comes under Strategic Axis 1).

4.3.2.1 Encourage agroecological and agroforestry practices that favour water infiltration

The aim is to ensure that as much water as possible seeps through to preserve the water tower in the upstream parts, and the soil moisture everywhere.

Measure I.	Supporting agroecology in Fouta Djallon Developing it in the north in the Sahel zone
Origin (institution / project / programme)	Consultant and FPDF/GRET/CCFD Consultant and GRDR
Objective	Determine the relevance of agroecology in terms of improved infiltration, water retention capacity and natural water storage in the soil To show if there is a relevance of agro-ecological practices compared to conventional agriculture in terms of yield, productivity per worker and cost/benefit
Location	Fouta Djallon: three sites from the top to the bottom, Bantala, Koureniaki, Koliba basins Sahel: Baniou region, UTM 738260E 1605760N, 40 km north of Goudiry, upper Nieri Ko river
Description of the action	To compare in the same area (otherwise identical conditions) yield and cost/benefit of an agroecological crop and the same conventional crop, in 3 sites in each region
Ownership and implementation arrangements	1- FPDF/GRET/CCFD 2- GRDR
Duration	5 years
Costs and funding	Fouta Djallon: 430 million GNF Sahel: 29 million FCFA Total: €86,000 GRET ? CCFD ? GRDR ?
Risks envisaged	No transition to agroecology: risk of residues of plant protection products
Expected results	Comparison of infiltration and soil moisture under the two types of practices throughout the cropping season Comparison of yields and cost/benefit ratio of crops under conventional and agroecological practices

4.3.2.2 *Establish a follow-up of the hydrological cycle integrating the recommended measures*

The climatological and hydrometric (+ piezometric) measurement network in place or to be developed (see Strategic Axis 1) allows long-term monitoring of climate change in the three basins and assessment of the impacts of this climate change on water resources and on the quality of surface and deep water.

At the scale of the basins currently monitored and those that should ideally be monitored, the network should make it possible to determine the influence of the application of the recommended measures in the desired storage of water in soils and basins, over time to take account of climate change and its impacts in addition to those of the measures adopted.

In addition, the effectiveness of the measures taken to promote infiltration and water storage must be verified at the plot level, by installing stations to measure soil moisture (water content) to at least the depth of the root base. The aim is therefore to install 6 moisture monitoring stations (and, if relevant, small hydrometric stations downstream) in the areas that will have been chosen to carry out the comparison of net primary productivity, hydraulic conductivity and soil water retention capacity under the two approaches, agro-ecological and conventional.

Measure II.	Adapting the measurement network to the long-term monitoring of variables influenced by the proposed measures and by the CC
Origin (institution / project / programme)	OMVG, SDAGE Senegal Terra Ranka Water strategy plan, The Gambia
Objective	Assess the impact of the recommended measures on the water cycle
Location	Existing hydrometric stations, or to be created, hydrometric stations at the outlets of developed sites (1.2.1); market garden areas selected to study the relevance of agroecological practices to improve natural water storage and filtration
Description of the action	<ul style="list-style-type: none"> - Compare the flows and regimes before and after the application of the measures at the hydrometric outfall stations - Install small control pond stations set up on an ad hoc basis - Compare EC and CRES (soil water retention capacity) on agro-ecological and conventional plots
Ownership and implementation arrangements	OMVG, National Water Directorates, universities and research centres
Duration	10 years (extended to 20 years, perpetuation?)
Costs and funding	Sustainability of additional parameter measurements Installation of stations on experimental ponds Financing OMVG, FFEM, CTCN Support for the monitoring of 6 hydrometric stations and financing of agro-meteorological and hydrometric observations (purchase of 6 complete stations) of the 6 selected experimental sites for 10 years Total €228000 CTCN,
Risks envisaged	Changes in hydrological cycle variables too small to be noticeable in the first 5, 10 or 15 years
Expected results	Monitoring the impacts of the recommended measures on the hydrological cycle

4.3.3 Provision 2.1 - Improve multi-objective water resources management

GENERAL PRINCIPLE

Based on the data, knowledge and tools recommended by Strategic Axis 1 and the training provided, the OMVG and the national actors are led to improve water resources management in the 3 basins. The management of water resources involves, in particular, the development and management of hydro-agricultural and hydroelectric facilities in order to meet the growing water, food and energy needs of the member states. These hydraulic works to support irrigation and the development of hydroelectricity introduce major hydrological changes, reducing the amplitude of floods, but also allow low-water support. Some needs can be incompatible with others, or even lead to deleterious effects, particularly on ecosystems. The influence of these structures, as well as the management strategies to optimise their operation and minimise their impacts, will have been studied and discussed through the measures of provision 2.3. It is then necessary to develop a common strategy (e.g. "shared vision" of the NBA) for the development of the river basins and to implement the development and reasoned and reactive management of the structures in order to best satisfy the needs of the water-supply-energy-ecosystem nexus

EXPECTED RESULTS

Common strategy for the development and management of surface water resources through hydraulic developments.

Reactive (day-to-day) management of facilities to meet the objectives of the water-supply-energy-ecosystems nexus.

AREA OF INTERVENTION

The 3 basins

PROPOSED MEASURES

The measures concern both the improvement of the management of the few existing small hydraulic infrastructures, and the implementation of a development of hydraulic structures and their management.

Measure 2.1.1 - Optimise the management of existing hydraulic infrastructures according to common objectives

The basins are relatively undeveloped; this measure concerns in particular the works on the Anambé (Confluent and Niandouba dams) but could be extended to other works identified by the national services.

Measure 2.1.1	Optimise the management of existing hydraulic infrastructures according to common objectives
Origin (institution / project / programme)	PAGIRE, OMVG
Objective	Improving the management of existing hydraulic structures
Location	Anambé reservoirs, others?
Description of the action	<ul style="list-style-type: none"> ➤ Conduct consultations between all stakeholders ➤ Agree between states on development/rehabilitation and management choices ➤ Mobilise the necessary financial resources from donors ➤ Implementing river development ➤ Implement the management of rivers and structures (creation of structures, drafting of management manuals, operational monitoring of structure levels and needs, etc.)

