



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

Phase 2 - Sectoral Plans - 2/6

Energy, Mining, Industry and Handicrafts

Final version - April 2022



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Phase 2 - Sectoral Plan - Energy, Mining, Industry and Handicrafts

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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
ANSD	National Agency for Statistics and Demography
APD	Official Development Assistance
APIP	Private Investment Promotion Agency
APS	preliminary design
ANSD	National Agency for Statistics and Demography
AfDB	African Development Bank
EIB	European Investment Bank
BGGA	Guinean Bureau of Applied Geology
BID	Islamic Development Bank
BV	Basin / catchment area
CAD	Development Assistance Committee
CBG	Compagnie des Bauxites de Guinée
UNFCCC	Conference of the Parties to the 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)

Acronym	Meaning
DH	Directorate of Hydraulics (Senegal)
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
SDG	Sustainable Development Goals

Acronym	Meaning
OECD	Organisation for Economic Co-operation and Development
OFOR	Office des Forages Ruraux du Sénégal
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 Service 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
SSE	Senior Secondary Education
STP	Public Transport Company
ToR	Terms of reference
TER	Regional express train
ICT	Information and Communication Technology
TRIE	Inter-State Road Transit

Acronym	Meaning
UBE	Upper Basic Education
UCAD	Cheikh Anta Diop University of Dakar
EU	European Union
UEMOA	West African Economic and Monetary Union
PMU	Management and Planning Units
ITU	International Telecommunication Union
UNCDF	United Nations Capital Development Fund (UNCDF)
UVS	Virtual University of Senegal
VET	Vocational Education and Training
VMA	Vessel Management System
VOD	Video on demand
WMS	Warehouse Management System

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 called 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" (FENU, 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;
- **The 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 plan.
- **Phase 3: Preparation of the OMVG basins Integrated Development Master Plan**

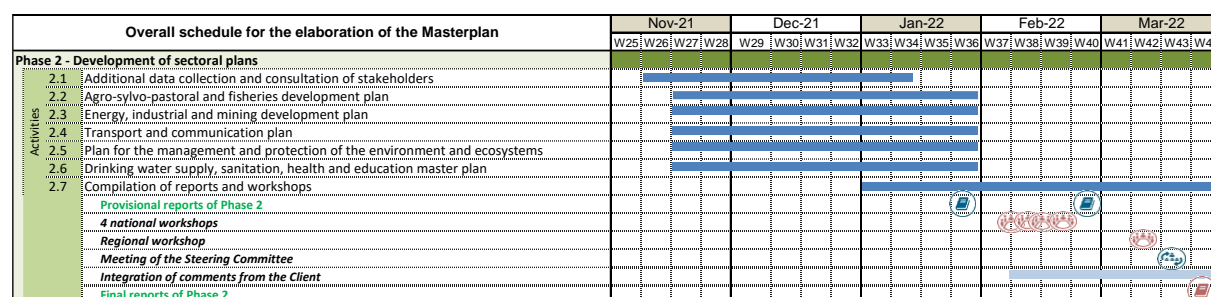
An inception report for the study was validated on 15 September 2021 at the Regional Validation Workshop held remotely and a final version of the inception report, incorporating the workshop recommendations, was submitted to OMVG and UNCDF on 30 September 2021.

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 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 in the three basins. 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 draft version. This version of the report was the basis for consolidation work carried out in National Workshops and then in a Regional Validation Workshop, respectively in February and March 2022 (see next section).

Phase 2 of the study is now complete.

Figure 1-1 Timeline for 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 draft 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 development plan for energy, mining, industry and handicraft.

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

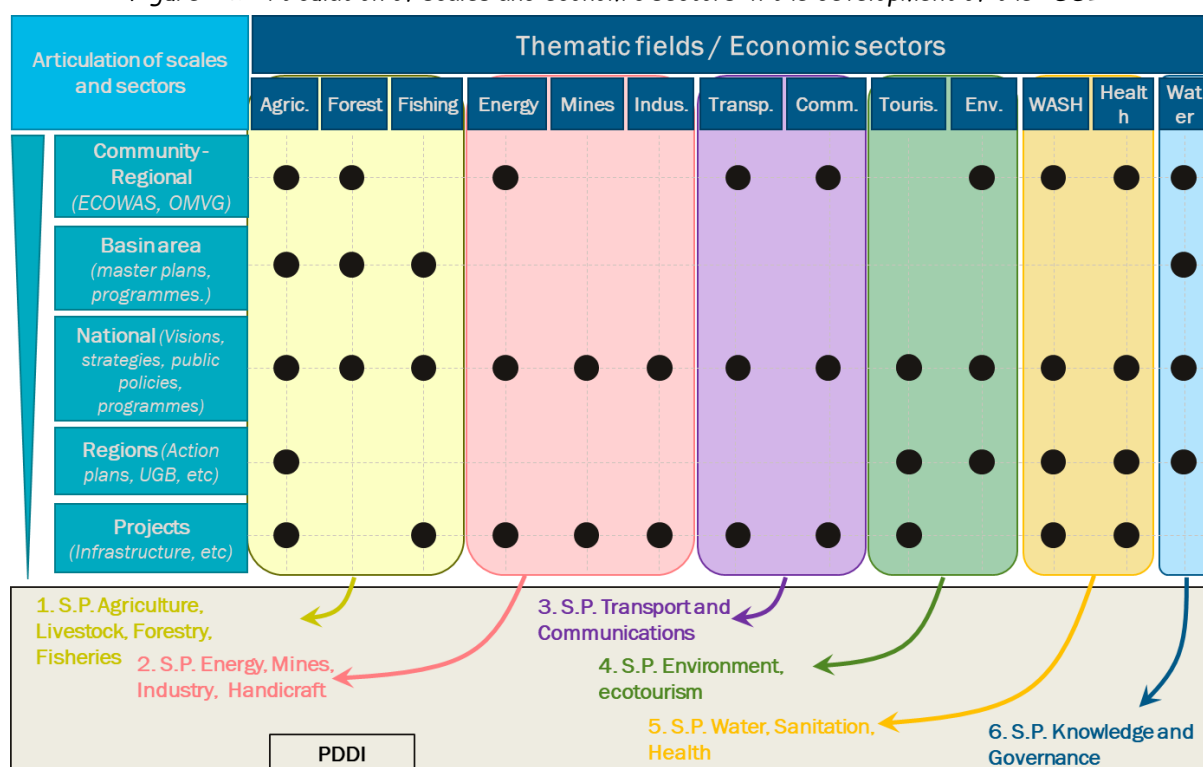
Each of the six sector plans presents the proposed intervention strategy for each sector, as well as the associated implementation tools. These strategies are an **aggregation of national and regional visions, policies and programmes, as well as the recommendations of the consortium.**

The elaboration of the development plan for energy, mining, industry, and handicrafts is based 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 PDDI



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.

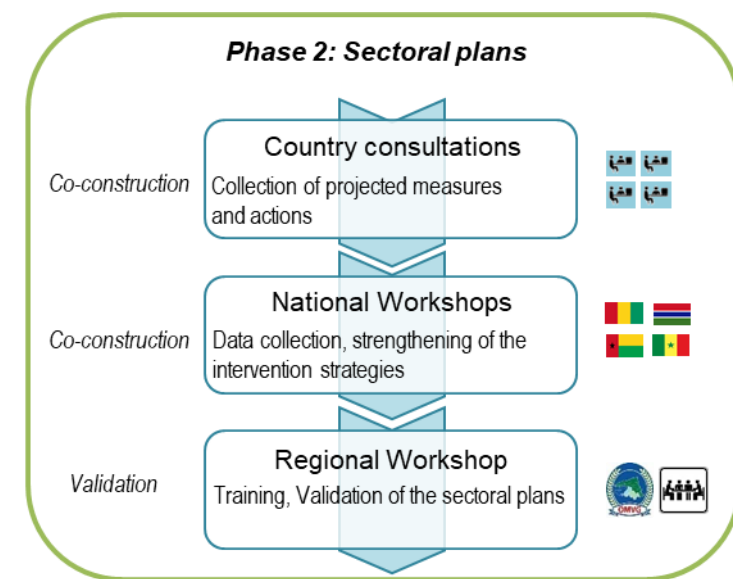
The necessary technical, legal and institutional interventions at national level were identified and analysed through the intervention of national experts in each of the 4 countries. The sector plans integrate these elements.

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 a series of actions, listed in the Annex.

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



ENERGY

The 2030 Agenda for Sustainable Development, in the context of SDG 7, aims to ensure access to improved, reliable and affordable energy services for all, to significantly increase the share of renewable energy in the global energy mix and to improve energy efficiency. These goals are at the heart of the major challenges to combat climate change while at the same time developing employment, housing, food production, businesses, public services, etc.

As mentioned in Phase 1, the region's energy sector suffers from technical, structural and institutional shortcomings that hinder the development of its assets: the absence of real incentive policies in rural areas, resulting in a lack of infrastructure (or lack of maintenance when it exists), and the poverty of rural areas are obstacles to the well-being of the populations and the diversification of the regional economy.

Also as indicated in phase 1 of the studies and as detailed below, it is verified that most of the energy consumption in the OMVG region corresponds to households and very small local industries. With the exception of transport, which is fuelled by oil derivatives, most of which are imported, the main energy used at household level is firewood and, to a lesser extent, charcoal. LPG in 6 and 12 kg bottles is used relatively little, especially in Senegal and in urban areas. Electricity, an essential form of energy for the development of the population and the economy, represents only 5% of total energy consumption and has a clearly insufficient production capacity and penetration.

It is clear that the current situation has major disadvantages in terms of economic, social and environmental development, which must be overcome as soon as possible.

However, it must be stressed that, although the development of the electricity sector is indispensable, it will not be able to totally replace traditional sources of energy, especially in the medium term, once the energy needs that would imply such a change are impossible to meet in a reasonable timeframe.

For this reason, the development of the energy sector will involve multidimensional interventions that will draw on two main strands:

- Development of electricity generation capacity, distribution for domestic, commercial and industrial uses; and
- Improving the energy supply chain for traditional domestic uses, so as to reduce environmental and health impacts and increase the quality of life of the surrounding communities.

For the definition of the energy sector development plans, the following activities are proposed:

Electricity section

- Carry out an analysis of the potential demand for electricity in the area and in the riparian Member States, and describe the typology of demand that will have to be met by conventional and alternative (renewable) means;
- Identify the hydroelectric potential and opportunities for diversification of energy sources (solar, wind, biomass) in the study area;
- Propose development strategies, compared in economic and financial terms, which take into account the reinforcement/rehabilitation of existing HV/MV networks or the construction/extension of new MV/LV networks or the installation of individual photovoltaic systems for domestic needs;
- Define medium and long term targets for rural and urban electrification taking into account universal access to sustainable energy services;
- Establish and structure a sequential hydroelectric development programme and a rural electrification programme up to 2040;
- Identify actions to be implemented in terms of investment, institutional measures, tariff policies and financing for the construction of infrastructure.

Domestic Energy Component

- Increase the availability of fuelwood for domestic use by introducing semi-industrial fuelwood production on managed forest plots;
- Introduction of improved stoves capable of reducing wood use and smoke production;
- Increasing LPG penetration;

- Biogas production where animal waste is available in quantity.

INDUSTRY AND MINING

The mining sector is a key sector of the economy in the OMVG area. The mineral resource potential is very diversified and globally appreciable, although not sufficiently known and still largely unexploited and little developed.

Mining production is not sufficiently diversified, and is often exported without transformation throughout the value chain. They mainly concern construction materials, industrial clays (ceramics), bauxite, industrial and artisanal gold, while the exploitation and development of important *resources of heavy minerals (ilmenite, zircon)*, phosphates, bauxite and iron are still awaiting to be developed.

Artisanal gold mining, known locally as "orpaillage", is a labour-intensive activity that generates significant wealth, but the negative environmental impacts it generates in Guinea and Senegal remain environmental challenges that the states are having difficulty curbing, despite the implementation of bold policies and measures. Furthermore, gold mining production is largely not subject to tax collection by governments.

- Carry out an inventory and analysis of industrial activities related to the development of agriculture, livestock and mining that will benefit from the new conditions of transport and energy availability;
- Conduct an analysis of the costs of the main factors of production in the four Member States (land, improvements, building, civil engineering, water, electricity, fuel, wages) and establish the existing relationships between the costs of the sector's reference factors;
- Analyse, in the light of the sectoral policies developed in the Member States and the regional and international conventions (EU, AU, UEMOA, ECOWAS), the potential markets for the various industrial and mining activities in the basin;
- Propose an industrial and mining development programme based on the development objectives for 2040 and taking into account the possibilities offered, the needs, the development objectives of the OMVG Member States and the technical, economic and financial criteria;
- Carry out a summary economic evaluation of each selected activity to justify its internal profitability;
- Propose a programme for the establishment of industrial and mining units according to the evolution of the OMVG programme in terms of irrigation, transport infrastructures, and extension of the electricity network;
- Assess the indicative investment needs with a short-term (2025) action plan including projects, resources and timeframes, and a summary of medium (2030) and long-term (2040) objectives/projects;
- Propose appropriate measures to limit the adverse effects of industrial and mining development, including industrial waste, dust and smoke emissions, air pollution, etc.

HANDICRAFTS

Handicrafts are a vital sector in the OMVG area. It integrates know-how and talents in sectors such as sewing, traditional cotton weaving, shoemaking, jewellery, carpentry and pottery, and offers many opportunities in terms of the number of businesses and jobs in the OMVG area. It contributes to the valorisation of local raw materials, to the satisfaction of the essential needs of the population, provides more than 40% of manufacturing production, and occupies about 25% of the Guinean working population and more than 30% of the urban population.

LIST OF NATIONAL DOCUMENTS USED (PROJECTS / NATIONAL POLICIES / PROGRAMMES)

OMVG:

- OMVG Energy Project (2014 -...)
- West African Power Pool (WAPP) (1999 -...)
- ECOWAS Regional Energy Access Project - ECOWAS-REAP (2018 - ...)
- Sustainable Energy for All by 2030 "SE4ALL"
- Strategy for Universal Access to Electricity / Sustainable Energy for All (SE4All)

The Gambia:

- Gambia Electricity Access Project (GEAP);
- National Energy Efficiency Action Plan - NEEAP (2015-2020/2030)
- National Renewable Energy Action Plan - NREAP (2015-2020/2030)
- Sustainable Energy Sector Programme in The Gambia
- The Gambia National Development Plan (2018-2021)
- The Gambia Electricity Sector Roadmap (2017)
- Sustainable Energy Action Plan for The Gambia (as part of the implementation of decisions 1/CP.19 and 1/CP.20 of the Conference of Parties of the UNFCCC, 2015)
- Intended Nationally Determined Contributions (INDCs) for The Gambia (2015)
- NAMA for "Rural Electrification with Renewable Energy in The Gambia" (2015)

Guinea:

- Energy Statistical Yearbook 2018 - National Statistical Institute
- Energy Sector Development Policy Letter - ESDPL (2014);
- National Programme to Improve Access to Electricity in Guinea
- Update of the Master Plan for the Development of Production-Transport Infrastructure (2019)
- Mini-Grid Programme (FEDA, 2019)

Guinea-Bissau:

- Plano Estratégico a Médio Termo (2020 a 2024) para o Sector Energético (2020)
- Estudo de tarifas de Energia e Água para as cidades de Bafatá e Gabú, Guiné-Bissau (2020)
- Projeto Energia da OMVG. Linha de interconexão - Plano de Acções de Reassentamento (PAR) - Linhas de transporte de eletricidade Guiné-Bissau (2019)
- Carta de Política Sectorial sobre o Aproveitamento das Diferentes Formas de Energia (2019)
- Plano Estratégico a Médio Termo para o Sector Energético (2020 to 2024)
- Criação de um Novo Quadro Regulatório das Concessões de Gestão de Serviços de Fornecimento de Electricidade na Guiné-Bissau (2018)
- Plano de Investimento para Energia Sustentável da Guiné-Bissau - Período 2015-2030 (2017)

- Plano de Ação Nacional de Eficiência Energética da Guiné-Bissau - PANEE, Período 2015-2020/2030 (2017)
- Plano de Ação Nacional do Sector das Energias Renováveis da Guiné-Bissau (PANER) Período 2015-2030 (2017)
- Strategic and Operational Plan 2015-2020 "Terra Ranka (2015)
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- Plano Nacional de Ação para a Política para Integração do Género no Acesso a Energia República da Guiné-Bissau, 2020-2025 (2020)
- Guinea-Bissau Rapid Assessment SE4ALL, 2013

Senegal

- Plant production monitoring 2019 - CSE - Min. Environment and Sustainable Development
- National Plan for Territorial Planning and Development (PNADT) - Horizon 2035
- Production Plan 2017-2030 | Emerging Senegal Plan (PSE)
- Rural Electrification of Senegal SE4ALL - Action Programme and Investment Prospectus (2018)
- Economic and social situation of Senegal 2017-2018, mining, quarrying and energy
- National Renewable Energy Action Plan (NREAP) - Period [2015-2020/2030] (2015)
- Emergency Plan for Rural Electrification 2015-2017 (PNUER)
- National Rural Electrification Programme (PNER) (2015)
- Emerging Senegal Plan (PSE) (2012)
- Senegalese Rural Electrification Action Programme (PASER) (1998)

2 THE ENERGY, INDUSTRY, MINING AND CRAFTS SECTOR IN THE OMVG AREA

This chapter aims to summarise the diagnosis of the energy, mining, industry and craft sectors, carried out during Phase 1 of the study, in order to prioritise the cross-border issues that will be the focus of the sectoral plan.

2.1 CURRENT STATE OF THE SECTOR

2.1.1 Energy

Energy consumption in the OMVG region is quite low, due to observed constraints. The average per capita consumption of primary energy in the region is 3400 kW/year, of which a large part (almost 70%) is used by households for domestic activities.

Access to electricity is significant in urban areas but normally low in rural areas - in the order of 5 to 10% - except in Senegal, where 42% of the rural population is already served.

The main energy sources used in the study area are

- Biomass (**firewood, charcoal and agricultural waste**) as a domestic fuel, accounting for just over half of the region's total energy consumption;
- Oil and liquefied **petroleum gases** for transport, power generation and domestic use; and
- **Electricity** (only 5% of total energy consumption).

Most of the electricity produced (60-70%) is consumed by households. The contribution of electricity for industrial uses is small.

Total electricity production (renewable and non-renewable) is quite low. According to data from 2019, the average annual electricity production is 143² kWh/inhab in Senegal, 174 kWh/inhab in The Gambia, 21 kWh/inhab in Guinea Bissau and 166 kWh/inhab in Guinea. The figures for the rural areas covered by the OMVG basins are even lower - about 30% of the countries' average values.