	➤ Improve the coordinated management of the Confluent dam on the Kayanga, which has tended to increase the severity of low water levels (particularly dry periods), which has a negative impact on downstream uses, particularly agriculture;
Ownership and implementation arrangements	OMVG, and national directorates DGPPE
Duration	10 years
Costs and funding	cf PAGIRE Kayanga-Geba
Risks envisaged	Failure of facilities, overflows, uncontrolled releases, reduction of downstream flows
Expected results	Existing structures best support downstream users by limiting adverse impacts

Measure 2.1.2 - Increase the mobilisation of water resources through hydraulic infrastructures

The OMVG Energy project includes the construction of several structures (8 in progress or planned). This measure concerns the definition and implementation of a development strategy (based on the knowledge and scenarios of Axis 1 for rivers through hydraulic works (including Sambangalou, Saltinho, etc.).

Measure 2.1.2	Increase the mobilisation of water resources through
Origin (institution / project / programme)	PAGIRE, OMVG
Objective	Mobilising resources to meet the needs of the water-food-energy-ecosystems nexus
Location	3 basins, primarily dam sites of the OMVG Energy project
Description of the action	<ul style="list-style-type: none"> ➤ Conduct consultations between all stakeholders ➤ Agree between states on development and management choices (large dams, small dams etc.) ➤ Mobilise the necessary financial resources from donors ➤ Implement river development ➤ Implement the management of rivers and structures (creation of structures, drafting of management manuals, operational monitoring of structure levels and needs, etc.)
Ownership and implementation arrangements	OMVG, national directorates, ministries of energy
Duration	20-30 years
Costs and funding	See energy diagram
Risks envisaged	Failure of facilities, overflows, uncontrolled releases, reduction of downstream flows
Expected results	Hydraulic works built and managed in a reasoned and concerted manner

4.3.4 Provision 2.2 - Improve flood management and forecasting

GENERAL PRINCIPLE

In addition to the measures of Axis 1 on the development/strengthening of knowledge and skills for flood forecasting, this provision aims to enable effective management of flood events in order to reduce the risk of flooding and the associated human and material damage.

EXPECTED RESULTS

Flood risk reduction.

Flood forecasting and monitoring service.

AREA OF INTERVENTION

The Gambia, Guinea, Guinea-Bissau, Senegal

PROPOSED MEASURES

The 2 measures for flood risk reduction concern (i) risk reduction through land use planning, (ii) operational management for flood forecasting and monitoring.

Measure 2.2.1 - Reduce risk through the development of structures and nature-based solutions

In addition to the major structures which can have a significant effect on flood control, other structures dedicated to flood protection will be developed. These will be built in the risk areas identified in measure 1.3.2 and in particular near human and material interests. Structures of different sizes will be built, but also the development of the territory will favour the maintenance of natural areas, wetlands, spreading areas, which by allowing a safe overflow of the river, and favouring infiltration, allow the speed and amplitude of the flood to be reduced.

Measure 2.2.1	Reduce risk through the development of structures and nature-based solutions
Origin (institution / project / programme)	
Objective	Reducing risk through land-use planning
Location	The 3 basins
Description of the action	<ul style="list-style-type: none"> ➤ Increase flood retention capacity through dedicated structures upstream of risk areas ➤ Maintenance of natural spreading areas ➤ Development of multi-objective sites (nature-based solutions)
Ownership and implementation arrangements	OMVG, national directorates
Duration	20 years
Costs and funding	
Risks envisaged	Degradation of structures, filling in, management of structures
Expected results	Construction of facilities (nature-based solutions) and containment structures

Measure 2.2.2 - Strengthen operational flood management

Measure 2.2.2	Strengthen operational flood management
Origin (institution / project / programme)	
Objective	Reduce risk through hazard management, risk communication etc.
Location	3 basins, proximity of material and human interests (urban centres)
Description of the action	<ul style="list-style-type: none"> ➤ Establish real time monitoring of upstream levels, rainfall etc. ➤ Create/strengthen flood forecasting and management units ➤ Define and establish rules for the management of flood protection works ➤ Translate the outputs of flood forecasting models into indicators (maps, thresholds) ➤ Develop a national and communal alert plan ➤ Communicate the forecasts to all the actors and populations concerned
Ownership and implementation arrangements	National Meteorological and Hydrological Directorates
Duration	10 years
Costs and funding	
Risks envisaged	Ineffective management, staff mobility, under-staffing
Expected results	Flood Forecasting Unit Alert maps and plan

4.3.5 Means for implementing the actions and measures of Strategic Axis 2

Most of the actions will be led by the national directorates of the water/hydraulics ministries in each country. Given the cross-sectoral nature of water resources, several ministries linked to water resource issues will be involved (water, agriculture, energy). However, in addition to the measures involving national actions (mobilisation of resources, flood management), measures on a transboundary scale on the coordinated management of structures in particular will have to be piloted by the OMVG in consultation with the national services.

4.4 STRATEGIC AXIS 3 - STRENGTHENING WATER RESOURCES GOVERNANCE IN THE THREE RIVER BASINS

4.4.1 Provision 3.1 - Strengthen the institutional framework

GENERAL PRINCIPLE

This provision aims to strengthen the institutions responsible for water resources management and governance. The strengthening of water resources governance is essential, in parallel with the axes and provisions on the development of skills and knowledge, in order to effectively support the implementation of actions on water resources management.

It should be noted that these proposals for institutional strengthening measures could be called into question by the recommendations of the legal and regulatory assessment currently underway (Lot 3), which assesses the need for an institutional mutation of the OMVG, in view of its new functions.

EXPECTED RESULTS

A strengthened and operationalised institutional framework, anchored in the territory of the OMVG basins.

AREA OF INTERVENTION

The four OMVG Member States: The Gambia, Guinea, Guinea-Bissau and Senegal.

PROPOSED MEASURES

The proposed measures aim to capitalise on existing structures (CLCS, OMVG National Structures, CPE, SOGESART), as well as to fill the gaps identified in the institutional framework (strategy for mobilising financial resources and coordination and monitoring unit for the implementation of PDDI measures within the OMVG HC)

Measure 3.1.1 - Sustain the status of the Local Coordination and Monitoring Committees, established under the energy project

The Local Coordination and Monitoring Committees (CLCSs) are essential to ensure the link between OMVG projects and local populations; they provide the link between the national authorities and the communities. In particular, they are involved in monitoring the acceptance of projects by local populations, as well as in monitoring the implementation of measures (information, awareness raising, consultation, compensation and indemnification).

Measure 3.1.1	<u>Perpetuate the status of the Local Coordination and Monitoring Committees, established under the energy project</u>
Origin (institution / project / programme)	OMVG
Objective	To anchor decisions in the territory and ensure ownership of projects and programmes by local decision-makers, to allow a constant link between the local territory and the national and supranational authorities.
Location	<p>16 CLCS established under the Energy project :</p> <ul style="list-style-type: none"> ▶ Gambia: Lower River, West Coast ▶ Guinea: Balaki, Commune Urbaine de Mali, Lébékéré, Labé-Mali, Pita-Dalaba-Mamou, Dubréka-Telemele-Kindia, Boké-Boffa-Fria ▶ Guinea Bissau: Quebo, Mansoa ▶ Senegal: Kaolack, Kaffrine, Tambacounda, Kédougou, Sédhiou <p>CLCS to be established outside the Energy project areas :</p> <ul style="list-style-type: none"> ▶ Gambia: Janjanbureh, Lower Santa Su ▶ Guinea: Koundara, Gaoual ▶ Guinea Bissau: Buba <p>Senegal: Kolda, Vélingara</p>
Description of the action	<ul style="list-style-type: none"> ▶ Perpetuation of the CLCS staff (per CLCS: a half-time facilitator and secretary, a communication officer and a full-time administrative/accounting officer) ▶ Establishment of CLCSs in OMVG catchment areas outside the energy project areas and recruitment of necessary staff ▶ Training of CLCS staff on OMVG issues
Ownership and implementation arrangements	OMVG
Duration	5 years
Costs and funding	To be determined
Risks envisaged	Budgetary constraints limiting the possibilities of recruiting CLCS staff and therefore the sustainability of CLCSs.
Expected results	Operational CLCS

Measure 3.1.2 - Strengthen the National OMVG Units so that they can carry out their mandate effectively and sustainably

Measure 3.1.2	Strengthen the National OMVG Units so that they can carry out their mandate effectively and sustainably
Origin (institution / project / programme)	OMVG
Objective	Strengthen the OMVG National Units so that they can ensure effective communication between the OMVG HC and the States, as well as ensure the effective implementation of OMVG projects and programmes in each national portion
Location	Bissau, Conakry, Dakar and Banjul
Description of the action	<ul style="list-style-type: none"> ▶ Capacity building of the National OMVG Units

Ownership and implementation arrangements	OMVG
Duration	5 years
Costs and funding	To be determined.
Risks envisaged	Insufficient technical and financial means at the disposal of the National Cells
Expected results	Capacities of National Units strengthened for strategic planning, coordination and monitoring of OMVG projects and programmes at national level

Measure 3.1.3 - Establish a Permanent Water Commission, a consultation body for stakeholders, including users and riparian communities, in the management of water resources in the river basins

Measure 3.1.3	Operationalise a Permanent Water Commission, a consultation body for stakeholders, including users and riparian communities, in the management of water resources in the river basins
Origin (institution / project / programme)	OMVS SDAGE
Objective	Prevent and manage conflicts related to the use and management of water resources by involving all stakeholders
Location	HC of the OMVG
Description of the action	Created in the OMVG texts, it is necessary to operationalise the PEC by : <ul style="list-style-type: none"> ► Establishment of rules and operating procedures; ► Establishment of an operating budget; ► Recruitment of animation staff; ► Technical and operational training; ► Implementation of consultation and decision-making tools.
Ownership and implementation arrangements	OMVG
Duration	3 years
Costs and funding	To be determined
Risks envisaged	Inefficient management, insufficient budget, conflicts over water resources
Expected results	The FPC is operational and involved in decisions on the principles and modalities of water resources allocation in the OMVG area, and reviews project proposals that have an impact on these water resources. The PEC periodically submits a water resources management plan for the OMVG area based on projected needs and available resources.

Measure 3.1.4 - Operationalise the autonomous energy management company within OMVG (SOGESART)

Measure 3.1.4	Operationalise the autonomous energy management company within OMVG (SOGESART)
Origin (institution / project / programme)	OMVS with the creation of SOGEM/SOGED
Objective	Operationalise and extend to all three OMVG catchment areas the Société de Gestion de Sambangalou et de l'Interconnexion (SOGESART). The SOGESART will carry out the OMVG's heritage function.
Location	4 states, sites for the headquarters of this company to be determined
Description of the action	
Ownership and implementation arrangements	OMVG

Duration	10 years
Costs and funding	To be determined
Risks envisaged	Mobility of staff, delay in the creation of works
Expected results	Autonomous energy management company created (1 or more linked to each hydroelectric dam?)