These values can be compared with the average consumption in Africa (567 kWh/inhab/year) and in the world (3260 kWh/inhab), which indicates that there is a very large margin for potential evolution.

As mentioned above, energy use in the OMVG region is mainly concentrated in households and transport, which account for an average of 85% to 90% of total energy demand.

The following table shows the distribution of primary energy used in each country by sector.

² Consumption is higher than this value, once 65 kWh/inhabitant, of water origin, are imported from Mali

Table 2-1 Distribution of energy consumption by country and type of activity

Activity	Senegal	The Gambia	Guinea Bissau	Guinea	Average
Households	46%	80%	89%	75%	63%
Transport	37%	12%	8%	15%	25%
Industry	14%	2%	2%	4%	9%
Other	3%	6%	1%	5%	4%

It can be ascertained that energy use by households (mainly for cooking, water heating and lighting) is responsible for about two thirds of total energy consumption (firewood, charcoal and LPG). Transport (road and air) is responsible for a quarter of the total energy demand (oil derivatives). Industry consumes on average 10% of total energy and other uses (utilities, agriculture, water pumping) use about 4% of total energy consumption.

Transport obviously uses oil-based products (petrol, diesel) and no significant impact on demand will be possible in the short term, unless the average age of the car fleet is reduced.

In terms of electricity, access is low in the OMVG region, mainly in rural areas. An exception is Senegal, where access to electricity is significant even in rural areas, as shown in the following table.

Table 2-2 Access to electrical energy by country and settlement type

Environment	Unit	Senegal	The Gambia	Guinea Bissau	Guinea
Urban area	%	93	77	54	53
Rural area	%	47	27	13	11
Total	%	69	60	31	26

Beyond the low access to electricity, the current generation capacity is very low, as shown in the following table, regarding electricity generation.

Table 2-3 Electricity generation per capita by country

Energy	Unit	Senegal	The Gambia	Guinea Bissau	Guinea	Total
Non-renewable	kWh / year	122	172	20	61	96
Renewable	kWh / year	21	2	1	106	51
Hydro	kWh / year	65*	0	0	104	40
Solar	kWh / year	14	1	1	2	8
Bioenergy	kWh / year	7	0	0	0	3
Total	kWh / year	229	174	21	166	147

* Energy produced in Mali

The average availability of electricity in all the OMVG countries is therefore around 150 kWh/year.inhab. The OMVG area, which is rather rural, will have a lower availability, estimated at around 50 kWh/year.inhab. on average.

The following tables show the overall energy consumption by country and by type of use:

Table 2-4 Primary energy consumption by country and type of activity

Activity	Unit	Senegal	The Gambia	Guinea Bissau	Guinea	Total
Households	TWh / year	24.4	3.2	7.9	35.9	71.3
Transport	TWh / year	19.6	0.5	0.7	7.3	28.1
Industry	TWh / year	7.4	0.1	0.2	2.0	9.7
Other	TWh / year	8.9	0.2	0.1	2.5	11.7
Total	TWh / year	53.02	4.02	8.82	47.64	113.5

Table 2-5 Primary energy consumption per capita, by country and type of activity

Activity	Unit	Senegal	The Gambia	Guinea Bissau	Guinea	Total
Households	kWh / year	1539	1412	4199	2889	2200
Transport	kWh / year	1238	212	377	587	867
Industry	kWh / year	468	35	94	164	300
Other	kWh / year	100	106	47	199	135
Total	kWh / year	3345	1765	4718	3839	3502

We can therefore verify that the average consumption of electricity is of the order of 5% of household consumption. It will therefore be impossible, even in the medium term, to replace traditional energy sources in households.

Increased electricity penetration will therefore need to be focused on higher value, lower demand uses such as lighting, telecommunications and refrigeration.

It is becoming clear that the largest users of energy in the OMVG countries are households. Households use mainly fuelwood and charcoal and also, in much smaller quantities, electricity and LPG.

The type of energy used by households is relatively similar between the OMVG countries, and relatively variable between urban and rural areas. The following tables show the percentage of rural and urban households that use each type of energy for cooking and hot water.

Table 2-6 Household energy sources in rural areas

Source of energy	Senegal	The Gambia	Guinea Bissau	Guinea
Wood	67.7%	98.5%	93%	82.3%
Charcoal	21.3%	0.5%	7%	12.2%
LPG	10.6%	0.5%	0%	0.1%
Electricity	0.0%	0.0%	0%	0.0%
Other	0.3%	0.0%	0%	3.1%

Table 2-7 Household energy sources in urban areas

Source of energy	Senegal	The Gambia	Guinea Bissau	Guinea
Wood	28.4%	84.5%	93%	17.5%
Charcoal	53.3%	7.5%	7%	67.7%
LPG	18.0%	6.6%	0%	0.5%
Electricity	0.3%	0.0%	0%	0.0%
Other	0.0%	1.3%	0%	0.4%

In rural areas, firewood is the most widely used fuel, used by 67-99% of households. In urban areas the use of charcoal is increasing and is even predominant in Senegal and Guinea. LPG use is marginal in all countries except Senegal, with the percentage of households varying between 11 and 17%.

Electricity, used mainly for lighting and communications, represents a fairly low percentage in rural areas (0% to 1.4%), but reaches significant values in urban areas in Senegal and The Gambia (over 5%).

Studies in Guinea estimate average household use of fuelwood at 0.8 kg/day/per capita and charcoal at 0.2 kg/day/per capita.

If one considers a traditional profitability of wood to charcoal conversion of around 6 kg of wood for 1 kg of charcoal, this indicates that the consumption of charcoal, while preferable in terms of ease of use and health benefits (less smoke), implies a higher consumption of wood, since the 0.2 kg/day of charcoal will require 1.2 kg/day of wood.

The method of converting wood waste into charcoal by traditional methods gives average yields of 10%³. These traditional methods are the most widespread. Modern charcoal making techniques provide higher yields (up to 30%). Despite the diversity of charcoal production practices, charcoal is generally obtained from the slow pyrolysis of biomass at atmospheric pressure. The production of charcoal is, in principle, based on waste and secondary products of all species (except toxic ones) in the allocated areas.

SUMMARY OF THE SWOT MATRIX

The Strengths, Weaknesses, Opportunities and Threats corresponding to the energy aspects are presented on next page.

³ Value of yield by weight - In energy terms the yield will be double, once a kg of coal has twice the energy of a kg of wood

Table 2-8 SWOT matrix of the energy sector in the OMVG basins

Strengths	Weaknesses	Opportunities	Threats
<ul style="list-style-type: none"> • Significant potential room for improvement. • Opportunity and willingness to improve growth and competitiveness in all four countries. • Political will expressed through strategies and energetic development plans. • Availability of labour. 	<ul style="list-style-type: none"> • Serious energy supply problems. • Excessive exploitation of biomass resources. • Lack of real incentive policies in rural areas. • Dependence on imported diesel. • Lack of infrastructure. • Poverty in rural areas. • Very high electricity tariffs. • Structural deficiency of the electricity sector. • High energy production, transmission and distribution costs. • Large imbalance between supply and demand. 	<ul style="list-style-type: none"> • Alternative energy sources such as biodiesel, solar and wind are increasingly attractive. • Regional electricity trade: import of low cost renewable energy from the region (OMVG, OMVS, WAPP). • Very large hydroelectric potential, around 6,000 MW in Guinea. • Significantly reduce fossil fuel consumption and thus greenhouse gas emissions. 	<ul style="list-style-type: none"> • Population growth. • High risks: price volatility. • Lack of funding. • Climate change may impact on hydropower systems, by changing the behaviour of major rivers and their tributaries, as well as other climatic conditions. • Political instability (armed conflicts; poor governance of natural resources). • Insufficient scientific knowledge of the resources. • Conflicts over the use of transboundary natural resources.

2.1.2 Mining

Mining is a key sector of the economy in the OMVG region. The mining potential is colossal, very diversified, but poorly known in detail, little exploited and little transformed throughout the value chain. The mining products listed are essentially construction materials, industrial clays (ceramics), bauxite, industrial gold and artisanal gold, while the exploitation and development of important resources of heavy minerals (ilmenite, zircon), phosphates and bauxite are still awaiting to be developed.

Artisanal gold mining, known locally as gold panning ("orpaillage" in French), is a labour-intensive activity that generates significant wealth, but the negative environmental impacts it generates in Guinea and Senegal remain a challenge that states are having difficulty curbing, despite the implementation of bold policies and measures. Furthermore, gold mining production is largely not subject to tax collection by the states.

In The Gambia, the mining sector does not play a major role in the economy, with mineral production limited to construction materials (clay, laterite, sand, gravel) and intermittent heavy mineral black sands (ilmenite and zircon).

Guinea's subsoil holds a huge potential for bauxite. Furthermore, Guinea, described as a "geological scandal", has the world's largest untapped iron reserves, as well as significant gold and diamond potential. The Guinean subsoil abounds in many other mineral resources, notably nickel, copper, cobalt, chromium, manganese, uranium and limestone.

In Guinea Bissau, the mining sector is characterised by a significant potential in phosphate and bauxite that is still unexploited. In this respect, the Farim phosphate mine is under development and the project could be completed in the short term, while the Boé bauxite project is envisaged in the medium term.

In Senegal, the Gambia Basin, which borders the Kédougou region, is concerned by industrial gold production (Sabodala and Mako mines), but also by small-scale mining and artisanal gold panning. Major mining projects could be launched in the coming years. The most important of these is the Falémé iron ore project, which is covered by the OMVS SDAGE and which could either export raw iron ore or integrate an industrial steel production unit.

KEY FIGURES

- The world's largest untapped iron reserves are located in Guinea, amounting to 20 billion tonnes.
- Significant gold potential estimated at 700,000 tonnes and diamond potential ranging from 30-40 million carats of proven reserves to 500 million carats of probable reserves is reported in Guinea.
- Gold production by gold panning has been estimated in Guinea at 25.47 tonnes in 2019, equivalent to more than USD 1.6 billion in revenue, while total industrial production (by SAG-Anglo Gold Ashanty and Société minière de Dinguiraye - SMD) would be 3.6 tonnes.
- In Senegal, artisanal gold mining in the Gambia River basin in south-eastern Senegal, in the regions of Tambacounda and Kédougou, produced 4.3 tonnes of gold worth CFAF 86.6 billion.
- The use of cyanide and mercury for gold amalgamation in small-scale mining contaminates the waters of the River Gambia, with levels in the sediments analysed of up to 9.9 mg/kg.
- The Government of Guinea Bissau aims to make the mining sector the fourth engine of its growth in 2025. According to a World Bank estimate, bauxite and phosphate mining would, in the best-case scenarios, allow for increases of 26% in GDP, 121% in tax revenues and 102% in export revenues.

SUMMARY OF THE SWOT MATRIX

Table 2-9 SWOT matrix of the mining sector in the OMVG basins

Strengths	Weaknesses	Opportunities	Threats
<ul style="list-style-type: none"> • Economic growth in the world and in Africa. • Improving knowledge of the subsoil. 	<ul style="list-style-type: none"> • Insufficient knowledge of mineral resources. • High dependence on mineral prices. • Constraints related to the availability of energy and water. • Constraints related to transport and multimodal logistics. • Constraints related to human resources. • Gold panning, a flourishing activity, but with problems. • Overly generous incentives. • Lack of capacity in mining administrations. • Health and safety challenges. 	<ul style="list-style-type: none"> • Strong economic (and demographic) growth in Africa, coupled with domestic consumer demand (spill-over effect on sector development). • Strong opportunities on domestic, regional and international markets: opportunity for income-generating activities, job creation for young people and women, increased sources of income. 	<ul style="list-style-type: none"> • Fluctuating world mineral prices. • Weak harmonisation of interventions by national actors and development partners. • Low development of energy potential which increases production costs. • Lack of an integrated community development programme. • Insecurity situation in the Sahel zone and its effects on the explosion of costs, the drop in production and the abandonment of certain projects.

2.1.3 Industry

The inventory of the industrial sector in the OMVG area was the subject of the diagnostic report of phase 1 of the study. A summary is presented here to draw out the main development issues and problems.

Overall, the industrial sector is poorly developed in the territories of the OMVG basins. This is due to the fact that the economy is essentially focused on the export of raw materials, mainly groundnuts, fishery products and cashew nuts.

In The Gambia, in the absence of significant mineral resources and with a limited agricultural base, industrial activities mainly revolve around the processing of groundnut production, fisheries resources (fish meal manufacture), tanning of hides and skins, tourism, breweries, assembly of agricultural machinery, metal and woodworking, and clothing.

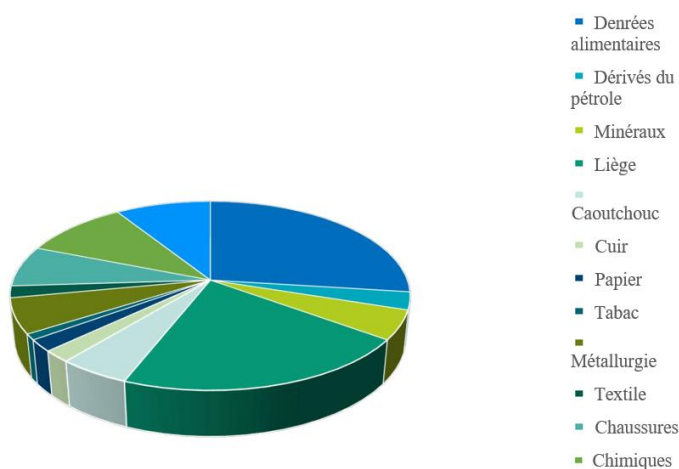
In Guinea, the sector is dominated by the mining industry, characterised by a growing desire on the part of state authorities to transform bauxite ore into alumina and then aluminium. The industrial fabric thus includes the alumina manufacturing industry and the cement factories, but also the agri-food industries, the textile industries and the wood industry.

In Guinea Bissau, the economy is extremely dependent on variations in cashew nut production and prices. The country also has significant rice-growing potential, as well as fisheries and mining resources (bauxite, phosphates) that are still unexploited. Two major constraints handicap the country's economic development: (i) the inadequacy of infrastructure, particularly electricity, and (ii) the isolation of regions with high agricultural potential.

In Senegal, industrial activity is dominated by the extractive industries, followed by the construction materials industry (cement factories), energy production, and finally the chemical industries (production of phosphoric acid by the ICS). Other industrial sectors have been in sharp decline in recent years, notably the textile, manufacturing, mechanical, food, leather, paper and cardboard industries. In the Gambia basin, the cotton ginning plant established in Tambacounda by SODEFITEX (Société de développement et des fibres textiles) produces 20,000 tonnes of cotton per year. Other smaller industries are listed: tobacco factories, oil mills, slaughterhouses, breweries, meat canneries, wood industries, and lighter factories.

KEY FIGURES

- The particularly underdeveloped manufacturing sector in The Gambia accounts for less than 6% of the country's GDP and employs less than 20,000 people.
- Approximately 412 industrial companies are listed in 2018 in Guinea (see breakdown below), of which only 19 are in the OMVG area



- The Guinea-Bissau economy is extremely dependent on variations in the production and price of cashew nuts (around 150,000 tonnes), which represent more than 95% of the country's exports, mainly to India and Vietnam.

- Industry in Guinea-Bissau accounts for just over 12% of GDP, while services account for almost 30%.
- The SODEFITEX (Société de développement et des fibres textiles) cotton ginning plant in Tambacounda (Senegal) in the Gambia basin produces between 18,000 and 20,000 tonnes of cotton per year. (ANSD, Situation économique et sociale du Sénégal Ed. 2017/2018).

SUMMARY OF THE SWOT MATRIX

This is presented in the table below.

Table 2-10 SWOT matrix of the industrial sector in the OMVG basins

Strengths	Weaknesses	Opportunities	Threats
<ul style="list-style-type: none"> • Significant development potential given the current low level of development coupled with the availability of significant mineral and agricultural resources. • Important mineral resources (iron, bauxite, phosphates), either unexploited or not processed locally. • Valorization of agricultural products (cashew, cocoa, pineapple, cotton) for domestic consumption and export is a major potential for growth of the agro-industry. 	<ul style="list-style-type: none"> • Sector essentially focused on the export of raw materials, with little or no added value. • Sector strongly competing with imported products • Unavailability of energy hinders the competitiveness of industrial companies that set up their own power plants or use generators, which increases production costs. 	<ul style="list-style-type: none"> • Strong economic (and demographic) growth in Africa, coupled with strong domestic demand in terms of consumption (spillover effect on sector development) • Strong opportunities on the domestic, regional and international markets: opportunity for income-generating activities, job creation for youth and women, increase in sources of income 	<ul style="list-style-type: none"> • Lack of competitiveness of industrial products compared to imported products • Weak harmonization of the interventions of national actors and development partners • Poor development of industrial and energy potential • Absence of an integrated community development program • Insecurity situation in the Sahel zone and its effects on the explosion of costs, the drop in production and the abandonment of certain projects.

2.1.4 Handicrafts

Handicrafts are not sufficiently developed in the OMVG region despite their great potential and the clearly stated desire of the States to make them a sector that promotes economic and social growth. In The Gambia, it is placed under the supervision of the Ministry of Tourism and Culture (MoTC), which has the National Council for Arts and Culture (NCAC) to preserve, promote and develop arts and culture in The Gambia.

In Guinea, the craft potential is immense and specific to each natural area of the country: sculpture in Lower Guinea, indigo fabric in Middle Guinea and Forest Guinea, sculpture and bakha in Upper Guinea. It contributes to the valorisation of local raw materials, to the satisfaction of the essential needs of the population, to the creation of jobs and to the training of young people.

In Guinea Bissau, handicrafts, under the supervision of the Ministry of Culture, Tourism and Handicrafts, are most famous for the talent of its Manjak weavers, who use a traditional loom with local cotton to make pagnes of unparalleled beauty.

In Senegal, the President of the Republic considers handicrafts to be a *vital sector, integrating know-how in several fields* (sewing, shoemaking, jewellery, carpentry, pottery, etc.), *generating strong growth and creating jobs for young people*. It is the sector that offers the most opportunities in terms of businesses created. Senegalese craft creation is rich and diversified and above all famous thanks to the sub-regional and international reputation of many Senegalese craftsmen. Export-oriented activities have been identified, notably clothing and fashion, leatherwork, leather goods and shoe-making, carpentry and cabinet-making (wood and wrought iron), embroidery/dyeing, jewellery, painting and sculpture. The pilot sectoral plan for handicrafts is a pilot project for the structuring of promising sectors of handicrafts, the improvement of market access through the creation of label houses and the eventual extension of the pilot plan to other types of crafts.