Measure 3.1.5 - Define a strategy for mobilising financial resources

Measure 3.1.5	Define a strategy for mobilising financial resources
Origin (institution / project / programme)	
Objective	OMVG is able to mobilise sufficient diversified and sustainable financial resources to support its projects and programmes
Location	OMVG HC
Description of the action	<ul style="list-style-type: none"> ▶ Identification of diversified financial sources ; ▶ Establishment of mechanisms to mobilise sustainable financial resources; ▶ Capacity building in financial management and accounting to maintain these mechanisms for mobilising financial resources on the long term.
Ownership and implementation arrangements	OMVG
Duration	3 years
Costs and funding	To be determined
Risks envisaged	The financial resources identified are insufficient or unsustainable
Expected results	A strategy for mobilising financial resources in the short and long term is established

Measure 3.1.6 - Establish a coordination and monitoring unit for the implementation of PDDI measures within the OMVG HC

Measure 3.1.6	Establish a coordination and monitoring unit for the implementation of PDDI measures within the OMVG HC
Origin (institution / project / programme)	
Objective	Ensure that PDDI measures are implemented
Location	OMVG HC
Description of the action	<ul style="list-style-type: none"> ▶ Establishment of a coordination and monitoring unit for the implementation of PDDI measures ▶ Establishment of coordination and monitoring tools, training for the members of this coordination and monitoring unit (in particular for support in mobilising financial resources and designing cross-border projects) ▶ Periodic meetings of the Coordination and Monitoring Unit
Ownership and implementation arrangements	OMVG HC
Duration	1 year
Costs and funding	To be determined
Risks envisaged	Low priority, measures and recommendations not implemented
Expected results	The Coordination and Monitoring Unit is operational and monitors the implementation of the PDDI measures

4.4.2 Provision 3.2 - Strengthen the legal and regulatory framework

GENERAL PRINCIPLE

The objective is to provide OMVG and its Member States with a legal and regulatory framework that is strengthened and harmonised between the four Member States, adapted to the new context (Blue Peace financing, Energy project, etc.), and ensuring the effective implementation of IWRM principles.

It should be noted that the proposed measures in this provision will be supplemented and adjusted by the recommendations to be made by the legal component of the Lot 3 study.

EXPECTED RESULTS

A strengthened, harmonised and effective legal and regulatory framework in the four OMVG Member States.

AREA OF INTERVENTION

The four OMVG member states: The Gambia, Guinea, Guinea-Bissau and Senegal.

PROPOSED MEASURES

The proposed measures address both the need to update and harmonise the legal and regulatory framework at international level (measure 3.2.1) and at inter-state level (measure 3.2.2) and finally at supranational level between the States and the OMVG (measure 3.2.3).

Measure 3.2.1 - Revise the provisions of the existing international conventions (establishing the status of the river, creating the OMVG and defining its common works), and establish effective water legislation in order to integrate the adjustments necessary for the management of Blue Peace funding, to frame the procedures for prior notification, definition of target flows, etc

Measure 3.2.1	<u>Revise the provisions of the existing international conventions (establishing the status of the river, creating the OMVG and defining its common works), and establish effective water legislation in order to integrate the adjustments necessary for the management of Blue Peace funding, to frame the procedures for prior notification, definition of target flows, etc</u>
Origin (institution / project / programme)	
Objective	Review the provisions of existing international conventions and developing effective water legislation
Location	The Gambia, Guinea Bissau, Guinea, Senegal
Description of the action	<ul style="list-style-type: none"> ▶ Conducting a legal audit of the provisions of existing international conventions ▶ Establishment of effective water legislation incorporating the results of the audit to revise the provisions of existing international conventions, new key parameters to be taken into account (e.g. Blue Peace funding), the framing of prior notification procedures, the definition of target flows, etc
Ownership and implementation arrangements	OMVG
Duration	4 years
Costs and funding	
Risks envisaged	
Expected results	The provisions of international conventions are revised and water legislation takes into account all the necessary adjustments for effective implementation of IWRM principles

Measure 3.2.2 - Harmonise national legal frameworks for water resources management (Water Codes)

Measure 3.2.2	Harmonise national legal frameworks for water resources management (Water Codes)
Origin (institution / project / programme)	
Objective	Update and harmonise the Water Codes so that they take into account the evolutions of the different legal instruments in the ECOWAS and UEMOA areas and in the 4 Member States
Location	► The Gambia, Guinea, Guinea Bissau, Senegal
Description of the action	<ul style="list-style-type: none"> ► Identification of adjustments in legal instruments, harmonisation needs, notably through the conclusions of Lot 3; ► Updating and harmonisation of water codes. ► Dissemination and communication of legal developments in the Water Codes to stakeholders involved in the management and preservation of the resource
Ownership and implementation arrangements	OMVG
Duration	2 years
Costs and funding	To be determined
Risks envisaged	Political instability
Expected results	Harmonised water codes, integrating water-related legal and regulatory developments, effective in determining water use regimes and organising water resource conservation.

Measure 3.2.3 - Establish and implement protocols for sharing data and information from Member States with the OMVG

Measure 3.2.3	Establish and implement protocols for sharing data and information from Member States with the OMVG
Origin (institution / project / programme)	OMVG and OMVG National Units
Objective	To enable OMVG and Member States to have effective and timely access to up-to-date data and information necessary for IWRM decision-making
Location	The 4 Member States and OMVG
Description of the action	<ul style="list-style-type: none"> ► Identification of bottlenecks preventing effective data and information sharing between Member States and the OMVG ► Definition and implementation of data and information sharing protocols ► Setting up tools for systematising data sharing
Ownership and implementation arrangements	OMVG
Duration	1 year
Costs and funding	To be determined.
Risks envisaged	Protocols are not implemented effectively
Expected results	OMVG and Member States have easy and efficient access to relevant data and information

4.4.3 Provision 3.3 - Strengthen the capacity of the OMVG HC and stakeholders at national and local level

GENERAL PRINCIPLE

The objective of this provision is to build the OMVG HC staff's and local and national stakeholders' capacities through staff training efforts so that they can respond more effectively and appropriately to integrated water resources management issues at the level of riparian communities.

EXPECTED RESULTS

OMVG HC staff and stakeholders at national and local levels are empowered to respond to IWRM issues rooted in the territory. Communication and involvement of the riparian community is improved, ownership of OMVG projects and programmes is increased.

A technical assistance is currently being provided (Lot 2 of UNCDF's support to OMVG) to establish the training needs of the OMVG High Commission. Their conclusions will enrich these proposed measures.

AREA OF INTERVENTION

The OMVG space.

PROPOSED MEASURES

Measure 3.3.1 - Train HC staff and experts from Member States in the principles of riparian community participation, as well as in communication and outreach methods.