KEY FIGURES

- The **handicraft** sector **provides more than 40% of Guinea's manufacturing output**, employs about 25% of the Guinean working population and more than 30% of the urban population.
- The ambition in Senegal is to make **handicrafts an engine for inclusive economic and social growth**, with a contribution of 70 billion to GDP and the creation of 17,000 jobs.

SUMMARY OF THE SWOT MATRIX

Table 2-11 SWOT matrix of the handicraft sector in the OMVG basins

Strengths	Weaknesses	Opportunities	Threats
<ul style="list-style-type: none"> • Immense potential specific to each region • Know-how and local talents in several fields • Willingness of the state authorities to make it a sector of economic and social growth 	<ul style="list-style-type: none"> • Forte concurrence des produits importés • Difficultés d'accès aux financements • Difficultés d'accès aux marchés à l'exportation 	<ul style="list-style-type: none"> • Strong competition from imported products • Difficulty in accessing financing • Difficulty in accessing export markets 	<ul style="list-style-type: none"> • Lack of structuring of export-oriented sectors • Difficulty in accessing export markets

2.2 EVOLUTION OF THE SECTOR

2.2.1 Trend scenario

2.2.1.1 Energy

The trend development of energy use in the OMVG region is limited in global terms. The energy sector that sees significant programmed development is that of electricity, for which the OMVG countries have a development programme based on the construction and operation of medium to large-scale hydroelectric power plants and high-voltage power transmission systems.

The following table shows the power generation systems planned for the OMVG region.

Table 2-12 Power generation systems planned for the OMVG region

Dams / hydropower plants	Type	Possible start date	Capacity	Average production
			MW	GWh/year
Sambangalou	Hydro	2025	128	402
Saltinho	Hydro	2030	27	128
Digan	Hydro	2030	100	242
Kurawel	Hydro	2032	135	350
Fellou-Sounga	Hydro	2036	82	339
		<i>Subtotal (hydro)</i>	472	1461
Solar Gambia	Solar	2025	170	425
		<i>Subtotal (solar)</i>	170	425
Total			642	1886

In a first phase the system will be fed by the Kaléta and Souapiti dams

Table 2-13 Main existing hydropower generation systems in the OMVG interconnections and energy project area

Dams / hydropower plants	Type	Date of commissioning	Capacity	Average production
			MW	GWh/year
Kaleta	Hydro	2015	240	1095
Souapiti	Hydro	2021	450	1900
Total			690	2995

A total maximum capacity of 642 MW is planned to be installed until 2040, producing an average of 1 886 GWh/year. Given the population forecast for 2040 in the region (5.9 million inhabitants), this will increase the average availability of electricity per capita by 314/kWh.year, i.e. about four times the current average availability in the OMVG area (~50 kWh/year.hab), for a total of about 360 kWh/year.hab in 2040. If we consider the 20-year growth period, this will correspond to an annual growth rate of over 10%.

This is acceptable but not extraordinary growth. Many countries and regions in the initial stages of electrification have exceeded average annual growths of 10%.

The planned new generation capacity will be sufficient to meet the overall electricity targets, if the transmission and distribution networks are also developed.

For other forms of thermal energy (firewood, LPG) no specific projects are currently planned. We will propose them in the following chapters.

2.2.1.2 Mining

In the absence of investment in structuring programmes for the development of geological and mining infrastructures (detailed geological maps, geophysical and geochemical coverage, strategic and tactical prospecting campaigns, geological information synthesis, mining cadastre systems, geological and mining information systems, etc.), the mining potential will remain poorly known and the States will not be able to appropriate the subsoil resources, which will remain the preserve of foreign mining companies.

The lack of diversification of mining production will maintain the risk of dependence on mineral prices.

The low competitiveness of mining production will remain a reality in the absence of cheap energy.

Pollution of water resources and negative effects on the environment, biodiversity and human health will persist.

Many mining projects will be delayed due to constraints related to transport and multimodal logistics (phosphates, iron).

Mining projects will continue to face health and safety challenges.

2.2.1.3 Industry

The lack of industrialisation or the weak development of industry will have the following consequences:

- The persistence of an economy based on the export of raw materials and the import of manufactured products and consumer goods;
- Strong competition from imported products, even when they are low-end (e.g. unfair competition from second-hand clothes which defeats all the development efforts of the cotton sector and the clothing industry);
- Guinea continues to supply the global aluminium industry with bauxite raw material;
- Industry will remain uncompetitive due to lack of energy or it will continue to use energy that is too expensive, which will affect its competitiveness;
- The negative impacts of gold mining on the environment, biodiversity and human health, as well as child labour in artisanal mining, will remain major challenges;
- The loss of agricultural land to gold mining sites, in the absence of clear legislation and state supervision, will exacerbate food insecurity.

2.2.1.4 Handicrafts

The lack of structuring of export-oriented craft industries, difficulties in accessing financing and export markets will remain an obstacle to the development of the handicraft sector and will hinder the ability to face strong competition from imported products.

2.2.2 Key issues

2.2.2.1 Energy

In terms of future energy development in the region, the main issues are

- As far as electricity supply is concerned, it will be necessary to start from a very embryonic situation in terms of the transmission and distribution network which will have to be built almost from scratch. It is estimated that, beyond the HV interconnection network, 15,400 km of medium voltage lines and 38,500 km of low voltage lines will have to be built. This will be costly and time consuming;
- The hydroelectric potential of the Fouta-Djalon region is very significant and could be the basis for the electrification of the region in the long term;
- The potential of solar energy is significant (and greater than that of wind power) and can complement the supply of electricity in less densely populated areas;
- The current use of fuelwood from natural forests is a sustainability issue. The potential for growth of biomass grown specifically for use as a heat source for households is high and will reduce pressure on the natural environment;
- In order to achieve the above objectives, sufficient funding will be required;
- It will also be necessary to have sufficient technical capacity to promote the installation of electrical distribution and supply networks in homes. It will therefore be necessary to prepare the technical training of installers.

2.2.2.2 Mining

The main issues in mining are at 3 levels:

- The mining potential is huge and very diversified, but remains poorly known due to the lack of basic geological infrastructure and national strategic and tactical mining exploration programmes.
- Mining production is generally exported in the form of raw minerals. There is little processing throughout the value chain.
- Gold mining generates negative environmental impacts in the OMVG area, particularly in Guinea and Senegal where the activity remains a real headache for the States.

2.2.2.3 Industry

The main challenges for the development of industry in the OMVG area are as follows:

- The industrial sector is poorly developed due to: (i) an economy essentially focused on the export of raw materials, mainly groundnuts, fishery products and cashew nuts; (ii) the inadequacy of infrastructure, particularly electricity; (iii) the isolation of regions with high agricultural potential;
- The mining industry in Guinea is characterised by a growing desire to transform mining products throughout the value chain, in particular the transformation of bauxite ore into alumina and aluminium;
- The economy in Guinea Bissau is extremely dependent on variations in the production and prices of cashew nuts, which are exported in raw form, without any added value.

2.2.2.4 Handicrafts

The main issues in the handicraft sector are:

- Access to finance;
- Lack of structuring;
- The lack of a framework for better access to export markets.

2.2.3 Alternative scenarios

2.2.3.1 Energy

As mentioned above, the current planned baseline scenario is based mainly on the distribution of conventional, mostly renewable electricity - hydro and solar.

Subsequently, complementary scenarios for the energy sector are proposed. These complementary scenarios essentially cover the following aspects :

- Individual or small village use of electricity generated by solar panels;
- Acquisition and development of plots for the planting of fast-growing plant species for the production of good quality dry wood for distribution to the population in order to reduce the pressure on natural forests;
- Increase the use of LPG in households, mainly in urban areas.

The objective of the first complementary scenario is to increase the initial penetration of electricity and prepare the population, mainly rural, for the benefits of electricity.

The second scenario covers the thermal energy component and will have as its main objective to improve the quality of life of families (especially women and children) and also to reduce the health risks to inhabitants caused by the smoke from wood and charcoal fires used by households. Rationalising the use of domestic fuels will also be important to reduce the pressure on the natural environment, especially caused by the exploitation of forests and woodlands. To increase the effectiveness of the measure, it will have to be accompanied by the introduction and popularisation of locally manufactured domestic stoves, which are more efficient and generate less smoke.

Finally, the third complementary scenario will also cover the thermal needs of families with more comfort and less impact on health and the environment.

2.2.3.2 Mining

The following alternative scenarios are proposed to ensure the sustainable development of the mining sector:

- Development of geological infrastructure (implementation of detailed geological coverage programmes, establishment of geological and mining information systems and mining cadastral systems, regional geophysical and geochemical coverage, implementation of strategic and tactical mining exploration programmes, requirement for mining projects to have a value-added and processing component throughout the value chain).
- Organise and supervise the exploitation of artisanal and small-scale mines (EMAPE) in order to ensure the development of the sector in strict compliance with environmental and occupational health and safety standards.
- Train human resources (creation of centres of excellence for training expertise, like the National Oil and Gas Institute in Senegal)
- (Re)negotiate production share contracts, as in the hydrocarbon sector, by involving well-equipped national experts, namely mining lawyers.
- Implement a Local Content Law that stimulates and promotes the participation of national companies in the implementation of mining projects
- In Senegal: the decree reorganising the organisation chart of the Ministry of Mines and Geology with the creation of: (i) the Direction des Mines à petite échelle et artisanales; (ii) the Direction de la Géologie with a geological service whose mission is to conduct national geological mapping and mining prospecting programmes.
- In Guinea, President Doumbouya's shock declaration on the transformation of mineral raw materials and the diversification of mining activities: *"Your obligations in this framework must be respected without delay. If the investments made in the mining sector have been mainly in bauxite and gold in recent years, we must do everything possible to promote the production of other minerals including iron... We must accelerate the second phase of the value chain, i.e. the transformation of bauxite into alumina and then into aluminium in the country."*

2.2.3.3 Industry and handicrafts

The alternative scenarios for securing the development of the mining industry and agro-industry are based on two fundamental options that depend on strong political will and a commitment to make it a sustainable sector for economic and social growth:

- Option to process mining products instead of exporting raw materials without adding value.
- Option of processing agricultural products throughout the value chain (setting up a network of small and medium-sized industrial enterprises active in the valorisation of local agricultural products, know-how and talents).
- The following conditions should be considered:
 - Human resources training;
 - Development of mining and agricultural potential;
 - Valuation of local know-how and talents;
 - Access to finance;

- Promotion of local labels;
- Development of craft villages;
- Organisation of fairs;
- Guidance and support for access to export markets;
- Support for the participation of stakeholders in international fairs.

2.2.4 Evolution of sector needs to 2040

2.2.4.1 Development potential / identified projects / trends

Energy

As indicated earlier, the region is expected to see an increase in the availability of electricity of around 10% per year between 2022 and 2040, rising from the current 50 kWh/year.inhabitant to 360 kWh/year.inhabitant, based on the creation of the hydroelectric and solar schemes indicated in the Tableau 2-12.

We have identified two lines of energy projects that are complementary to the basic electrification project:

- **Electricity** - Individual electrification in rural areas using solar energy
- **Thermal energy** - renewable fuelwood production and increased LPG penetration

The first line tries to increase the speed of electrification in rural areas, by implementing individual or collective electricity systems based on solar energy.

The second line draws on the strongest source of energy used in the region - firewood and charcoal - in order to increase the availability of good quality dry wood without harming the environment. Also in the context of thermal energy it is proposed to increase the availability of LPG in the urban areas of the OMVG. Both interventions will have a positive effect on the health of the population - mainly women - due to the reduction of smoke production.

Mining, industry and handicrafts

The diagnosis of the sector in phase 1 revealed a number of mining projects that are more or less mature:

- 2 heavy minerals projects (ilmenite, zircon): in The Gambia (Batukunku, Kartung, Sanyang) and in Guinea Bissau (Valéra);
- 2 bauxite projects: in Guinea (Massif du Fouta Djallon: Tougué, Mali) and in Guinea Bissau (Boé);
- 2 phosphate projects in Guinea Bissau (Farim) and Senegal (Kolda).

2.2.4.2 Current and 2040 water needs of the sector

Energy

The hydropower production by large dams obviously uses large quantities of water and changes the natural regime of rivers, but the water used remains free for other uses downstream, for example irrigation.

Properly managed hydropower schemes have significant benefits beyond energy production, including flood control, provision of water for irrigation (either through direct water abstractions or through downstream releases), management of ecological flows, fish farming in the reservoir, etc.

Water losses through evaporation in the reservoir can be significant. For example, the Sambangalou dam reservoir, with a surface area of 181 km², average rainfall of 900 mm/year and evaporation of around 2,700 mm/year, is expected to lose 326 Mm³/year, equivalent to an average flow of 11 m³/s. Although significant, this flow is well below the average flow of the river at the dam site, which is around 120 m³/s on average.

This indicates that the increased regulation of the river flow will more than compensate for the inevitable increase in evaporation losses.

Mining, industry and handicrafts

The water needs of the mining industry were assessed in the Phase 1 diagnostic report on the basis of the water needs of a gold mine of the size of Sabodala (Kédougou region, Senegal) estimated at around 3.5 million m³ per year. This requirement is about 10 times greater for a phosphate mine, also of medium size. The annual water requirements of the mines in the Gambia, Kayanga-Geba and Koliba-Corubal river basins were thus estimated at (see table below).

Table 2-14 Annual water requirements for mines to 2040

Country	Mines	No. of mines	Annual water requirement Unit (Mm ³)	Total (Mm ³)
The Gambia	Heavy minerals	2	35	70
	Silica sand	1	17.5	17.5
Guinea	Bauxite	3	35	105
	Gold	1	3,5	3,5
Guinea Bissau	Bauxite	1	35	35
	Phosphate	1	35	35
	Heavy minerals	1	35	35
Senegal	Phosphate	1	35	35
TOTAL				336
TOTAL needs by 2040: 336 million x 15 (2025-2040)				5 040

3 VISION AND STRATEGIC OBJECTIVES

3.1 VISION TO 2040

3.1.1 Energy

In terms of a global vision, and taking into account the current situation, the following is envisaged for the energy component

Modern, reliable and efficient energy will stimulate growth, catalyse economic transformation and contribute to higher socio-economic living standards.

Achieving this Vision will require access for all to improved, reliable and affordable energy services, a significant increase in the share of renewable energy in the regional energy mix, and improved energy efficiency.

Given the current starting point, it seems essential to act on two main aspects: electricity and thermal energy for domestic use.

In terms of electricity, for the medium and long term, it seems reasonable to pursue the project corresponding to the construction of large hydroelectric schemes financed by the OMVG, based on the recently constructed High Voltage interconnection system.

However, to increase the availability of electricity in the short term, and to expose people, mainly in agricultural areas, to the positive impacts of electrification, it is suggested that individual and collective solar-based systems be installed, capable of providing small amounts of energy for lighting, telecommunications and refrigeration. These are important aspects for the quality of life of the population and are energy efficient.

For the thermal energy component for domestic use, there are some aspects that need to be improved in the face of current conditions:

- Facilitating household access to domestic fuels;
- Reduce smoke generated by the use of fuels;
- Reducing waste by increasing efficiency;
- Reduce the environmental impacts of biofuel use.

3.1.2 Mining and industry

A mining and industrial sector in the OMVG area, driving integrated regional economic development that respects the environment and human health.

Development objective: The objective is that the exploitation of the region's mining potential and its transformation throughout the value chain should lay the foundations for genuine industrialisation and serve as a lever for other sectors, in particular agriculture.

In order to better understand the mining potential of the territories of the OMVG area, it is imperative to carry out the following work:

- Map coverage of countries at detailed scales;
- Development of geological and mining infrastructure;
- Regional geophysical coverage;
- Stream-sediment geochemical survey;

- Strategic and tactical mineral exploration;
- Development of anomalies and mineral showings.

3.1.3 Handicrafts

The handicraft sector in the OMVG area, as an engine for inclusive economic and social growth.

The objective is to enhance the value of handicrafts and manufacturing production so that they can best contribute to the economic and social development of the countries in the OMVG area. This will be achieved through, among other things

- The development of the specific craft potential of each natural region;
- The development of export-oriented activities through clothing and fashion, leatherwork, leather goods and shoe-making, carpentry and cabinet-making (wood and wrought iron), embroidery/dyeing, jewellery, painting and sculpture;
- The structuring of promising sectors of the handicrafts industry;
- Improving market access through the creation of label houses;
- The creation and promotion of craft villages;
- The organisation of regional craft fairs;
- Supporting craftspeople to participate in international craft fairs;
- The development of local know-how in various sectors (sewing, shoemaking, jewellery, woodwork, pottery, etc.);
- The development of local raw materials to meet the basic needs of the population;
- The creation of craft enterprises with a positive impact on job creation for young people and women.