Measure 3.3.1	<u>Train HC staff and experts from Member States in the principles of riparian community participation, as well as in communication and outreach methods.</u>
Origin (institution / project / programme)	OMVG
Objective	Improve participation and ownership of OMVG actions by riparian communities, and ensure that these actions take into account the concerns and needs of riparian communities
Location	OMVG
Description of the action	<ul style="list-style-type: none"> ► Identification of training needs: communication and outreach methods, IEC methods, methods and tools to increase participation of riparian communities. The findings of Lot 2 will be integrated into the identification of training needs. ► Development of a training programme ► Establishment of participation tools, communication and outreach strategies
Ownership and implementation arrangements	OMVG
Duration	3 years
Costs and funding	To be determined.
Risks envisaged	
Expected results	OMVG HC staff and Member State experts are trained in the principles of riparian community participation and in communication and outreach methods

Measure 3.3.2 - Fill vacant positions in the revised organisation chart of the OMVG HC

Measure 3.3.2	Fill vacant positions in the revised organisation chart of the OMVG HC
Origin (institution / project / programme)	OMVG
Objective	Ensure that all positions necessary for the OMVG HC to perform its functions effectively are filled, and that the OMVG HC staff are capable of fulfilling their duties
Location	OMVG HC
Description of the action	<ul style="list-style-type: none"> ➤ Train HC staff and experts from Member States on the principles of participation of riparian communities in OMVG river basins, as well as on communication and outreach methods ➤ Monitoring and evaluation training / PDDI implementation ➤ Establish a unit within the HC of the OMVG in charge of mobilising financial resources and supporting the design of cross-border projects ➤ Building community capacity for climate change adaptation ➤ Fill the vacant positions in the revised organisation chart of the HC of the OMVG
Ownership and implementation arrangements	OMVG
Duration	3 years
Costs and funding	To be determined.
Risks envisaged	Limited budget
Expected results	Every positions in the revised OMVG HC organisation chart are filled, and OMVG HC staff are qualified to fill these posts

4.4.4 Provision 3.4 - Structure OMVG communication within the organisation (its bodies), towards decision-makers, towards users and populations of the basin

Structure OMVG communication within the organisation (its bodies), towards decision-makers, towards users and populations of the basin

GENERAL PRINCIPLE

Internal and external communication is essential to legitimise OMVG's actions, to ensure that projects are understood and appropriated internally and externally, and to move towards greater coherence in the actions carried out by OMVG. Communication is also necessary to make itself known to donors, transboundary basin networks, the international community and the population of the Member States.

EXPECTED RESULTS

The OMVG has an internal and external communication strategy, implemented over the long term. OMVG's actions are ultimately better known by decision-makers, users and populations of the basins; and OMVG's projects gain in legitimacy and financial and technical support.

AREA OF INTERVENTION

OMVG

PROPOSED MEASURES

The proposed measures aim to give OMVG a clear and strategic position in the institutional landscape (measure 3.4.1), as well as to include and communicate OMVG's activities to the various stakeholders (measure 3.4.2 and 3.4.3).

Measure 3.4.1- Define an external institutional communication strategy, including an action plan, a graphic charter and the setting up of an OMVG institutional website

Measure 3.4.1	Define an external institutional communication strategy, including an action plan, a graphic charter and the setting up of an OMVG institutional website
Origin (institution / project / programme)	OMVG
Objective	To give a clear and strategic identity to the OMVG, to make its mandate and activities known
Location	OMVG
Description of the action	<ul style="list-style-type: none"> ► Define an external institutional communication strategy, including an action plan and a graphic charter. ► Setting up an OMVG institutional website ► Training and creation of communication tools enabling OMVG actors to know and respect the institutional communication strategy
Ownership and implementation arrangements	OMVG
Duration	5 years
Costs and funding	
Risks envisaged	Inadequate funding
Expected results	OMVG's institutional website is functional, the institutional communication action plan is implemented, OMVG's institutional communication is globally reinforced and OMVG as an institution has a clear identity

Measure 3.4.2 - Develop advocacy for Member State parliaments and decision-makers to disseminate IWRM principles and facilitate the implementation of the PDDI

Measure 3.4.2	<u>Develop advocacy for Member State parliaments and decision-makers to disseminate IWRM principles and facilitate the implementation of the PDDI</u>
Origin (institution / project / programme)	
Objective	
Location	Disseminate IWRM principles among policy makers in Member States
Description of the action	OMVG
Ownership and implementation arrangements	<ul style="list-style-type: none"> ► Training in advocacy techniques ; ► Establishing a strategy for disseminating IWRM principles ; ► Development and dissemination of an IWRM advocacy document incorporating.
Duration	OMVG
Costs and funding	3 years
Risks envisaged	
Expected results	Less impact, activity to be renewed over time

Measure 3.4.3 - Develop and implement an outreach and awareness raising strategy for riparian communities and users of OMVG basins on IWRM principles (including water quality), PDDI implementation, climate change impacts, flood/drought risks

Measure 3.4.3	<u>Develop and implement an outreach and awareness raising strategy for riparian communities and users of OMVG basins on IWRM principles (including water quality), PDDI implementation, climate change impacts, flood/drought risks</u>
Origin (institution / project / programme)	
Objective	Communicate the principles of IWRM and related issues to riparian communities and watershed users
Location	OMVG Space
Description of the action	<ul style="list-style-type: none"> ➤ Training in outreach and awareness raising strategies, training in IWRM principles as well as in climate change, flood and drought risk issues ➤ Development of an outreach and awareness-raising strategy and tools for the issues identified for riparian communities and watershed users (identification of targets, definition of outreach and awareness-raising techniques and methods, development of tools, definition of key messages, etc) ➤ Implementation of the outreach and awareness strategy
Ownership and implementation arrangements	OMVG
Duration	20 years
Costs and funding	To be determined
Risks envisaged	Insufficient mobilisation of riparian communities and users of the basins
Expected results	Catchment users and riparian communities understand the principles of IWRM and the key issues in the catchments related to climate change and flood and drought risks, and this strengthens the legitimacy of OMVG's actions

4.4.5 Means for implementing the actions and measures of Strategic Axis 3

The bulk of these measures will be carried out by the OMVG High Commission.