3.2 STRATEGIC AXES OF THE SECTOR

The OMVG's vision for the development of energy, industry, mining and handicrafts up to 2040 will be based on three strategic axes, in line with the National Development Plans for these sectors of the four Member States:

- 1. Electricity - Ensure universal access to electricity for the populations of the OMVG area by 2040;**
- 2. Thermal Energy - Facilitating access to improved sources of thermal energy, reducing the impact on the environment;**
- 3. Tapping the mining, agro-industrial and handicraft potential rationally.**

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 recaps 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 the Energy, Mining, Industrial and Handicraft sector up to 2040

Strategic areas	Provisions	Measures
1. Electricity - Ensuring access to electricity for 80% of the population by 2040	1. 1 Continue the plan to build new medium and large renewable electricity generation facilities	1.1.1 Construction of the Sambangalou Hydroelectric Scheme (AHES), with 128 MW of installed capacity, 402 GWh/year of producible power, in Senegal, on the Gambia River, in the Kédougou region,
		1.1.2 Construction of the Saltinho hydroelectric scheme, with 27 MW of installed capacity, 128 GWh/year of producible power (without the effect of regulation of upstream hydroelectric schemes), in Guinea-Bissau, on the Corubal river, in the Bafatá and Tombali region.
		1.1.3 Construction of the Digan hydroelectric scheme (AHED), with MW100 of installed capacity, 242 GWh/year of producible power, in Guinea, on the Gambia River, in the Labé region.
		1.1.4 Construction of the Kourawel hydroelectric scheme (AHEK), with 135 MW of installed power, 350 GWh/year of producible energy, in Guinea, on the Komba river (tributary of the Koliba river), in the Labé region.
		1.1.5 Construction of the Fellou-Sounga hydroelectric and agricultural scheme, with 82 MW of installed capacity, 339 GWh/year of producible energy, in Guinea, on the Koliba river, in the Boké region.
		1.1.6 Construction of a 20 MW solar power plant in The Gambia,
		1.1.7 Construction of a 150 MW solar power plant in The Gambia,
	1.2 Complete construction of 225 kV HV interconnection lines	1.2.1 Construction of a transmission line, substations and a dispatching centre (1677 km long), substations and two (02) dispatching centres (Linsan and Tambacouda).
		1.2.2 Construction of a 500 km long power line to connect the Digan, Fello-Sounga, Kourawel and Saltinho hydroelectric power stations as well as the Soma (Gambia) and Tambacounda (Senegal) substations via the Bassé substation to be built.
	1. 3 Ensure the distribution of energy to the population	1.3.1 Connection to the interconnected network of urban centres with more than 1000 inhabitants
		1.3.2 Creation of micro-grids with solar source for small agricultural villages - 50 kWh/capita/year

Strategic areas	Provisions	Measures
	1.4 Promotion of energy efficiency	1.3.3 Financing for the selection and installation of small individual solar systems - 400-600 kWh/household/year. Creation of small companies for installation and maintenance,
		1.4.1 - Launch awareness-raising campaigns on energy management and saving and promote the use of low-energy equipment among users
		1.4.2 - Promote energy efficiency through the implementation of technologies to combat technical losses in the distribution network
2. Thermal Energy - Facilitating access to clean sources of thermal energy, reducing the impact on the environment	2.1 Facilitating access to biofuels (wood and charcoal) for the entire population (mainly rural)	2.1.1 Creation of plots for the planting of fast-growing plant species for the renewable production of firewood - including planting, maintenance, cutting and replanting
		2.1.2 Establishment of companies for the drying, thin cutting, and distribution of wood
		2.1.3 Establishment of enterprises to process wood into charcoal using modern technology (less than 3.5 kg of dry wood per kg of charcoal)
		2.1.4 Creation of a charcoal distribution system
		2.1.5 Distribution of improved stoves for charcoal use (steel stoves with standard design created by local companies)
	2.2 Promoting access to LPG and biogas in urban and suburban centres	2.2.1 Creation of an industrial chain including the supply, filling, distribution and collection of LPG cylinders,
		2.2.2 Support for the purchase of LPG equipment (ovens and water heaters)
		2.2.3 Biogas promotion, production and distribution.
		2.2.4 Promote the construction and use by households of solar thermal units (water heaters without solar panels).
3. Exploiting mining, agro-industrial and handicraft potential	3.1 Develop geological and mining infrastructure by establishing multi-year national geological and mining mapping programmes and by implementing a mining cadastre	3.1.1 Carry out a 1:50,000 mapping programme
		3.1.2 Establish a Geological and Mining Information System (GMIS)
		3.1.3 Setting up a Mining Cadastre System
	3.2 Exploring underground resources	3.2.1 Conducting airborne geophysical mapping programme
		3.2.2 Conducting regional geochemical mapping programmes
	3.3 Mining and processing products across the value chain	3.3.1 Finalise the construction phase of the infrastructure of the Koumbia bauxite mine (Gaoual, Boké)
		3.3.2 Carry out detailed and construction engineering for the Farim phosphate mining project (Guinea Bissau)
		3.3.3 Carry out the feasibility study for the exploitation of phosphates in Kolda (Senegal)
		3.3.4 Carry out the feasibility study for the exploitation of bauxite in Boé (Guinea Bissau)
	3.4 Develop artisanal mining in a sustainable manner by regulating gold panning activities	3.4.1 Improving mineral extraction and processing techniques and technologies
		3.4.2 Strengthening the capacity of the sector's actors

Strategic areas	Provisions	Measures
	3.5 Developing agro-industry, handicrafts and manufacturing	3.5.1 Establish units for processing agricultural products and organise marketing and export channels for value-added products
		3.5.2 Promoting the development of handicrafts and export-oriented activities
		3.5.3 Establishment of the industrial superstructure - Agropole South project
		3.5.4 Development of infrastructure for the servicing of the Boké & Kankan agro-parks (PDZSTA-BK)

4.2 STRATEGIC AXIS 1 - ELECTRICITY - ENSURING UNIVERSAL ACCESS TO ELECTRICITY FOR THE OMVG POPULATIONS BY 2040

4.2.1 Provision 1.1 - Continue the plan to build new medium and large renewable electricity generation facilities

GENERAL PRINCIPLE

The large-scale hydropower projects will provide the bulk of the electricity that will be supplied to the OMVG area. Initially, the system will be fed by the production of the Souapiti (450 MW, 2,000 GWh/year) and Kaléta (240 MW, 270 MWh/year) schemes in Guinea, on the Konkouré River. These facilities will supply only part of their energy to the OMVG grid. Later, the Sambangalou scheme in Senegal (128 MW, 402 GWh/year) and a series of other schemes built by OMVG will come on stream. Large-scale solar systems will also be built in The Gambia.

EXPECTED RESULTS

Availability of almost 2000 GWh/year (800 MW capacity) to supply the whole OMVG region in 2040.

AREA OF INTERVENTION

The entire OMVG area

PROPOSED MEASURES**Measure 1.1.1 - Construction of the Sambangalou hydroelectric scheme (AHES) in Senegal**

The construction of the Sambangalou Hydroelectric Scheme (AHES), already underway, and its commissioning, is extremely important in the development of the energy sector of the four OMVG countries. This scheme will be integrated into the OMVG Generation and Transmission System, through the 225 kV electrical interconnection that links the four member countries (Guinea-Bissau, Senegal, Guinea and The Gambia).

Measure 1.1.1	Construction of the Sambangalou Hydroelectric Scheme (AHES), with 128 MW of installed capacity, 402 GWh/year of producible power, in Senegal, on the Gambia River, in the Kédougou region.
Origin (institution / project / programme)	OMVG Energy Project
Objective	The main objectives are to provide electricity, irrigate agricultural land and supply water to the surrounding population.
Location	Senegal (but the hydroelectric production will thus supply all four OMVG countries) Latitude: 12°23'36.48 "N Longitude: 12°11'53.40 "W
Description of the action	Construction of the Sambangalou hydroelectric scheme.
Ownership and implementation arrangements	OMVG
Duration	42 months, Start of works: Second half of 2021
Costs and funding	Total estimated cost of USD 438 million, including USD 60 million allocated by the African Development Bank (AfDB). Sources: OMVG and Ecofin Agency (Note: Consultant's estimation - \$350 million remains to be invested)
Risks envisaged	<ul style="list-style-type: none"> ▶ Instability of hydroelectric productivity due to climate change. ▶ Possible delay in the construction of the Sambangalou hydroelectric scheme. ▶ Political changes that may interfere with the objectives to be achieved. ▶ Delay in funding.
Expected results	<ul style="list-style-type: none"> ▶ Facilitate energy trade and improve the quality of electricity supply in OMVG member countries. ▶ Significantly reduce the consumption of fossil fuels and, consequently, greenhouse gas emissions. ▶ Provide renewable energy at a competitive price. ▶ Contribute to the socio-economic development of the organisation's member countries by improving people's access to energy and water. ▶ Contribute to the expansion of the electricity trading system. ▶ Strengthen the energy independence of countries. ▶ Increase agricultural productivity. ▶ Possibility of irrigating 90,000 ha of agricultural land (50,000 ha in The Gambia and 40,000 ha in Senegal). ▶ Develop a major infrastructure to supply the industrial sector of the Gambia River basin. ▶ Improvement of the living conditions of the beneficiary populations. ▶ Decrease in the rural exodus. ▶ Regulation of the flow of the Gambia River resulting in a reduction in flooding.

Measure 1.1.2 - Construction of the Saltinho hydroelectric scheme in Guinea-Bissau

The future construction and commissioning of the Saltinho hydroelectric scheme, currently under project, is of particular importance in the development of the energy sector of the four OMVG countries. This scheme will be integrated into the OMVG Generation and Transmission System, through the 225 kV electrical interconnection that interconnects the four member countries (Guinea-Bissau, Senegal, Guinea and The Gambia)

Measure 1.1.2	Construction of the Saltinho hydroelectric scheme, with 27 MW of installed capacity, 128 GWh/year of producibility (without the effect of regulation of upstream hydroelectric schemes), in Guinea-Bissau, on the Corubal river, in the Bafatá and Tombali region.
Origin (institution / project / programme)	OMVG Energy Project
Objective	The main objective is to strengthen regional cooperation and integration of OMVG member countries in the energy sector, and particularly in the electricity sub-sector. The Saltinho hydroelectric scheme is part of the second generation of the OMVG energy programme.
Location	Guinea Bissau (but the hydroelectric production will thus supply all four OMVG countries). The future Saltinho site is located about 170 km from Bissau by road, near the village of Xitole, and the distance to the villages of Bambadinca and Quebo is relatively small. Latitude: 1°13'7,63 "N Longitude: 1°44'1'15,97 "W
Description of the action	Construction of the Saltinho hydroelectric scheme.
Ownership and implementation arrangements	OMVG
Duration	3 years
Costs and funding	Total estimated cost of 117 USD million, co-financed by the African Development Bank (AfDB). Sources: COBA
Risks envisaged	<ul style="list-style-type: none"> ▶ Instability of hydroelectric productivity due to climate change. ▶ Possible delay in the elaboration of the studies (in progress) and in the future, in the construction of the Saltinho hydroelectric scheme. ▶ Political changes that may interfere with the objectives to be achieved. ▶ Delay in funding.
Expected results	<ul style="list-style-type: none"> ▶ Facilitate energy trade and improve the quality of electricity supply in OMVG member countries. ▶ Significantly reduce the consumption of fossil fuels and, consequently, greenhouse gas emissions. ▶ Provide renewable energy at a competitive price. ▶ Contribute to the socio-economic development of the organisation's member countries by improving people's access to energy. ▶ Contribute to the expansion of the electricity trading system. ▶ Develop a major infrastructure to supply the industrial sector of the Corubal river basin. ▶ Improvement of the living conditions of the beneficiary populations, ▶ Strengthen the energy independence of countries.

Measure 1.1.3 - Construction of the Digan Hydroelectric Scheme (AHED) in Guinea

The construction of the Digan Hydroelectric Scheme (AHED) and its future commissioning, currently under project, is extremely important in the development of the energy sector of the four OMVG countries. This scheme will be integrated into the OMVG Generation and Transmission System, through the 225 kV electrical interconnection that interconnects the four member countries (Guinea-Bissau, Senegal, Guinea and The Gambia).

Measure 1.1.3	Construction of the Digan hydroelectric scheme (AHED), with 100 MW of installed capacity, 242 GWh/year of producible power, in Guinea, on the Gambia River, in the Labé region.
Origin (institution / project / programme)	OMVG Energy Project
Objective	The main objective is to strengthen regional cooperation and integration of OMVG member countries in the energy sector, and particularly in the electricity sub-sector. The Digan hydropower scheme is part of the second generation of OMVG's energy programme.
Location	Guinea, Labé region (but the hydroelectric production will thus supply all four OMVG countries). Latitude: 11°51'54.49"N Longitude: 11°49'24.26"W
Description of the action	Construction of the Digan hydroelectric scheme.
Ownership and implementation arrangements	OMVG
Duration	-
Costs and funding	Total estimated cost of USD 126 million, co-financed by the African Development Bank (AfDB). Source: National Renewable Energy Action Plan (PANER).
Risks envisaged	<ul style="list-style-type: none"> ▶ Instability of hydroelectric productivity due to climate change. ▶ Possible delay in the construction of the Digan hydroelectric scheme. ▶ Political changes that may interfere with the objectives to be achieved. ▶ Delay in funding.
Expected results	<ul style="list-style-type: none"> ▶ Facilitate energy trade and improve the quality of electricity supply in OMVG member countries. ▶ Significantly reduce the consumption of fossil fuels and, consequently, greenhouse gas emissions. ▶ Provide renewable energy at a competitive price. ▶ Contribute to the socio-economic development of the organisation's member countries by improving people's access to energy and water. ▶ Contribute to the expansion of the electricity trading system. ▶ Increase agricultural productivity. ▶ Develop a major infrastructure to supply the industrial sector of the Gambia River basin. ▶ Improvement of the living conditions of the beneficiary populations. ▶ Regulation of the flow of the Gambia River resulting in a reduction in flooding. ▶ Decrease in the rural exodus. ▶ Strengthen the energy independence of countries.

Measure 1.1.4 - Construction of the Kourawel hydroelectric scheme (AHEK) in Guinea

The future construction and commissioning of the Kourawel Hydroelectric Scheme (AHEK), currently under project, is of particular importance in the development of the energy sector of the four OMVG countries. This scheme will be integrated into the OMVG Generation and Transmission System, through the 225 kV electrical interconnection that links the four member countries (Guinea-Bissau, Senegal, Guinea and The Gambia).

Measure 1.1.4	Construction of the Kourawel hydroelectric scheme (AHEK), with 135 MW of installed capacity, 350 GWh/year of producible power, in Guinea, on the Komba River (tributary of the Koliba River), in the Labé region.
Origin (institution / project / programme)	OMVG Energy Project
Objective	The main objective is to strengthen regional cooperation and integration of OMVG member countries in the energy sector, and particularly in the electricity sub-sector. The Kourawel hydropower scheme is part of the second generation of OMVG's energy programme.
Location	Guinea (but the hydroelectric production will thus supply all four OMVG countries). Latitude: 11°42'35.09"N Longitude: 12°34'08.06"W
Description of the action	Construction of the Kourawel hydroelectric scheme
Ownership and implementation arrangements	OMVG
Duration	-
Costs and funding	Total estimated cost of USD 185 million. Source: Tractebel (2018)
Risks envisaged	<ul style="list-style-type: none"> ▶ Instability of hydroelectric productivity due to climate change. ▶ Possible delay in the construction of the Kourawel hydroelectric scheme. ▶ Political changes that may interfere with the objectives to be achieved. ▶ Delay in funding.
Expected results	<ul style="list-style-type: none"> ▶ Facilitate energy trade and improve the quality of electricity supply in OMVG member countries. ▶ Significantly reduce the consumption of fossil fuels and, consequently, greenhouse gas emissions. ▶ Provide renewable energy at a competitive price. ▶ Contribute to the socio-economic development of the organisation's member countries by improving people's access to energy and water. ▶ Contribute to the expansion of the electricity trading system. ▶ Establish a major infrastructure to supply the industrial sector of the Komba/Koliba river basin. ▶ Improvement of the living conditions of the beneficiary populations. ▶ Regulation of the flow of the Komba/Koliba River resulting in a reduction in flooding. ▶ Decrease in the rural exodus. ▶ Strengthen the energy independence of countries.

Measure 1.1.5 - Construction of the Fellou-Sounga hydroelectric and agricultural scheme in Guinea

The future construction and commissioning of the Fellou-Sounga hydroelectric and agricultural scheme, currently being planned, is of particular importance in the development of the energy sector of the four OMVG countries. This scheme will be integrated into the OMVG Generation and Transmission System, through the 225 kV electrical interconnection that links the four member countries (Guinea-Bissau, Senegal, Guinea and The Gambia).

Measure 1.1.5	Construction of the Fellou-Sounga hydroelectric and agricultural scheme, with 82 MW of installed capacity, 339 GWh/year of producible energy, in Guinea, on the Koliba river, in the Boké region.
Origin (institution / project / programme)	OMVG Energy Project
Objective	The main objective is to strengthen regional cooperation and integration of OMVG member countries in the energy sector, and particularly in the electricity sub-sector. The Fellou-Sounga hydroelectric scheme is part of the second generation of OMVG's energy programme.
Location	Guinea-Bissau (but the hydroelectric production will thus supply all four OMVG countries), The future Fellou-Songa site is located about 27 km south of Gaual. Latitude: 11°32'N Longitude: 13° 16W
Description of the action	Construction of the Fellou-Sounga hydroelectric scheme.
Ownership and implementation arrangements	OMVG
Duration	-
Costs and funding	Total estimated cost of USD 353 million, co-financed by the African Development Bank (AfDB). Source: Tractebel (2018)
Risks envisaged	<ul style="list-style-type: none"> ▶ Instability of hydroelectric productivity due to climate change. ▶ Possible delay in the construction of the Fellou-Sounga hydroelectric scheme. ▶ Political changes that may interfere with the objectives to be achieved. ▶ Delay in funding.
Expected results	<ul style="list-style-type: none"> ▶ Facilitate energy trade and improve the quality of electricity supply in OMVG member countries. ▶ Significantly reduce the consumption of fossil fuels and, consequently, greenhouse gas emissions. ▶ Provide renewable energy at a competitive price. ▶ Contribute to the socio-economic development of the organisation's member countries by improving people's access to energy and water. ▶ Contribute to the expansion of the electricity trading system. ▶ Increase agricultural productivity. ▶ Establish a major infrastructure to supply the industrial sector of the Koliba river basin. ▶ Improvement of the living conditions of the beneficiary populations. ▶ Decrease in the rural exodus. ▶ Regulation of the flow of the Koliba River resulting in a reduction in flooding.

Measure 1.1.6 - Construction of a 20 MW solar power plant in Jambur, The Gambia

The construction of the 20 MW solar power plant in Jambur and its commissioning is of great importance in the development of the Gambian energy sector.

Measure 1.1.6	Construction of a 20 MW solar power plant in The Gambia.
Origin (institution / project / programme)	Renewable energy development programme in The Gambia
Objective	Improving access to electricity for rural communities.
Location	Jambur, near the capital Banjul, The Gambia.
Description of the action	Construction of the 20 MW solar power plant in Jambur.
Ownership and implementation arrangements	The solar power plant will be implemented with the public electricity provider Nawec (National Water & Electricity Company).
Duration	-
Costs and funding	This power plant project benefits from USD 160 million financing from the European Investment Bank (EIB), the European Union and the World Bank. This financing will specifically be used to finance the construction of a 20 MW solar photovoltaic power plant in Jambur, near the capital Banjul, and associated infrastructure (battery storage system, distribution line, etc.). The project benefits from a concessional loan of USD 74 million from the European Investment Bank, a grant of USD 46 million from the European Union budget and financing of USD 40 million from the World Bank. Part of the EU funds will be used for feasibility and environmental impact studies, technical training, assistance to Nawec for the integration of renewable energy in the Gambia's electricity mix. Source: <i>Energies - Media</i> website (25/04/2019)
Risks envisaged	<ul style="list-style-type: none"> ► Possible delay in the construction of the 20 MW solar power plant in Jambur. ► Political changes that may interfere with the objectives to be achieved. ► Delay in funding.
Expected results	<ul style="list-style-type: none"> ► Provide energy to 1,000 schools and 100 health centres in rural areas. ► Significantly reduce the consumption of fossil fuels and, consequently, greenhouse gas emissions. ► Provide renewable energy at a competitive price. ► To contribute to the socio-economic development of The Gambia. ► Strengthen the energy independence of countries. ► Improvement of the living conditions of the beneficiary populations. ► Decrease in the rural exodus.