5 PROGRAMME OF MEASURES

This programme of measures, or action plan, brings together the elements for implementing the proposed measures.

The timeline of measures and the cost table of measures will be developed in Phase 3, once the recommendations of Lot 3 are available.

5.1 SUMMARY OF THE SECTOR PLAN AND RESULTS FRAMEWORK

Strategic axes/objectives	Overall results (provisions)	Specific results (measures)
1. Knowledge and monitoring of water resources are improved	1.1 Monitoring of water resources is improved	1.1.1 The surface and groundwater monitoring network is repaired and consolidated
		1.1.2 Sources of pollution are identified and treated and a water quality monitoring programme is established
		1.1.3 National institutes for data collection, installation, maintenance of networks are trained and equipped
	1.2 National knowledge and skills on water resources and the environment are strengthened	1.2.1 Knowledge, tools and data on water resources and the environment are consolidated
		1.2.2 A water and environment observatory within the OMVG is created
		1.2.3 A water resources database + geographic information system for the OMVG area is established
		1.2.4 National centres of excellence on water resources and the environment have emerged
	1.3 OMVG and national institutes are equipped with decision-making tools	1.3.1 OMVG and the states are equipped with effective decision support tools for water resources planning and management
		1.3.2 OMVG and the states are equipped with effective early warning tools on floods, droughts and shortages
2. Rivers and their basins are developed for multi-objective and sustainable management of the resource	2.3 Multi-objective management of water resources is improved	2.3.1 The management of existing structures is optimised according to common objectives
		2.3.2 The mobilisation of water resources through reservoirs is increased
	2.4 Flood management and forecasting are improved	2.4.1 Risk is reduced through the development of structures and nature-based solutions
		2.4.2 Operational flood management is strengthened
3. Governance and integrated management of water resources are strengthened	3.1 Institutions are strengthened	3.1.1 The status of the Local Coordination and Monitoring Committees, established under the energy project, is sustained
		3.1.2 The National OMVG Units are strengthened so that they can carry out their mandate effectively and sustainably
		3.1.3 A Permanent Water Commission, a consultation body for stakeholders, including users and riparian communities, in the management of water resources in the river basins, is operationalised.

		3.1.4 An autonomous energy management company within the OMVG
		3.1.5 A financial resource mobilisation strategy is adopted and implemented
		3.1.6 Coordination and monitoring unit for the implementation of PDDI measures within the OMVG HC is established and its members have been trained
	3.2 Legal and regulatory frameworks/contexts are strengthened	3.2.1 The provisions of existing international conventions are adapted
		3.2.2 National legal frameworks for water resources management (Water Codes) are harmonised
		3.2.3 Protocols for sharing data and information from Member States with the OMVG are established and implemented
	3.3 OMVG capacities are strengthened	3.3.1 OMVG HC and Member State officials are trained in communication and outreach to riparian communities
		3.3.2 Vacancies in the OMVG HC are filled
	3.4 OMVG communication is well organised	3.4.1 An institutional communication strategy is defined.
		3.4.2 Advocacy to parliaments and decision makers on IWRM principles and PDDI implementation is drafted.
		3.4.3 An outreach and awareness-raising strategy for local communities is implemented

5.2 RISKS OF NON-IMPLEMENTATION OF MEASURES

Table 5-1 Risks associated with the proposed measures and proposed risk management

Risk of non-implementation	Possibility of occurrence (-, +, +++)	Importance of the impact (-, +, +++)	Proposed risk management measure
Common to the whole sector plan			
Insecurity in the basins	++	+++	Continuity of services in the national and OMVG directorates
Mobility of trained staff	++	++	HR management within the OMVG and national directorates to retain staff and allow for sufficient transitions/transfers
No operating budget	+++	+++	Measures on institutional and regulatory strengthening to ensure sustainable resources for OMVG and national directorates
Strategic axis 1 - Improve knowledge and monitoring of water resources			
Defective or damaged/stolen water resources monitoring equipment	+++	+++	Training of technical staff in national services, equipment, and recurrent provision for field visits (maintenance)
Brain drain (national experts)	++	++	Funding to strengthen national centres of excellence
Lack of data	+	+++	Creation of an observatory and development of skills/recourse in satellite imagery
Strategic axis 2 - Develop rivers and their basins for multi-objective and sustainable management of the resource			
Pressures/lobbies from certain sectors	+++	++	Measures on institutional and regulatory strengthening to promote consultation, discussion and definition of minimum standards
Faulty facilities	+	+++	Rigorous project management and selection of design offices, rigorous maintenance and monitoring
Poor management of facilities	++	++	Development of decision support tools and implementation/management bodies Systematic use of feedback in the event of management malfunctions
Extreme events (beyond what is expected)	+	+++	Early warning system: real-time monitoring of water levels and rainfall, national alert plan and forecasting and management cells Emergency Response Plan in case of unplanned and untimely occurrence
Strategic Axis 3 - Strengthen governance			

5.4 OWNERSHIP OF THE MEASURES

Project owner	List of provisions / measures	Estimated cost	2022-2025	2025-2030	2030-2040	Planned / anticipated financing
Strategic Axis 1						
OMVG	Measure 1.2.1 Consolidate knowledge, tools and data on water resources and the environment		X	X	X	
	Measure 1.2.2 Creation of a water and environment observatory within the OMVG		X			
	Measure 1.2.3 Establish a database of water resources, ecosystems and their uses, and a geographic information system		X			
	Measure 1.3.1 Provide the OMVG and the States with efficient decision-making tools for		X	X		
	Measure 1.3.2 Equip OMVG and the States with effective tools for early warning on floods, droughts and shortages		X	X		
Ministries/National Water Resources Departments	Measure 1.1.1. Instrument, repair and consolidate the surface and groundwater monitoring network in the three basins		X	X	X	
	Measure 1.1.2 Control sources of pollution and establish a water quality monitoring programme		X			
Ministry of Higher Education and Research	Measure 1.2.4 Promote the emergence of national centres of excellence on water resources and the environment		X	X	X	
Strategic Axis 2						
OMVG	Measure 2.3.1 Optimise the management of existing hydraulic infrastructures according to common objectives		X	X		
	Measure 2.3.2 Increase the mobilisation of water resources through		X	X	X	
	Measure 2.4.1 Reduce risk through the development of structures and nature-based solutions		X	X	X	
Ministries/National Water Resources Departments	Measure 2.4.2 Strengthen operational flood management		X	X		
Strategic focus 3						

5.5 IMPLEMENTATION FRAMEWORK

Water resources	Description	OVI indicator (Baseline)	Budget	Actors	period (ST - MT - LT)	Verification sources	Risks and assumptions
Overall goal - vision 2040	On the basis of thorough and updated data, knowledge and tools, OMVG and national institutes through specialised bodies ensure the protection and good management of transboundary water resources of the OMVG area in order to meet the water needs of the populations and ecosystems.						
Strategic axes	Strategic Axis 1 - Improve knowledge and monitoring of water resources						
	Strategic Axis 2 - Develop rivers and their basins for multi-objective and sustainable management of the resource						
	Strategic Axis 3 - Strengthen governance						
Provision 1.1 Improve the monitoring of water resources	Measure 1.1.1. Instrument, repair and consolidate the surface and groundwater monitoring network in the three basins	Number of stations in operation		Ministries/National water resources Directorates	MT	Reports, monitoring missions and database	Sustainability of networks, limited recurrent budget
	Measure 1.1.2 Control sources of pollution and establish a water quality monitoring programme	Number of staff trained per country		Ministries/National water resources Directorates	ST	Reports	Staff mobility
Provision 1.2 Develop national knowledge and skills on water resources and the environment	Measure 1.2.1 Consolidate knowledge, tools and data on water resources and the environment	Commissioned studies		OMVG Ministries/National water resources Directorates Universities, specialised centres, consultancies	MT	Reports, publications	Incomplete studies
	Measure 1.2.2 Creation of a water and environment observatory within the OMVG	Observatory established and active		OMVG Ministries/National water resources Directorates Universities, specialised centres, consultancies	ST	Reports, database	Sustainability of the scheme
	Measure 1.2.3 Establish a database of water resources, ecosystems and their uses, and a geographic information system	Online database and GIS		OMVG Ministries/National water resources Directorates Universities, specialised centres, consultancies	ST	Reports, online tools	Sustainability of the scheme
	Measure 1.2.4 Promote the emergence of	Pole of excellence		Ministries/National water resources Directorates	LT	Reports	Brain drain, limited

	national centres of excellence on water resources and the environment	water resources and environment in each state		Ministry of Higher Education and Research Universities, specialised centres, consultancies			recurrent budget
Provision 1.3 Equip OMVG and national institutes with decision-making tools	Measure 1.3.1 Provide the OMVG and the States with efficient decision-making tools for	Tools available at OMVG and online		OMVG Ministries/National water resources Directorates Universities, specialised centres, consultancies	MT	Reports	Non-rigorous studies and data gaps
	Measure 1.3.2 Equip OMVG and the States with effective tools for early warning on floods, droughts and shortages	Tools available at OMVG and online		OMVG Ministries/National water resources Directorates Universities, specialised centres, consultancies	MT	Reports	Non-rigorous studies and data gaps
Provision 2.1 Improve multi-objective water resources management	Measure 2.3.1 Optimise the management of existing hydraulic infrastructures according to common objectives	Indicators of satisfaction of needs achieved		OMVG Ministries/National water resources Directorates	MT	Reports	Imbalance between sectors/priorities
	Measure 2.3.2 Increase the mobilisation of water resources through	Structures/dams created and Indicators of satisfaction of needs achieved		OMVG National Ministries/ water resources and energy Directorates	LT	Reports	Imbalance between sectors/priorities Ineffective management
Provision 2.2 Improve flood management and forecasting	Measure 2.4.1 Reduce risk through the development of structures and nature-based solutions	Facilities created and peak flow reduction. E-flows		OMVG Ministries/National water resources and spatial planning/urbanism Directorates	LT	Reports	Non-rigorous studies and data gaps
	Measure 2.4.2 Strengthen operational flood management	Reduction of annual flood damage		OMVG Ministries/National water resources and meteorology Directorates	MT	Reports	Non-rigorous studies and data gaps. Extreme floods

6 ASSESSMENT OF THE SOCIAL AND ENVIRONMENTAL IMPACTS OF THE SECTOR PLAN

This chapter does not replace the detailed impact assessments that will be carried out for the various measures, but it gives an overview of the possible impacts and the avoidance, mitigation or compensation measures.

[Chapter to be consolidated once the intervention strategy is confirmed].

Table 6-1 Social and environmental impacts identified

Potential impact of the envisaged measures E= Environmental S = Social	Possibility of occurrence (-, +, +++)	Importance of the impact (-, +, +++)	Possible avoidance, mitigation or compensation measures (Avoidance; Mitigation; Compensation) (/ = nil: no negative impact)
Strategic Axis 1 - Knowledge and monitoring of water resources are improved			
E Improving resource management	+++	+++	/
S Improvement of water quality	+++	+++	/
S Improvement of water supply	+++	+++	/
S Improvement of the electricity supply (interconnection)	+++	+++	/
S Improvement of vocational training	+++	+++	/
S Improved management of institutions	+++	+++	/
E Development of waterborne diseases (dam lakes)	++	+++	Frequent changes in the level of water bodies Treatment of water bodies with "natural" insecticides (neem, eucalyptus, etc.) Improvement of the health network (health huts, health posts, etc.)
E Development of invasive plants (freshwater bodies)	++	++	Frequent changes in the level of water bodies Finding a useful and profitable use for invasive plants Compensate fishermen, pirogue workers, motorized pump farmers, etc.
E Increased risk of flooding due to the failure of a hydraulic structure	+	+++	Oversize and secure the strength of the dikes; Submergence warning system in the right of way of submersible areas Relocation of the most exposed villages
E Degradation of vegetation (HV lines of the interconnection)			Burying the HV network Use amphibious areas as much as possible (non-flammable so no preventive cutting) Reforestation with slow-growing shrubs and trees