Measure 1.1.7 - Construction of a 150 MW solar power plant in Soma, The Gambia

The construction of the 150 MW solar power plant in Soma and its commissioning is of great importance in the development of the Gambian energy sector.

Measure 1.1.7	Construction of a 150 MW solar power plant in The Gambia.
Origin (institution / project / programme)	West African Power Pool (WAPP) of the Economic Community of West African States.
Objective	Improving access to electricity for rural communities.
Location	Soma, The Gambia.
Description of the action	Construction of the 150 MW solar power plant in Soma (with a storage capacity of 100 to 150 MWh)
Ownership and implementation arrangements	OMVG The process of setting up this solar park started in October 2019 with the completion of a feasibility study. It will be implemented in Soma in two phases that will allow the deployment of 80 MW and 70 MW respectively. Its production will be sold to NAWEC, the public electricity provider (National Water & Electricity Company).
Duration	- Commissioning is planned for 2025.
Costs and funding	Total estimated cost of the works: USD 700 million. Financing: WAPP

	Source: Ecofin Agency (10/0/20920)
Risks envisaged	<ul style="list-style-type: none"> ► Possible delay in the construction of the 150 MW solar power plant in Soma. ► Political changes that may interfere with the objectives to be achieved. ► Delay in funding.
Expected results	<ul style="list-style-type: none"> ► Significantly reduce the consumption of fossil fuels and, consequently, greenhouse gas emissions. ► Provide renewable energy at a competitive price. ► To contribute to the socio-economic development of The Gambia. ► Strengthen the energy independence of countries. ► Improvement of the living conditions of the beneficiary populations. ► Decrease in the rural exodus.

4.2.2 Provision 1.2 - Complete the construction of 225 kV high voltage interconnection lines

GENERAL PRINCIPLE

The main ring interconnection line will initially connect the Sambangalou, Souapiti and Kaléta hydropower plants. With a total length of about 1,677 km this line, operating at 225 kV, will include 15 transformer plants and will connect all the main towns in the OMVG region. The interconnection line is shown in the following figure.

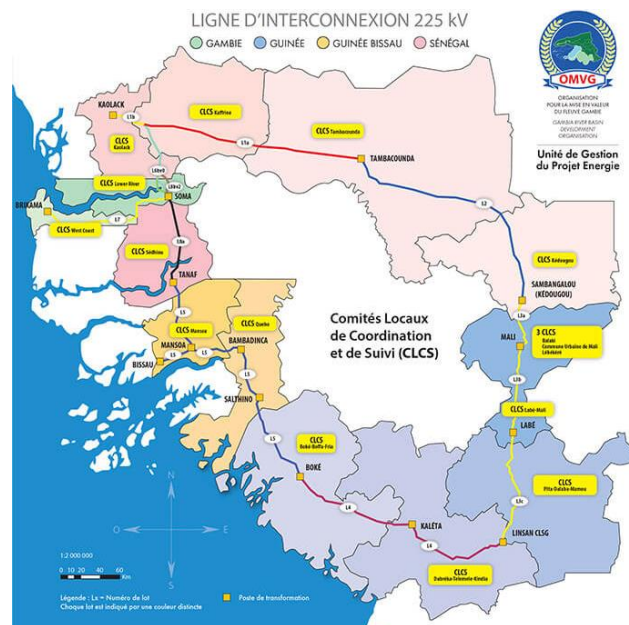


Figure 4-1 225 kV interconnection line

EXPECTED RESULTS

Availability of quality electricity to the entire OMVG region in reasonable quantities, with an average annual growth rate of 10%. Also requires the construction of medium voltage and low voltage distribution lines (thousands of kilometres)

AREA OF INTERVENTION

The entire OMVG area

PROPOSED MEASURES**Measure 1.2.1 - Construction of the electricity interconnection (1677 km long)**

Measure 1.2.1	Construction of a 225 kV HV transmission line (1677 km long), substations and two (02) dispatching centres (Linsan and Tambacouda).
Origin (institution / project / programme)	OMVG Energy Project
Objective	The main objective is to supply the four member countries from the energy produced by the Sambangalou plant in Senegal (Measure 1.1.1), the Kaléta plant in Guinea (commissioned in 2015), and other plants.
Location	The interconnection line crosses the 4 OMVG countries, through the following regions <ul style="list-style-type: none"> – <i>The Gambia</i>: Western, Lower River and North Shore Divisions. – <i>Guinea</i>: Lower Guinea and Middle Guinea regions. – <i>Guinea-Bissau</i>: Oio, Bafatá, Tombali and Bissau regions. – <i>Senegal</i>: Tambacounda, Kaolack and Kolda regions.
Description of the action	<ul style="list-style-type: none"> ▶ Construction of a 1,677 km long loop (183 km in Gambia, 575 km in Guinea, 218 km in Guinea Bissau and 701 km in Senegal) and a 225 kV transmission line interconnecting the four countries. ▶ Construction of fifteen (15) high and medium voltage transformer stations (2 in The Gambia, 5 in Guinea, 4 in Guinea Bissau and 4 in Senegal), for the injection of electricity into the national networks. ▶ Construction of two dispatching centres for the management of electricity flows.
Ownership and implementation arrangements	OMVG
Duration	5 years (<i>Note: Consultant's forecast</i>) In progress
Costs and funding	USD 904 million budget, of which operating USD 452 million Sources: OMVG (<i>Note: Consultant's estimation – USD 814 million remains to be invested</i>)
Risks envisaged	<ul style="list-style-type: none"> ▶ Possible delay in the construction of the interconnection line, transformer stations and dispatching centres. ▶ Delay in funding. ▶ Political changes that may interfere with the objectives to be achieved.
Expected results	<ul style="list-style-type: none"> ▶ Facilitate energy trade and improve the quality of electricity supply in OMVG member countries. ▶ Significantly reduce the consumption of fossil fuels and, consequently, greenhouse gas emissions. ▶ Provide renewable energy at a competitive price. ▶ Contribute to the socio-economic development of the organisation's member countries by improving people's access to energy. ▶ Contribute to the expansion of the electricity trading system. ▶ Develop a major infrastructure to supply the industrial sector of the Gambia River basin. ▶ Improvement of the living conditions of the beneficiary populations.

The construction of the electricity interconnection, which is already underway, and its commissioning is extremely important in the development of the energy sector of the four OMVG countries.

Measure 1.2.2 - Construction of a 500 km long 225 kV power line

The construction of a 500 km line, which is already underway, and its commissioning is extremely important in the development of the energy sector of the four OMVG countries.

Measure 1.2.2	Construction of a 225 kV power line approximately 500 km long to connect the Digan, Fello-Sounga, Kourawel and Saltinho hydroelectric power stations and the Soma (Gambia) and Tambacounda (Senegal) substations via the Bassé substation to be built.
Origin (institution / project / programme)	OMVG Energy Project
Objective	The main objective is to contribute to the power supply of the four member countries.
Location	Guinea and Guinea-Bissau
Description of the action	► Construction of a 500 km long power line.
Ownership and implementation arrangements	OMVG
Duration	2 years (<i>Note: Consultant's estimation</i>)
Costs and funding	USD 350 million (<i>Note: Consultant's estimation</i>)
Risks envisaged	<ul style="list-style-type: none"> ► Possible delay in construction of the 500 km line. ► Delay in funding. ► Political changes that may interfere with the objectives to be achieved.
Expected results	<ul style="list-style-type: none"> ► Facilitate energy trade and improve the quality of electricity supply in OMVG member countries. ► Significantly reduce the consumption of fossil fuels and, consequently, greenhouse gas emissions. ► Provide renewable energy at a competitive price. ► Contribute to the socio-economic development of the organisation's member countries by improving people's access to energy. ► Contribute to the expansion of the electricity trading system. ► Improvement of the living conditions of the beneficiary populations.

4.2.3 Provision 1 3- Ensure the distribution of energy to the population

GENERAL PRINCIPLE

In order to supply the energy to the urban centres, medium voltage lines will have to be installed, connecting the transformation nodes of the high voltage line to the urban centres. These lines will have voltages from 6 to 30 kV depending on the distances to be covered and the maximum power to be transmitted. An average of 15 kV will be considered, with a line cost per km of USD 15,000 per km. At the downstream end of each line there should be a small substation with circuit breakers and MV/LV transformers.

The final distribution to the final consumers of the energy will normally be done in low voltage - except for the possible industries receiving directly medium voltage - with single phase / three phase 230/400 V lines. The cost of the low voltage distribution network with overhead lines will be around USD 10,000 per km.

According to the available data, the length of the MV systems will be about seven times the length of the HV transmission lines, i.e. in this case about 15,400 km of medium voltage line.

Similarly, for low voltage lines, 2.5 times the length of the MV network is envisaged, i.e. 38,500 km in this case.

In the first phase (2025-2035), it is envisaged to serve about 40% of the population - 1 million urban inhabitants and 0.5 million rural inhabitants in the vicinity.

For the rural population not served by the main grid, two pilot projects are proposed, based on solar energy, supported by batteries.

- Collective systems in small villages with 100 inhabitants;
- Individual systems.

For household use in small villages, three types of consumers (four in urban areas) were planned. The consumption characteristics of each household type (eight persons) are shown in the following table.

Table 4-2 Expected consumption per household by type of consumption

Device	Annual consumption (kWh)	Consumption type 1		Consumption type 2		Consumption type 3		Consumption type 4	
		Qty	Consom	Qty	Consom	Qty	Consom	Qty	Consom
11 W LED lamp	24	6	144	8	192	10	240	10	240
Portable charger	8	2	15	3	22.5	4	30	4	30
Portable radio	40	1	40	1	40	1	40	1	40
32-inch LCD TV	100	1	100	1	100	1	100	1	100
Satellite box	100	1	100	1	100	1	100	1	100
Laptop computer	150					1	150	1	150
Well pump 40 m	100					1	100	1	100
Microwave oven	100					1	100	1	100
Single door fridge 250L	150			1	150				
2 door fridge freezer 350	200					1	200	1	200
Washing machine	520					1	520	1	520
Baking tray	1500							1	1500
Water heater	2500								
Air conditioning 9000 BTU	3500							1	3500
Total per household (kWh/year)		399		605		1580		6580	
Average per capita (kWh/year)		50		76		198		823	
Percentage in rural areas		30%		30%		10%			
Percentage in urban areas				30%		50%		10%	

In households with lower consumption, priority is given to lighting, with LED lamps, and communications (mobile phone charger, television, satellite box and radio). The average annual consumption of such a type 1 household will be around 400 kWh. The unit capacity of each system will be in the order of 200 W average power.

Type 2 households add to the electrical appliances available for type 1 a 250 L door fridge. The average consumption of such a household will be 600 kWh/year. The unit capacity of each system will be in the order of 300 W average power.

Type 1 and 2 households are regulated by Senegalese law, which limits subsidies to individual solar systems with an average output of less than 350 W.

Type 3 households add to the electrical appliances available for type 2 a 350 L two-door fridge, a microwave, an electric well pump and a washing machine and/or an iron. The average consumption of such a household will be 1,580 kWh/year. The unit capacity of each system will be in the order of 800 W average power.

Finally, type 4 households add an electric cooker and an air conditioner to the electrical appliances available for type 3. The average consumption of such a household will be 6580 kWh/year, with an average power of 3,200 W.

In a rural area, with a population of 100 inhabitants (eight households), 4 type 1 households, 3 type 2 households and one type 3 household are considered, for a total of 5,000 kWh/year, with a daily peak of 20 kW.

In the OMVG area, the average annual solar radiation is shown in the following figure.

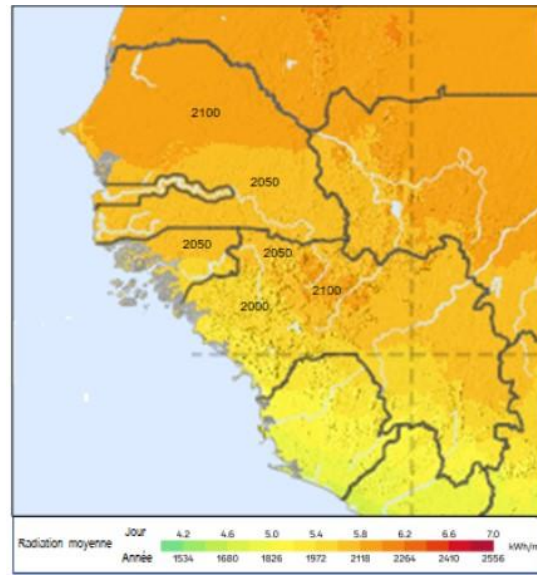


Figure 4-2 Solar irradiation in the OMVG area

It can be verified that the average irradiation is around 2050 kWh/m².year with an annual variability indicated in the following figure:

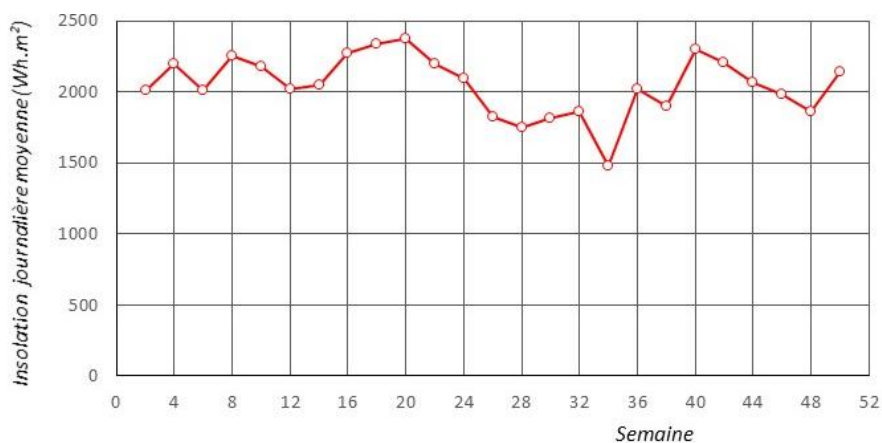


Figure 4-3 OMVG area - average daily irradiation

A relatively constant average irradiation is observed, with a minimum during the rainy period, which is cloudier. The minimum daily irradiation is 1,500 Wh/m². If we exclude this value, we can consider the following minimum value, of the order of 1,750 Wh/m².

For an autonomous solar system, if we consider an average panel efficiency of 18% (normal value), it will be possible to provide 315 Wh/m² on the worst days. A battery system with at least the daily production capacity should be available to allow the use of energy during the night, a charge control and an inverter to produce alternating current from the energy stored in the battery. If we consider an efficiency of 95% for the electronic components, we can consider a net daily production value of 300 Wh per m² of panel.

In these conditions, for each type of family or village, the following values will be needed:

Table 4-3 Characteristics of solar systems to be applied in the OMVG area

Consumer type	Daily consumption (kWh)	Panel area (m ²)	No. of panels (-)	Battery capacity (kWh)	Batteries	Installation cost (USD)
Type1	400	3,6	2	1,3	1 x 24V x 60Ah	1450
Type 2	600	5,5	3	2,0	2 x 24V x 60Ah	2150
Type 3	1580	14,4	7	5,2	4 x 24V x 60Ah	5600
Village 100	5000	45,7	22	50,2	22 x 24V x 100 Ah	17800
Village 200	10000	91,3	44	100,5	44 x 24V x 100 Ah	35600

EXPECTED RESULTS

Distribute the energy transmitted through the High Voltage Interconnection System by the population of the OMVG region

AREA OF INTERVENTION

The entire OMVG area

PROPOSED MEASURES

Measure 1.3.1 - Connection to the interconnected network of localities with more than 1000 inhabitants

Measure 1.3.1	Connection to the interconnected network of localities with more than 1000 inhabitants.
Origin (institution / project / programme)	OMVG
Objective	Supplying urban areas - 1 ^{ère} phase
Location	The entire OMVG region
Description of the action	Creation of the MV network - 1 ^{ère} phase - 6 000 km Creation of the distribution network - 15,000 km
Ownership and implementation arrangements	MV Network - OMVG - Electricity companies LV network - Municipalities - Electricity companies
Duration	2025 - 2040
Costs and funding	MV Network - USD 120 million LV network - 150 MUSD
Risks envisaged	Risk of increased construction and equipment costs
Expected results	Coverage of the entire urban population of the region and part of the rural population - about 1.5 million people

Measure 1.3.2 - Creation of micro grids with solar source for small agricultural villages – 50 kWh/inhabitant/year

Measure 1.3.2	Creation of micro-grids with solar source for small rural villages - 50 kWh/inhabitant/year.
Origin (institution / project / programme)	OMVG
Objective	Providing solar electricity to small rural villages
Location	OMVG Space
Description of the action	Pilot programme - covering 5% of the rural population 175,000 people in the 4 countries
Ownership and implementation arrangements	Local authorities - Electricity companies
Duration	2025-2030
Costs and funding	35 MUSD
Risks envisaged	Indiscipline of the population, with excessive use of the energy produced
Expected results	Verification of the adherence of the populations

Measure 1.3.3 - Financing for the selection and installation of small individual solar systems - 400-600 kWh/household/year. Creation of small businesses for installation and maintenance.

Measure 1.3.3	Financing for the selection and installation of small individual solar systems - 400-600 kWh/household/year. Creation of small businesses for installation and maintenance.
Origin (institution / project / programme)	OMVG
Objective	Providing solar electricity to small rural villages
Location	OMVG Space
Description of the action	Pilot programme - covering 5% of households in the rural area, 20,000 households, 180,000 people in the 4 countries
Ownership and implementation arrangements	Local authorities - Electricity companies
Duration	2025-2030
Costs and funding	USD 50 MILLION
Risks envisaged	Maintenance of systems by users (cleaning of panels, etc.)
Expected results	Verification of the adherence of the populations

4.2.4 Provision 1.4 - Promotion of energy efficiency

GENERAL PRINCIPLE

The amount of electricity available per person will always be limited, especially in the initial stages of energy production. For this reason, it will be essential that all consumption is monitored by meters, and consumption can be pre- or post-paid. Pre-payment (as with mobile phones) allows intervention before problems occur and seems preferable.

Depending on the characteristics of the generating system, its capacity and the number of consumers served, it will be possible to limit the maximum consumption of each user to a greater or lesser extent, either by means of the cost of the energy supplied or by limiting consumption (instantaneous or monthly maximum) according to the energy purchased. From the limits defined for each case, consumption will be cut off or limited, with prior notification sent by SMS.

The issue in the quest to increase electricity efficiency will therefore not be to reduce total energy consumption (which will depend on the tariff and pricing scheme chosen) but to increase the benefit that users can get from the energy they pay for.

This will require the promotion of efficient energy use, including the use of energy-saving devices, mainly in the areas of lighting (LED lamps), communication (modern TV sets and satellite decoders) and refrigeration and air conditioning (efficient fridges and well-sized air conditioners in insulated rooms). Also energy-saving habits (switching off the light when leaving a room, disconnecting electronic devices on standby, unplugging unused chargers, always closing the fridge door properly).

In the case of individual solar systems, notions about maintenance (cleaning of panels, maintenance of batteries) will increase the availability of the energy produced by each system.

Technical losses on distribution networks can be caused either by voltage drops on overloaded transmission and distribution lines or by illegal connections. In both cases these are energy losses that will be overloads on paying consumers.

In principle, in areas to be served from scratch, new lines will be sized to take into account the expected development of consumption in the future and this issue will not arise. However, in areas already served, it is likely that the increase in consumption will require reinforcement of the existing network.

With regard to illegal connections, strict vigilance of the network will be required to avoid any illegal connections or bypasses around the meter. When a situation is reported, immediate intervention should follow, to avoid it becoming a habit.

EXPECTED RESULTS

Increase in the usefulness of the electrical energy consumed by the new users. Decrease in the use of alternative energy.

AREA OF INTERVENTION

The entire OMVG region

PROPOSED MEASURES

Measure 1.4.1 - Launch awareness-raising campaigns on energy management and saving and promote the use of low-energy equipment among users

Measure 1.4.1	Launch awareness campaigns on energy management and saving and promote the use of low consumption equipment among users (lamps, refrigerators, etc.).
Origin (institution / project / programme)	OMVG. Electricity distributors
Objective	Increase the efficiency of energy use.
Location	The entire OMVG region
Description of the action	Training of new and existing users on forms of electricity conservation
Ownership and implementation arrangements	Responsibility of energy distributors. Face-to-face actions when each user's system is first installed, explaining what needs to be done to "make electricity last longer". Trained agents will follow the installers to explain the practical details. Complemented with radio and TV advertising.
Duration	2025-2035
Costs and funding	USD 10 million for the whole region (400,000 consumers), or USD 25 per consumer. Financed by revenues from the sale of electricity.
Risks envisaged	No
Expected results	Better use of the new form of energy

Measure 1.4.2 - Promote energy efficiency through the implementation of technologies to combat technical losses in the distribution network

Measure 1.4.2	Promote energy efficiency through the implementation of technologies to combat technical losses in the distribution network.
Origin (institution / project / programme)	OMVG. Energy suppliers
Objective	Reducing energy losses in networks
Location	The entire OMVG region
Description of the action	Analysis of existing networks. Modernisation and reinforcement where necessary.
Ownership and implementation arrangements	Energy distributors. Initiating upgrades and reinforcements to existing networks where necessary. Monitoring all networks to avoid illegal diversion of energy.
Duration	2025-2035
Costs and funding	OMVG and distributors for modernisation. Distributors and local authorities to control illegal use. Total expected - USD 80 million for the whole period
Risks envisaged	People's resistance: "If electricity is invisible, you can't steal it (it's like air)"
Expected results	To avoid uncontrolled situations as sometimes seen in peri-urban areas.

4.3 STRATEGIC AXIS 2 - THERMAL ENERGY - FACILITATING ACCESS TO CLEAN SOURCES OF THERMAL ENERGY, REDUCING THE IMPACT ON THE ENVIRONMENT

4.3.1 Provision 2.1 - Facilitate access to biofuels (wood and charcoal) for the entire population (mainly rural)

GENERAL PRINCIPLE

Throughout the OMVG region, the main source of energy is biological - firewood, agricultural waste, charcoal. Wood is collected, often by women and children, in the forests of the region. Often the wood collected is not well dried, which leads to a decrease in calorific value and an increase in smoke production. The collection is normally done in an uncontrolled way and, although looking for branches and remains of dead trees as much as possible, the collection of wood leads to an excessive pressure that exceeds the natural regeneration capacity of the forests. The ecological impact of this practice is obvious and the retreat of the forest implies ever longer collection times. This situation will tend to become more serious in the future as the population increases.

There are small enterprises licensed to collect wood, but they normally prefer to transform the wood into charcoal, which is preferred for use in urban areas because of the lower smoke production. The methods used for charcoal production are normally primitive and require the use of 6-10 kg of wood to obtain a single kilo of charcoal.

Finally, the use of wood and charcoal by households is done in a very inefficient way, which leads on the one hand to excessive consumption of wood and charcoal and on the other hand to excessive production of smoke which is, in the long run, harmful to the health of the family, mainly that of women and children.

For the above reasons, and taking into account that it is the most important source of energy in the region, there is a clear interest in preparing for a change in the operation of the system, which will involve reducing the pressure on natural forests, facilitating the production of good quality dry wood, reducing the time spent by families searching for wood, reducing the need for wood by increasing the efficiency of its use and reducing losses for charcoal production

To this end, it is proposed to undertake the following actions:

- Development of patches of degraded land with no other use for the establishment of fast-growing tree species
- Planting, maintenance and controlled cutting of trees, drying of wood and replanting of cut areas
- Distribution of dry wood to the population at affordable prices
- Construction and distribution of improved stoves to reduce the need for wood and smoke production
- Reduce charcoal production by using wood directly whenever possible - the calorific value of charcoal is twice that of wood but requires, even in good conditions, 3 to 4 times its weight in wood. In urban areas increase the availability of LPG in cylinders

For the production of artificial forests, the use of eucalyptus varieties well adapted to the climate of the region is proposed. Experiments in Brazil, under climatic conditions similar to those in the OMVG area, indicate production capacities of around 10 to 20 tonnes of dry wood per hectare per year, depending mainly on the available rainfall. In sub-humid areas (annual rainfall around 800 mm) production is lower, around 10 tonnes/ha.year, but can rise to, or even exceed, 20 tonnes/ha.year for rainfall values above 1200 mm/year.

Eucalyptus does not require well developed soils. Planting requires preliminary mechanical preparation with fertiliser. Following planting (usual compass 2x3 m²), weeding and ant control is required at the end of the first year. For firewood the first cut is normally made after 6 years.



Figure 4-4 Eucalyptus plantation in Angola, along the Benguela railway line. The trees in the photo will be over 50 years old

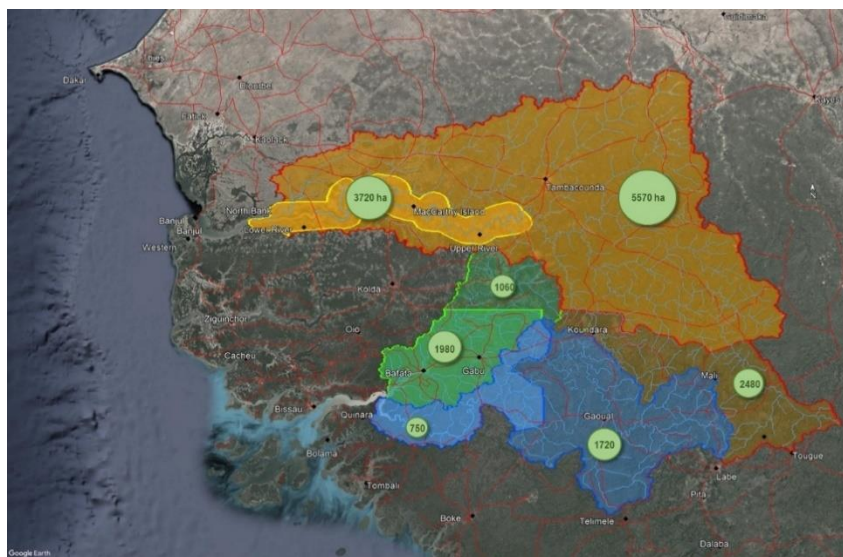


Figure 4-5 Areas of fast-growing timber plantations by region

In terms of costs, the initial costs of 700 USD/ha (land acquisition, vegetation cutting and deep soil ripping) can be considered. For planting and cutting (six year cycle) a value of 2,000 USD/ha can be considered (including plants, planting, fertiliser, acidity correction and final cutting).

The cut wood will be taken to drying sites to reach a moisture content of less than 15%, and the chunks will then be cut into small pieces suitable for domestic use, bagged and transported to the points of sale.

In terms of required plantation areas, these are shown in the following table, considering an average production of 15 tonnes of wood/ha.year (6-year cutting cycle).

A production corresponding to 25% of the current consumption has been considered. Indeed, with the best conditions of preparation and drying of wood and the use of improved kilns, it is imagined that this production will replace half of the current consumption.

Table 4-4 Area required for planting fast-growing species for fuelwood

Country/ basin	Population 2025			Annual consumption (1000 t)			Area for 25% production (ha)
	Urban	Rural	Total	Wood	Coal	Equiv. wood	
Gambia	215 265	597 969	813 233	221	1	223	3 724
Guinea							
Gambia	43 254	447 843	491 097	90	6	103	1 714
Kayanga-Geba	860	4 083	4 943	1	0	1	17
Koliba-Corubal	63 605	647 392	710 997	130	9	149	2 481
Totals	107 718	1 099 319	1 207 037	221	16	253	4 212
Guinea Bissau							
Kayanga-Geba	121 171	300 599	421 771	115	2	119	1 980
Koliba-Corubal	49 140	110 102	159 242	43	1	45	748
Totals	170 312	410 701	581 013	158	3	164	2 728
Senegal							
Gambia	487 243	1 151 729	1 638 972	263	36	334	5 573
Kayanga-Geba	98 602	216 072	314 673	50	7	64	1 064
Totals	585 844	1 367 800	1 953 645	313	43	398	6 637
Totals	1 079 139	3 475 789	4 554 928	913	63	1 038	17 300

A total of 17,300 ha in the OMVG area will therefore need to be managed, which corresponds to less than 0.2% of the total forest area of the region. For this reason, although the environmental value of the eucalyptus plots is low, the reduction of pressure on a much larger area of natural forest will have clear environmental benefits.

To improve the results in terms of consumption and reduction of smoke in the houses, it will be useful to be able to provide low-cost, locally built improved stoves. An Indian Chulha type stove, made of cement blocks covered with clay, can be made locally at a cost of US\$15. A stove of this type can reduce wood consumption by more than 50% and reduce smoke production by 90%.



Figure 4-6 Improved fireplace with chimney of the Chulha type, locally made

As mentioned above, charcoal production is not very energy efficient, once, even with modern techniques, 50% of the energy of the wood will be lost in its transformation into charcoal (degassing of the wood). However, in urban areas (flats, etc.) there is a strong preference for the use of charcoal, because of the lower weight and less smoke production.

Under these conditions it will be preferable to promote the installation of charcoal production devices that use the gases released during the carbonisation of wood to provide energy for the process, with a notable increase in efficiency (from 3.5 to 4 kg of wood per kg of charcoal).

The following figure shows a Cornell type stove with a separate burner. Initially the starting heat for the process is provided by an external fuel (normally oil). The hot gas is forced through the wood, heating it and releasing combustible gases, which are then burnt in the burner. When the temperature reaches a suitable value, the fuel injection can be switched off and the system operates automatically until the wood is completely degassed, after which carbonisation is complete.

In addition to wood, the system can also use agricultural wastes such as sawdust, and the empty shells that result from the industrial processing of cashew and groundnut.

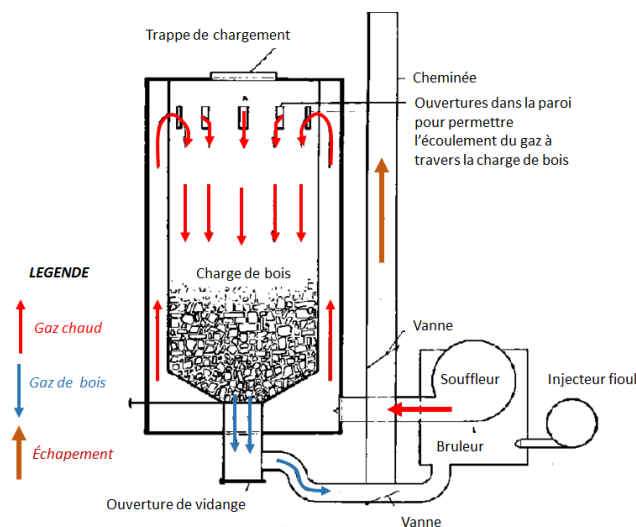


Figure 4-7 Schematic of a Cornell furnace

EXPECTED RESULTS

Improved living conditions for the population. Decrease in the time needed to find fuel. Reduction of human pressure on the environment.

AREA OF INTERVENTION

The entire OMVG area

PROPOSED MEASURES

Acquisition and preparation of 17,300 ha of degraded land with poor conditions for other uses, located along the entire OMVG area. Plot sizes between 20 and 100 ha are envisaged.

Measure 2.1.1 - Creation of plots for the planting of fast-growing plant species for the renewable production of fuelwood - including planting, maintenance, cutting and replanting

Measure 2.1.1	Creation of plots for the planting of fast-growing plant species for the renewable production of fuelwood - including planting, maintenance, cutting and replanting
Origin (institution / project / programme)	OMVG / Ministry of Agriculture
Objective	Fuelwood production
Location	The entire OMVG territory
Description of the action	Acquisition and preparation of land. Planting and cutting of fast growing tree species. Variant to be defined in experimental plots.
Ownership and implementation arrangements	Ministries of Agriculture
Duration	2022-2040
Costs and funding	Initial cost: USD 13.5 million, subsequent annual cost: USD 6.5 million/year
Risks envisaged	Forest fires. Opposition from companies currently harvesting firewood
Expected results	Availability of 260,000 tonnes of wood per year

Measure 2.1.2 - Establishment of companies in charge of drying, thin cutting and distribution of wood

Measure 2.1.2	Establishment of companies for wood transport, drying, secondary cutting, drying, bagging and transport to sales sites.
Origin (institution / project / programme)	Ministries of Industry
Objective	Production of dry and cut firewood
Location	The entire OMVG territory
Description of the action	Transport, drying, cutting of wood, packaging and distribution of wood produced in the plantations.
Ownership and implementation arrangements	Ministry of Industry
Duration	Permanent from 2028
Costs and funding	Self-supporting
Risks envisaged	Opposition from companies currently harvesting fuelwood
Expected results	Production of 200,000 tonnes of dry cut wood per year

Measure 2.1.3 - Establishment of enterprises for processing wood into charcoal using modern technology (less than 3.5 kg of dry wood per kg of charcoal)

Measure 2.1.3	Establishment of enterprises for processing wood into charcoal using modern technology (less than 3.5 kg of dry wood per kg of charcoal)
Origin (institution / project / programme)	Ministry of Industry
Objective	Production of charcoal and briquettes from wood and forest waste.
Location	The entire OMVG territory
Description of the action	Call for tenders for the creation of local companies for the carbonisation of wood (60,000 tonnes/year) and forestry waste. Each company will be sized for a production of around 2000 tons per year (20 companies in total)
Ownership and implementation arrangements	Ministry of Industry
Duration	Permanent from 2028.
Costs and funding	Initial investment 5 MUSD Self-supporting

Measure 2.1.3	Establishment of enterprises for processing wood into charcoal using modern technology (less than 3.5 kg of dry wood per kg of charcoal)
Risks envisaged	Opposition from current coal mining companies
Expected results	Availability of 40,000 tonnes of briquettes and coal per year

Measure 2.1.4 - Creation of a distribution system for firewood and charcoal

Measure 2.1.4	Creation of a distribution system for dry wood and charcoal
Origin (institution / project / programme)	Ministry of the Economy
Objective	Distribution of dry wood and charcoal to the population
Location	The entire OMVG area
Description of the action	Establishment of dry wood and charcoal distribution centres
Ownership and implementation arrangements	Ministry of Trade
Duration	Permanent, from 2028
Costs and funding	Self-supporting
Risks envisaged	Opposition from existing businesses
Expected results	Facilitate people's access to firewood and charcoal

Measure 2.1.5 - Production and distribution of improved stoves for the use of firewood or charcoal

Measure 2.1.5	Distribution of improved stoves for charcoal use (steel stoves with standard design created by local companies)
Origin (institution / project / programme)	Ministry of Industry (to be confirmed)
Objective	Construction and supply of locally produced improved cookstoves
Location	The entire OMVG area
Description of the action	Training of fireplace manufacturers (civil engineering). Preparation of construction plans. Publicity and education of the population.
Ownership and implementation arrangements	Ministry of Industry (to be confirmed)
Duration	2025-2030. After self-sustainable
Costs and funding	USD 2 million for training. USD 2 million for cost sharing
Risks envisaged	Cultural resistance to the use of improved cookstoves
Expected results	Acceptance of the use of fireplaces by 50% of households

4.3.2 Provision 2.2 - Promote access to LPG and biogas in urban and suburban centres

GENERAL PRINCIPLE

The use of LPG will be particularly attractive in urban areas, in multi-storey buildings, where the use of traditional fuels can be harmful, mainly in terms of smoke production. Household appliances are also much easier to use.

It will also be possible, in some peri-urban areas with enclosed animal husbandry, to have a significant amount of animal waste, which can be used for methane gas production in simple digesters. After washing, the gas will be stored in flexible gasometers for later distribution to local consumers using small networks.

For domestic water heating, it will also be possible to install solar panels for water heating, although the installation and maintenance of these panels is rather difficult, given their high weight and the need for complex piping.

EXPECTED RESULTS

Increased penetration of LPG in urban areas, up to 50% of total households. Alternative use of biogas and solar water heating.

AREA OF INTERVENTION

Urban and peri-urban areas throughout the OMVG area.