Strategic Axis 2 - Rivers and their basins are developed for multi-objective and sustainable management of the resource			
S Increasing farmers' and rural people's income through ecological intensification of activities	+++	+++	/
S Reducing hydrological risks through better forecasting	+++	+++	/
S Loss of income if flood control prevents flood recession crops	+	++	Maintenance of an equivalent artificial flood to support flood recession crops Maintenance of a partial artificial flood to support flood recession crops Sand removal for construction
S + E Improvement of agrosystems by keeping young people in the villages	+++	+++	/
E Increasing soil moisture through agroecological practices	+++	+++	/
E Reducing hydrological risks through agroecological practices	+++	+++	/
E Improvement of biodiversity and vegetation in protected areas	+++	+++	/
E Improvement of biodiversity and vegetation in degraded areas	+++	+++	/
E Siltation of the riverbeds by reducing flood peaks due to agroecology	++	++	Triggering of an artificial flood if dam upstream Bottom emptying of dams if existing upstream Sand removal for construction
E Development of waterborne diseases if water bodies for storage	+	++	Frequent emptying of water bodies Treatment of water bodies with "natural" insecticides (neem, eucalyptus, etc.) Improvement of the health network (health huts, health posts, etc.)
E Pollution from gold panning if included in the multi-activity plan	++	+++	Prohibition of gold panning in or near watercourses Remediation of water from gold mining Relocation of gold panning away from watercourses (sandman method)

E Improvement of fisheries by reducing suspended solids transport	+++	+++	/
Strategic Axis 3 - Governance and good management of water resources is strengthened			
S Institutional improvement	+++	+++	/
S Reduction of hydrological risks through better knowledge of the functioning of the basin	+++	+++	/
S Improving staff training and creating jobs	+++	+++	/
S Improved stakeholder relations	+++	+++	/
E Reduction of hydrological risks by natural flow regulation	+++	+++	/

7 CONCLUSIONS AND RECOMMENDATIONS

Based on documents (studies, past and current investment programmes, PAGIRE programme, etc.) and national and regional consultations, the water resources sector plan provides for xx measures organised around three axes of water resources knowledge, management and governance.

The first axis proposes a set of measures to consolidate the **knowledge and data** available on the water and environment sector. Like many rivers in the sub-region, but also in many countries in the North, the decline of hydrometric networks jeopardises the understanding and management of rivers and their basins. Several measures aim to enable the development of a national and transboundary network for monitoring surface and groundwater resources of good quality, while promoting the development of the skills necessary for its sustainability within national institutes. Despite the low level of investment required to maintain an observation network, it is this investment that is the mainstay of the entire sector plan. This measure is imperative/necessary and urgent, given the importance of long-term observations for understanding the intrinsic hydroclimatic variability and longer-term changes in the hydrological functioning of the basins. It is also important to stress the importance of recurrent support for the national directorates in charge of implementing these networks, in order to be able to carry out maintenance missions, necessary repairs and extensions, as well as complementary measurements and observations (gauging, readings, topography/bathymetry/profiles). The development of teletransmission systems must be evaluated with caution in the light of feedback from other countries (HYCOS) and should never replace a network of observers and regular monitoring and maintenance rounds.

From this data, and the chronicles that will be (re)constituted progressively over time, the OMVG and its partners will be able to commission a set of studies on water resources and decision-making tools. These tools will allow them to envisage with more certainty the opportunities of development and management of water resources as well as to understand the extreme phenomena and their impacts on the environment. In order to promote the increasing autonomy of the states, it is essential that these measures to increase knowledge be accompanied by measures to transfer and communicate this knowledge, but also, and above all, by measures to strengthen national capacities in the field of water resources and the environment. Strong expertise exists in the countries of the basin, but measures are important to accompany, gather and strengthen this expertise. This involves continuous training measures for national services, the creation of an observatory and technical and scientific committees within the OMVG, as well as the emergence of centres of excellence to train and retain the best experts and scientists in the sub-region.

The second axis concerns a set of measures aimed at **developing the rivers and their basins and promoting multi-objective management of water resources**. The three basins are currently almost entirely undeveloped, and the first major developments could have a very marked impact on the functioning of the rivers and the availability of water for the many users. This issue will be a central element of this PDDI, but given the previous remarks, the relative weakness of the existing data/timeline and studies to date means that decisions on major developments/dams must be taken with caution. The consolidation of knowledge will make it possible to invest with greater serenity in river development. Given the cross-cutting nature of water, this area requires investment from the OMVG, the water ministries, but also from the ministries of the other associated sectors: energy, agriculture, mining, and environment. One of the priority issues is to develop tools and scenarios capable of supporting discussions and consultations between these different sectors, as compromises are necessary, as some needs may be incompatible with others, or even lead to deleterious effects, particularly on ecosystems. The OMVG will have an important role to play in leading these intersectoral and transboundary consultations so that the States decide in a concerted (and not unilateral) way on the development of their basins for the well-being of the populations of each State.

Finally, these water resources management measures must be accompanied by measures on **governance**. An adequate institutional and legislative framework is essential to support and frame management choices, particularly in view of the transboundary and multi-sectoral nature of these water resources. Regulatory provisions are important to secure certain sectors or environments such as national parks, fragile ecosystems or certain uses (flood recession crops, fishing). The inclusion in the law of standards such as reserved/minimum flows or artificial floods will provide tangible guarantees for these sectors/needs and greater equity for these users. Otherwise, they may find themselves prejudiced in relation to other issues, for reasons of lobbying or short-term interests. Furthermore, it is important to remember how hazardous/dangerous it can be to favour short-term issues on the basis of purely economic indicators (e.g. value of 1m³ for irrigation > 1m³ for flood recession crops or ecosystems). Preserving these environments is essential for preserving the resource (groundwater recharge, infiltration) and also represents in the long term an essential investment for the well-being of populations, biodiversity and a source of income (agroforestry, ecotourism, etc.).



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