PROPOSED MEASURES**Measure 2.2.1 - Creation of an industrial chain including the supply, filling, distribution and collection of LPG cylinders**

Measure 2.2.1	Creation of an industrial chain including the supply, filling, distribution and collection of LPG cylinders
Origin (institution / project / programme)	Ministry of Industry
Objective	Increasing the use of LPG in urban areas
Location	OMVG urban areas
Description of the action	Establishment of companies with LPG cylinder filling centres. Distribution centres and collection of cylinders in urban areas.
Ownership and implementation arrangements	Oil companies
Duration	2025-2035
Costs and funding	-
Risks envisaged	-
Expected results	Significant increase in LPG consumption in urban areas

Measure 2.2.2 - Support for the purchase of LPG equipment (ovens and water heaters)

Measure 2.2.2	Support for the purchase of LPG equipment (ovens and water heaters)
Origin (institution / project / programme)	Ministry of Industry
Objective	Facilitating access to LPG use
Location	OMVG urban areas
Description of the action	Financing of buyers of LPG equipment
Ownership and implementation arrangements	Financing of vendors of basic LPG appliances. Total of 50,000 appliances
Duration	2025-2035
Costs and funding	2 MUSD
Risks envisaged	-
Expected results	Significant increase in LPG consumption in urban areas

Measure 2.2.3 - Promotion, production and distribution of biogas

Measure 2.2.3	Promotion, production and distribution of biogas
Origin (institution / project / programme)	Ministries of Energy and Agriculture
Objective	Production and availability of biogas using animal waste.
Location	Areas with high concentrations of livestock created in closed enclosures
Description of the action	Partial financing of digesters and gasometers and simple gas distribution networks

Measure 2.2.3	Promotion, production and distribution of biogas
Ownership and implementation arrangements	Breeders' associations, with support from Ministries of Agriculture
Duration	2025-2035
Costs and funding	A total of 100 systems with an average cost of USD 10,000, i.e. USD 10 million
Risks envisaged	Difficulty in terms of revenue. Fixed price per connection or meters?
Expected results	Installation of a total of 10 systems per year throughout the OMVG area

Measure 2.2.4 - Promote the construction and use by households of solar thermal units (water heaters without solar panels)

Measure 2.2.4	Promote the construction and use by households of solar thermal units (water heaters without solar panels).
Origin (institution / project / programme)	Ministries of Energy
Objective	Providing water heating systems to households that cannot afford LPG
Location	Rural areas of the OMVG region
Description of the action	Partial funding and technical assistance to households with water and access to LPG
Ownership and implementation arrangements	Ministries of Energy for technical assistance and partial financing
Duration	2025-2035
Costs and funding	Installation of a total of 10,000 individual systems throughout the region, with an investment cost of USD 1,000 per system, for a total of USD 10 million
Risks envisaged	Technical difficulties. Need to have a domestic drinking water system.
Expected results	Installation of 10,000 individual systems. Saving of 1000 tons of LPG per year

4.4 STRATEGIC AXIS 3 - EXPLOITING MINING, AGRO-INDUSTRIAL AND HANDICRAFT POTENTIAL

4.4.1 Provision 3.1 - Develop geological and mining infrastructures

GENERAL PRINCIPLE

The development of the mining potential of the basins of the OMVG area requires the existence of quality geological and mining infrastructures, in particular a robust Geological and Mining Information System (GMIS), the coverage of the studied territories in detailed geological maps (including the mapping of artisanal and clandestine mines).

Furthermore, the optimal manual and computerised management of spatial and administrative information on mining titles (permits, quarries, mining concessions, etc.) depends on the establishment of a mining cadastre system, the importance of which lies in the fact that it is an essential element in the promotion of the mining sector, while at the same time contributing, along with the Mining Code, to ensuring the transparency and security of mining investments. The mining cadastre is a computerised system to support decision-making for the granting and monitoring of mining titles.

EXPECTED RESULTS

Geological and mining infrastructure development is expected to make geological and mining information available and easily accessible to the public, including university researchers and students, investors and all public and private mining stakeholders.

The current situation in the Member States is characterised by incomplete and not easily accessible geological and mining information, incomplete cartographic coverage of the territories and at coarse scales (1/500,000th, 1/200,000th) which do not allow a good knowledge of the geology and the mineral raw material potential of the countries.

AREA OF INTERVENTION

The intervention area covers all the basins in the OMVG area.

PROPOSED MEASURES

Three (3) measures are proposed:

- (i) The establishment of a programme of geological maps at a scale of 1:50,000;
- (ii) The establishment of a Geological and Mining Information System (GMIS);
- (iii) The establishment of a Mining Cadastre System.

Measure 3.1.1 - Carry out a 1/50,000 scale mapping programme

This measure is proposed by the Consultant. Its relevance lies in the importance of the geological map as an infrastructure dedicated to the promotion of the mining sector, a tool whose implementation allows the discovery of mining anomalies and showings and thus a better knowledge of the mining potential of countries. Finally, the geological map is indispensable for the design and implementation of subsequent geological and mining exploration programmes.

Measure 3.1.1	Production of 1:50,000 geological maps of the 3 basins of the OMVG area
Origin (institution / project / programme)	Consultant's proposal
Objective	The 1:50,000 geological map is one of the three components of the geological infrastructure to be put in place to ensure better knowledge of resources and the implementation of the strategic axis "exploiting mining, agro-industrial and handicrafts potential".
Location	All basins in the OMVG area
Description of the action	<ul style="list-style-type: none"> - Take stock of the old geological maps made - Set up an optical and radar satellite database of the territories to be mapped, in support of fieldwork (drawing up of reconnaissance maps) - Carry out fieldwork (geotraverses, outcrop visits, lithological mapping, structural mapping, sampling, sub-surface work) - Feedback from the fieldwork - Petrographic and geochemical analyses
Ownership and implementation arrangements	Ministries in charge of Mining and Geology in member countries, in collaboration with universities and external partners.
Duration	4 and a half years
Costs and funding	Costs: USD 13,600,000 (3,400,000 x 4) Financing: IDA, EU, AfDB, state budgets
Risks envisaged	Unavailability of funding
Expected results	The territories of the OMVG basins are entirely mapped at a scale of 1:50,000

Measure 3.1.2 - Establish a Geological and Mining Information System (GMIS)

This measure is proposed by the Consultant. The Geological and Mining Information System is a modern tool that is now indispensable for the integrated management of geological and mining data. It allows to store, process, manage and disseminate a set of geological, geophysical, geochemical and other thematic data in order to cross-reference them for the production of maps and decision support

documents. It is also a tool for archiving the electronic document base so that it can replace physical documents.

Measure 3.1.2	Establish a Geological and Mining Information System (GMIS)
Origin (institution / project / programme)	Consultant's proposal
Objective	Instrument for storage, dissemination, cross-referencing, integrated spatial analysis of geological, geophysical, geochemical and other thematic data layers for the production of maps and decision support documents
Location	The GMISs will be domiciled in the Mining and Geological Services of the member countries
Description of the action	The implementation of the GISMs will be entrusted to Consultants (qualified consultancy firms) through public procurement. The activities to be carried out to this end will be detailed in the ToR of the study. As an indication, they will include (i) analysis of the context and specification of functional requirements; (ii) design of the GMIS; (iii) delivery, installation, parameterisation and configuration of the software architecture; (iv) digitisation, formatting and possible migration of spatial, attribute and documentary data; (v) development, testing and validation of the GMIS solution; (vi) user training and technical assistance.
Ownership and implementation arrangements	State services in charge of Mines and Geology. Public contract
Duration	12 months (for the 4 GMIS, 1 GMIS/country)
Costs and funding	Costs: USD 340,000 (85,000 x 4) Financing: IDA, EU, AfDB, state budgets
Risks envisaged	Unavailability of funding
Expected results	The GMISs are set up in the Ministries in charge of the mining sector.

Measure 3.1.3 - Establish a Mining Cadastre System

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This measure is proposed by the Consultant. The Mining Registry System is a modern and robust tool for the transparent management of mining titles (authorisations, permits and concessions). Through the Mining Cadastre portal, the system provides free access to all information related to mining titles. It also provides a detailed inventory of the areas allocated to mining activities, gives investors security and allows the State to better supervise the use of resources.

Measure 3.1.3	Establish a Mining Cadastre System
Origin (institution / project / programme)	Consultant's proposal
Objective	Providing The Gambia and Guinea Bissau with a robust mining title management tool
Location	Ministries in charge of Mines and Geology in The Gambia and Guinea Bissau (Guinea and Senegal already have Mining Cadastre Systems)
Description of the action	The implementation of the Mining Cadastre Systems will concern The Gambia and Guinea Bissau (Guinea and Senegal already have them). It will be entrusted to Consultants (qualified consultancy firms) in the framework of public contracts. It will involve setting up web platforms dedicated to (i) the management of information on holders and applicants; (ii) the management of information on requested, valid or cancelled titles; (iii) the spatial management of titles, control of encroachments; (iv) the management of the temporality of titles (renewal, expiry) and (v) the management of the historicity of a mining title (recording of the various acts that modify a title).

Measure 3.1.3	Establish a Mining Cadastre System
Ownership and implementation arrangements	Ministries in charge of Mines and Geology Public contracts awarded to consultants (qualified consultancy firms)
Duration	6 months (for the 2 Mining Registry Systems of The Gambia and Guinea Bissau)
Costs and funding	Costs: USD 175,000 (85,000 x 2) Financing: IDA, EU, Canadian Cooperation, State budgets
Risks envisaged	Unavailability of funding
Expected results	The Gambia and Guinea Bissau have a Mining Cadastre System.

4.4.2 Provision 3.2 - Explore subsoil resources

GENERAL PRINCIPLE

The mineral resources of the subsoil are not sufficiently known due to a lack of substantial investment and sustained commitment by the States in national programmes of detailed geological mapping, covering as a priority the most promising territories. Tactical and strategic mineral prospecting campaigns, airborne and ground geochemical and geophysical surveys are left to the initiative of foreign mining companies.

EXPECTED RESULTS

The measures proposed in this provision, namely the regional airborne geophysical coverage, the stream-sediment geochemical survey will lay the foundation for a systematic exploration of the entire OMVG area.

AREA OF INTERVENTION

The territories of the OMVG area.

PROPOSED MEASURES

Two measures are proposed in this provision: (i) the realisation of a regional airborne geophysical coverage; (ii) the realisation of a regional stream-sediment geochemical campaign. These activities provide useful information for subsequent exploration missions.

Measure 3.2.1 – Support the OMVG States in the implementation of airborne geophysical mapping programmes

Airborne geophysical coverage is a component of the geological infrastructure. It provides information about the subsoil and groundwater bodies.

Measure 3.2.1	Supporting states in the implementation of airborne geophysical mapping programmes
Origin (institution / project / programme)	Consultant's proposal
Objective	Provide the territories of the OMVG basins with geophysical data as an essential complement to the geological infrastructure
Location	OMVG basins
Description of the action	An airborne geophysical campaign will be carried out in all the basins of the OMVG area in order to acquire information on the subsoil and groundwater bodies.

Measure 3.2.1	Supporting states in the implementation of airborne geophysical mapping programmes
	<p>The campaign will make it possible to obtain high-definition, high-contrast images to determine the nature of the rocks at depths of up to 200 metres. Two methods will be used: magnetism, which is a function of the content of magnetic minerals (iron oxides, for example) present in the rocks, and electromagnetism, which differentiates geological entities according to their ability to propagate electromagnetic waves.</p> <p>The interpretation of geophysical data (magnetism, electromagnetism, radiometry) coupled with geological knowledge will make it possible to specify the subsoil resources (groundwater, materials, geothermal energy). It will also make it possible to extract subsoil parameters useful for development.</p>
Ownership and implementation arrangements	Ministries in charge of Mines and Geology Public contracts awarded to consultants (qualified consultancy firms)
Duration	6 months
Costs and funding	Cost: USD 1,500,000 Financing: IDA, EU, State budgets
Risks envisaged	Unavailability of funding
Expected results	The entire basin has airborne geophysical coverage

Measure 3.2.2 – Support the OMVG States in the implementation of regional stream-sediment geochemical survey programmes

The regional geochemical survey allows the delineation of favourable areas to target for further exploration.

Measure 3.2.2	Supporting states in the implementation of regional stream-sediment geochemical survey programmes
Origin (institution / project / programme)	Consultant's proposal
Objective	Carry out a regional stream-sediment geochemical survey of all the basins of the OMVG area in order to identify areas of favourable mineralization to target for future exploration programs.
Location	Three (3) OMVG basins
Description of the action	<p>The geochemical survey consists of taking samples (about 1 sample/10 km²) of fine sediments (mud) from the bed of the streams in the study area. The interest of these sediments, resulting from runoff from the surrounding hills, is that they may contain abnormally high levels of certain metals, revealing geological concentrations and therefore possible deposits.</p> <p>The samples collected will be dried, de-crushed, sieved and then analysed by ICP-MS for gold and 48 other elements (including all common metals).</p> <p>The analysis of the results will make it possible to characterise the major litho-geochemical complexes in the basins studied, but also to define and identify potential areas of mineralisation.</p>
Ownership and implementation arrangements	Ministries in charge of Mines and Geology Public contracts awarded to consultants (qualified consultancy firms)
Duration	18 months
Costs and funding	Costs: USD 1,000,000 Financing: IDA, EU, State budgets
Risks envisaged	Unavailability of funding
Expected results	Various types of maps (litho-geochemical maps, geochemical anomaly maps, gold, antimony, nickel, lithium grade distribution maps, etc.) are produced and can be used in subsequent detailed exploration programmes to identify economic deposits.

4.4.3 Provision 3.3 - Mining and processing products across the value chain

GENERAL PRINCIPLE

The mining sector is seen as a source of supply of raw mineral materials to global industry, exported without added value and therefore with very little impact on the economy. There is a need for a paradigm shift by processing minerals locally, which offers the opportunity to lay the foundations for heavy industrialisation.

EXPECTED RESULTS

It is expected that this provision will lead to further development of the mining sector with processing of mining products throughout the value chain. This will generate more jobs, technological investments, infrastructure development or activities for suppliers.

AREA OF INTERVENTION

Guinea Bissau, Senegal

PROPOSED MEASURES

Three measures are proposed: (i) the completion of *the detailed engineering for the Farim phosphate mining project (Guinea Bissau)*; (ii) the completion of the feasibility study for the Kolda phosphate mining project (Senegal); and (iii) the completion of the feasibility study for the Boé bauxite mining project (Guinea Bissau)

Measure 3.3.1 - Finalise the construction phase of the Koumbia bauxite mine (Guinea)

Alliance Mining Commodities (AMC) has a bauxite mining concession in Gaoual in the Boké region (Gambia River basin). This is the Koumbia bauxite mine located approximately 220 km north of Conakry and 130 km northeast of the port of Kamsar.

The mine is expected to operate for 50 years. The construction phase of the mine's infrastructure is underway, with the company's ambition to open a 112km mining road and build a port at Bogoroya on the Rio Nunez. To cover the water needs of the mining production, the company will use groundwater through boreholes, 11 of which are currently being developed.

Measure 3.3.1	Finalising the construction phase of the infrastructure of the Koumbia bauxite mine (Guinea)
Origin (institution / project / programme)	Alliance Mining Commodities (AMC) mining company project, holder of the mining concession
Objective	Preparing the conditions for the launch of the Koumbia bauxite mine
Location	220 km north of Conakry and 130 km northeast of the port of Kamsar
Description of the action	Complete the financing of the project. Complete the construction of the mine, the opening of the 112 km mining road and the construction of the port at Bogoroya on the Rio Nunez.
Ownership and implementation arrangements	Mining company Alliance Mining Commodities (AMC) and technical partners
Duration	3 years (2022-2025)
Costs and funding	Cost: US\$10,000,000 (indicative cost to complete project financing) Financing: GB Minerals State of Guinea Bissau
Risks envisaged	No
Expected results	The construction phase of the mine infrastructure is completed and production can start

Measure 3.3.2 - Carry out the detailed engineering and construction of the Farim phosphate mining project (Guinea Bissau)

Project engineering is the final study to be carried out before construction and installation of the mine and mill facilities can begin.

Measure 3.3.2	Carrying out the detailed engineering and construction of the Farim phosphate mining project (Guinea Bissau)
Origin (institution / project / programme)	GB Minerals project, holder of the mining concession
Objective	Preparing the conditions for the launch of the Farim phosphate mine
Location	Northern Guinea Bissau, 120 km from Bissau, on the north bank of the Farim/Cacheu River, about 215 km upstream from Cacheu.
Description of the action	Following the successful completion of the techno-economic studies, a number of engineering studies are to be carried out, including (but not limited to): updating the geological resource model; determining the rheological characteristics of the products and residues to determine the parameters of the phosphate ore filtration process; pilot plant tests of the different types of ore, metallurgical tests and performance tests of the ores in the phosphoric acid plant; Geotechnical studies for the bulk carrier loading facility at Ponta Chugue, navigational aids in the Geba River and Cacheu River crossing structures at Farim, development of a marine operational readiness plan; physical, geochemical testing, geological and hydrogeological modelling; sharing the ESIA and mining plan with the Government of Guinea Bissau
Ownership and implementation arrangements	GB Minerals and technical partners
Duration	3 years
Costs and funding	Cost: USD 1,000,000 Financing: GB Minerals State of Guinea Bissau
Risks envisaged	None
Expected results	The engineering and construction studies are complete and pave the way for the start of the installation of the mine and processing plant equipment.

Measure 3.3.3 - Carry out the feasibility study for the exploitation of phosphates in Kolda (Senegal)

The pre-feasibility and feasibility study is a prerequisite for any mining project. It is an essential document for convincing investors and bankers to commit themselves as partners or backers.

Measure 3.3.3	Carrying out the feasibility study for the exploitation of phosphates in Kolda (Senegal)
Origin (institution / project / programme)	Damash Minerals Ltd. project, holder of the mining concession
Objective	Study the feasibility of mining phosphates in Kolda in order to attract investment in the project
Location	30 km south of the Kolda region, more precisely in the rural community of Medina El Hadji, a few hundred metres from the Ziguinchor - Kolda - Dakar railway project
Description of the action	The feasibility study is to take stock of all the data that will enable the project's economics to be designed and decisions to be taken on the human and financial capital needed to run the project. This involves assessing the deposit (geology, tonnage, average grades in relation to cut-off grades), examining the mining methods and ore treatment processes that will be used, assessing the size of the mine and waste storage areas, the construction, operating and rehabilitation costs of the sites after mining, the market and selling prices of the mining products, and profitability. The environmental and social impact assessment will also be carried out, as well as consultation with the local population to ensure the social acceptability of the project.

Measure 3.3.3	Carrying out the feasibility study for the exploitation of phosphates in Kolda (Senegal)
Ownership and implementation arrangements	Damash Minerals Ltd and technical partners
Duration	2 years
Costs and funding	USD 500,000 Financing: Damash Minerals Ltd, State of Senegal
Risks envisaged	No risk
Expected results	The feasibility of the operation is documented and the promoter is assured of the appropriateness of further development of the project.

Measure 3.3.4 - Carry out the feasibility study for the exploitation of bauxite in Boé (Guinea Bissau)

The pre-feasibility and feasibility study is a prerequisite for any mining project. It is an essential document for convincing investors and bankers to commit themselves as partners or backers.

Measure 3.3.4	Carrying out the feasibility study for the exploitation of bauxite in Boé (Guinea Bissau)
Origin (institution / project / programme)	Project of the Compagnie Bauxite Angola, holder of the concession to exploit the bauxite deposits in Boé (Guinea Bissau)
Objective	Study the feasibility of exploiting the bauxite deposits in Boé in order to attract partners and investments to the project.
Location	280 km south-east of Bissau
Description of the action	Review of all data on the deposit (geology, tonnage, average grades as a function of cut-off grades), mining methods and ore treatment processes, dimensions of the mine and tailings storage areas, construction, operating and post-mining site rehabilitation costs, market and sales prices of mining products, project profitability, environmental impact assessment, social acceptability of the project
Ownership and implementation arrangements	Bauxite Company Angola and technical partners
Duration	2 years
Costs and funding	USD 500,000 Financing: Bauxite Company Angola, State of Guinea Bissau
Risks envisaged	No risk
Expected results	Feasibility study document

4.4.4 Provision 3.4 - Develop artisanal mining in a sustainable manner by regulating gold panning activities

GENERAL PRINCIPLE

Small-scale mining and gold panning are labour-intensive and income-generating activities. In order to optimise these activities while ensuring the preservation of the environment and the protection of health and safety at work, there is an urgent need to improve the techniques and technologies for extracting and processing minerals, as well as to strengthen the capacities of the actors in the sector.

EXPECTED RESULTS

Artisanal mining and gold panning activities have a negative impact on the environment and biodiversity, with repercussions on occupational health and safety, and child labour in the mines remains a major concern. To address this, this provision and associated measures are proposed. It is expected that the actors in the sector, who are technically equipped and aware of the degradation of the environment, will take responsibility and work towards a sustainable exploitation of mines.

AREA OF INTERVENTION

Small-scale mining and gold panning areas in Guinea and Senegal.

PROPOSED MEASURES

Two measures are proposed: (i) the improvement of extraction and processing techniques for minerals in the context of small-scale mining or gold panning; (ii) the strengthening of actors in the sector.

Measure 3.4.1 - Improve mineral extraction and processing techniques and technologies

The measure aims to provide the actors in the sector with a minimum knowledge of geology and mining prospecting, capacities and equipment adapted to mineral extraction and processing activities, in order to help them optimise their activities while preserving the environment and health and safety at work.

Measure 3.4.1	Improving extraction and processing techniques and technologies
Origin (institution / project / programme)	Consultant's proposal
Objective	Optimising activity in small-scale mining and gold panning
Location	Small-scale mining and gold panning sites (in Guinea and Senegal)
Description of the action	<p>These are:</p> <ul style="list-style-type: none"> – Strengthen the geological and prospecting knowledge of the actors in the sector so that they are able to optimise the quantities of barren ore transported and processed; – To propose crushing and grinding equipment adapted to the mechanical processing operations known to gold miners; – Improve ore washing techniques; – Demonstrate alternative solutions for phasing out hazardous chemicals or using them in a controlled manner; – Regulate the use of chemicals (cyanide, mercury) and explosives by formalising their marketing (setting up licensed operators for the sale of chemicals or explosives); – Study the possibility of treating oxidised ore by cyanide heap leaching (leaching from crushed ore without grinding); – Supervise the take-back of treatment residues by duly authorised operators and in accordance with current best environmental practices.
Ownership and implementation arrangements	Ministry of Mines and Geology and the directorates and services under it

Measure 3.4.1	Improving extraction and processing techniques and technologies
Duration	3 years
Costs and funding	Costs: USD 300,000 Funding: State budgets
Risks envisaged	Lack of funding
Expected results	The gold panners are identified and sensitised. Their activities are well supervised.

Measure 3.4.2 - Strengthen the capacities of the actors of the sector

Measure 3.4.2	Strengthen the capacities of the actors in the sector
Origin (institution / project / programme)	Consultant's proposal
Objective	Train the actors of the sector
Location	Ministries in charge of Mines and Geology in Guinea and Senegal
Description of the action	These are: <ul style="list-style-type: none"> - Develop a train-the-trainer programme to promote good practice in occupational health and safety and the environment; - To train trainers in efficient extraction techniques, health and safety management, modern and efficient mineral processing techniques (crushing, grinding, centrifugation); - Train the actors in the sector on good social practices and human rights, hygiene, water and sanitation, public health, gender equality, improvement of the situation of women, prohibition of child labour.
Ownership and implementation arrangements	Ministries in charge of Mines and Geology and dedicated services
Duration	3 years
Costs and funding	Costs: USD 300,000 Funding: State budgets
Risks envisaged	Lack of funding
Expected results	The capacities of the actors in the sector are strengthened

4.4.5 Provision 3.5 - Develop agro-industry, handicrafts and manufacturing

GENERAL PRINCIPLE

Agro-industry, handicrafts and manufacturing are poorly developed, despite significant potential. This is due to the fact that the economy is essentially focused on the export of raw materials, mainly groundnuts, fishery products and cashew nuts. To reverse this trend, a proactive policy of processing agricultural products will be put in place.

EXPECTED RESULTS

The following results are expected from the implementation of this provision:

- Industry development;
- Job creation;
- Export growth;
- Decrease in imports;
- Decrease in the trade balance deficit.

AREA OF INTERVENTION

All localities.

PROPOSED MEASURES

In order to develop agro-industry, handicrafts and manufacturing production, two measures are proposed within the framework of this provision: (i) the establishment of processing units for agricultural products and the organisation of marketing and export circuits for value-added products; (ii) the promotion of the development of handicrafts and export-oriented activities.

Measure 3.5.1 - Establish units for the processing of agricultural products and organise marketing and export channels for value-added products

The establishment of small-scale processing units for agricultural products throughout the value chain is favourable to the development of the agricultural sector. In addition to creating jobs and income, it helps to reduce imports of consumer products and thus reduce the trade deficit.

Measure 3.5.1	Establish units for processing agricultural products and organise marketing and export channels for value-added products
Origin (institution / project / programme)	Consultant's proposal
Objective	Adding value to agricultural products by processing them to meet the needs of the domestic market and for export
Location	Across countries
Description of the action	Entrepreneurship training Incubation of start-ups. Financing and support for businesses. Organisation of product distribution channels. Promotion of local labels in external markets. Identification of business opportunities. Supporting companies in foreign markets. Creation of an EXPORT unit within the consular institutions.
Ownership and implementation arrangements	Ministries in charge of trade in collaboration with research and development institutions on the processing of agricultural products (e.g. the Institut de Technologie Alimentaire in Senegal)
Duration	3 years
Costs and funding	Cost: USD 3,000,000 Financing: IDA, EU, State budgets
Risks envisaged	Lack of funding
Expected results	Increased local consumption. Decreased imports of everyday consumer goods.

Measure 3.5.2 - Promote the development of handicrafts and export-oriented activities

The measure stems from Vision 2040, which is to make the handicraft sector in the OMVG area an engine for inclusive economic and social growth.

The aim is to enhance the value of handicrafts and manufacturing production so that they can contribute to the economic and social development of the countries in the OMVG area.

Measure 3.5.2	Promote the development of handicrafts and export-oriented activities
Origin (institution / project / programme)	Consultant's proposal
Objective	Development of handicrafts and export-oriented activities
Location	In all locations
Description of the action	<p>The aim is to promote the development of handicrafts and export-oriented activities, through clothing and fashion, leatherwork, leather goods and shoe-making, carpentry and cabinet-making (wood and wrought iron), embroidery/dyeing, jewellery, painting and sculpture.</p> <p>This involves the structuring of handicraft growth sectors, improving access to markets through the creation of label houses, the creation of Export units within the consular institutions, supporting companies moving into foreign markets, the creation and promotion of craft villages, the organization of regional craft fairs, supporting artisans for their participation in international craft fairs</p>
Ownership and implementation arrangements	Ministry in charge of crafts and services under supervision.
Duration	3 years
Costs and funding	<p>Cost: USD 3,000,000</p> <p>Financing: IDA, EU, State budgets</p>
Risks envisaged	Lack of funding
Expected results	Development of handicrafts. Secondary effects on other sectors, notably tourism

Measure 3.5.3 - Establishment of the industrial superstructure - Agropole South Project

Measure 3.5.3	Establishment of the industrial superstructure - Agropole South Project
Origin (institution / project / programme) :	Southern Agro-Industrial Processing Zone Project (PZTA-South or Agropole South) Component A2. Establishment of the industrial superstructure
Objective:	The overall objective of the project is to contribute to the improvement of the living conditions of the population (including youth and women) through the creation of added value on agricultural products and the sustainable increase of productivity in priority agro-industrial sub-sectors (mango and cashew nuts). The specific objectives of the project are (i) to create conditions conducive to private investment in the industrial processing of agricultural products, as well as in the provision of inputs and services; and (ii) to strengthen the capacity of actors in the priority sector to sustainably increase agricultural productivity.
Location:	Casamance Natural Region - Ziguinchor, Sedhiou and Kolda.
Main beneficiary states of the action :	Senegal
Description of the action :	<ul style="list-style-type: none"> ▶ Construction of the central module (Adéane) with: (i) external facilities (drinking water, electricity, sanitation, etc.); (ii) an administrative block (offices, conference room, etc.); (iii) a social space block (crèche, medical centre, sports hall, restaurants, etc.); (iv) a service block (training centre, management centre, etc.); (v) a logistic block (loading/unloading platform, platform for the transport of goods, etc.); (vi) an administrative block (offices, conference room, etc.); (iv) a service block (training centre, management centre, etc.); (v) a logistics block (loading/unloading platform, weighing platform, storage/packaging sheds, etc.); (vi) 4 activity blocks (serviced plots, car parks, etc.); (vii) a technical block. ▶ Construction of 3 regional modules (Kolda, Sédhiou & Bignona) of 10 ha each, with : (i) a serviced site (earthworks, site development); (ii) a logistics & services block (administrative building, management centre, financial services, serviced plots for private investment, market place, loading/unloading platform, weighbridge, storage/packaging shed, etc.); (iii) a technical block. ▶ Construction of consolidation and service platforms: 5 sites of 5 ha each, with i) site servicing; ii) a service block (administrative building, weighbridge, loading/unloading dock, etc.); iii) a technical block (sorting area, primary storage, etc.). ▶ Additional engineering studies (DD, DCE, etc.) and control of infrastructure works in the agricultural hub (companies).
Project ownership and implementation :	Ministry of Economy and Finance
Duration :	2020-2025
Costs and funding :	Total estimated cost US\$38.44 million AfDB, IsDB and Government (including FONSIS)
Expected results :	Creation and consolidation of approximately 14,500 direct jobs (50% women and 60% youth) and 35,000 indirect jobs (50% women and 60% youth). Increased private investment thanks to the facilities put in place: construction of a central agro-industrial module (Adéane), three regional modules (Bignona, Sédhiou and Kolda) and five (5) aggregation and service platforms; Capacity building of value chain actors in the agro-industrial sectors (structuring/organisation of value chains, training, facilitating access to finance, research-based production of in-vitro plants for mango, cashew, maize, etc.)

Measure 3.5.4 - Realization of infrastructures for the development of agro-parks of Boké & Kankan (PDZSTA-BK)

Measure 3.5.4	Construction of infrastructure for the development of the Boké & Kankan agro-parks (PDZSTA-BK)
Origin (institution / project / programme) :	Development of special agro-industrial processing zones in Boké and Kankan (PDZSTA-BK). First phase of a programme to develop ten (10) agropoles.
Objective:	Reduction of agri-food imports and improvement of Guinea's food and nutritional security, through the creation of agro-industrial development poles supported by the private sector.
Location:	Boké and Kankan regions
Main beneficiary states of the action :	Guinea
Description of the action :	<ul style="list-style-type: none"> ▶ Site development works & VRD (roads, water supply, sewerage, electricity, telecom, fencing, etc.), Water supply station, WWTP, etc. ▶ Construction of buildings: (i) Administrative and residential block; (ii) Service block (training centre, conference centre, laboratories, etc.); (iii) Socio-community infrastructure block (school, health centre, guest house, etc.); ▶ Work to bring in the LV & MV power line and the telecom fibre ▶ Assistance in setting up a business incubator (service provider) ▶ Digitalisation of information and transactions ▶ Coordination with the initiative of the Chinese Winning Company for the establishment of a corridor for the development of Agricultural Technical Centres between the port of Kamsar and the agro-industrial park ▶ Implementation, control and monitoring studies of the works ▶ The setting up of the Guichet Unique d'Entreprises in Kankan ▶ Employment promotion for youth and women, through business incubators for youth (Youth Employability Programme) and women (AFAWA)
Project ownership and implementation :	Government of Guinea
Duration :	5 years (2019-2024)
Costs and funding :	Total estimated cost of USD 4 million (between 2022 and 2024) Funded by the African Development Fund
Risks considered :	<ul style="list-style-type: none"> ▶ Delays in mobilising donor funding for the implementation of project activities ▶ Delays in the approval and mobilisation of UNIDO's own resources and the establishment of a Trust Fund ▶ Institutional instability (frequent change of officials and interlocutors at national counterpart level). ▶ Delays due to insufficient coordination and involvement of actors and institutions, especially at regional level.
Expected results :	<p>The programme will cover approximately 110,000 ha in the entire programme area, for an estimated 220,000 direct beneficiaries and 670,000 indirect beneficiaries (50.7% women).</p> <p>Capacity building of value chain actors in the agro-industrial sectors (structuring/organisation of value chains, training, facilitating access to finance, research-based production of in-vitro plants for mango, cashew, maize, etc.)</p>

4.5 MEANS FOR IMPLEMENTING THE ACTIONS AND MEASURES IN STRATEGIC AXIS 3

Industry, Mining and Handicrafts

The budget, financing, institutional ownership and steering of the proposed actions/measures are summarised in the Table 4-5 below.

Table 4-5 Summary of the means dedicated to the implementation of the actions

Actions/Measures	Budget (MUSD)	Financing	Ownership/Steering
Mapping programme at 1:50,000 scale	13.6	IDA, EU, AfDB, government budgets	Ministries in charge of Mines and Geology/Consultant
Geological Mining Information System (GMIS)	0.34	IDA, EU, AfDB, government budgets	Ministries in charge of Mines and Geology/Consultant
Mining cadastre system	0.175	IDA, EU, Canadian Cooperation, State budgets	Ministries in charge of Mines and Geology/Consultant
Airborne geophysical campaign	1.5	IDA, EU, Canadian Cooperation, State budgets	Ministries in charge of Mines and Geology/Consultant
Regional geochemical campaign	1.0	IDA, EU, Canadian Cooperation, State budgets	Ministries in charge of Mines and Geology/Consultant
Engineering of the Farim phosphate project	1.0	GB Minerals Company State of Guinea Bissau	Ministry of Mines and Geology/Mining Company GB Minerals and technical partners
Kolda phosphate feasibility study	0.5	Damash Minerals Ltd, State of Senegal	Ministry of Mines and Geology/ Damash Minerals Ltd
Feasibility study for bauxite in Boé	0.5	Bauxite Company Angola, State of Guinea Bissau	Ministry in charge of Mines and Geology/ Compagnie Bauxite Angola,
Techniques/Technology extraction/treatment of minerals	0.3	State budgets	Ministries of Mines and Geology and the directorates and services under them
Capacity building of sector actors	0.3	State budgets	Ministries in charge of Mines and Geology and dedicated services
Establishment of agricultural product processing units	0.3	IDA, EU, State budgets	Ministries in charge of trade in collaboration with research and development institutions on the processing of agricultural products (e.g. the Institut de Technologie Alimentaire in Senegal)
Promotion of handicrafts and export-oriented activities	0.3	IDA, EU, State budgets	Ministries in charge of handicrafts and services under supervision

5 PROGRAMME OF MEASURES

5.1 SYNTHESIS OF THE SECTOR PLAN - RESULTS FRAMEWORK

Strategic axes/objectives	Overall results (provisions)	Specific results (measures)
1. Electricity - Ensure universal access to electricity for OMVG populations until 2040	1.1 New medium and large renewable electricity generation facilities built	1.1.1 The construction of the Sambangalou Hydroelectric Scheme (AHES), with 128 MW of installed capacity, 402 GWh/year of deliverable, in Senegal, on the Gambia River, in the Kédougou region, has been completed.
		1.1.2 The Saltinho hydroelectric scheme, with 27 MW of installed capacity, 128 GWh/year of deliverable (without the regulation effect of upstream hydroelectric schemes), in Guinea-Bissau, on the Corubal River, in the region of Bafatá and Tombali, has been built.
		1.1.3 The Digan Hydroelectric Scheme (AHED), with 100 MW of installed capacity, 242 GWh/year of deliverable, in Guinea, on the Gambia River, in the Labé region, has been built.
		1.1.4 The Kourawel hydroelectric scheme (AHEK), with 135 MW of installed capacity, 350 GWh/year of producible power, in Guinea, on the Komba River (tributary of the Koliba River), in the Labé region, has been built.
		1.1.5 The Fellou-Sounga hydroelectric and agricultural scheme, with 82 MW of installed capacity, 339 GWh/year of producibility, in Guinea, on the Koliba River, in the Boké region, has been built.
		1.1.6 The 20 MW solar power plant in Jambur, The Gambia has been constructed.
		1.1.7 The 150 MW solar power plant in Soma, The Gambia has been built.
	1.2 HV interconnections completed	1.2.1 The construction of a 225 kV HV transmission line, substations and two (02) dispatching centres (Linsan and Tambacouda) is completed.
		1.2.2 The construction of a 225 kV power line approximately 500 km long to connect the Digan, Fello-Sounga, Kourawel and Saltinho hydroelectric power stations as well as the Soma (Gambia) and Tambacounda (Senegal) substations via the Bassé substation has been completed
	1.3 The population has access to electricity	1.3.1 The connection to the interconnected network of settlements with more than 1000 inhabitants has been built.
		1.3.2 Microgrids with solar source for small agricultural villages - 50 kWh/inhabitant/year have been created.
		1.3.3 The selection and installation of small-scale solar installations have been financed. Small companies for installation and maintenance have been created.

Strategic axes/objectives	Overall results (provisions)	Specific results (measures)
	1.4 Energy efficiency is promoted	<p>1.4.1 An awareness-raising campaign on energy management and saving was carried out. The use of low-energy equipment by users (lamps, refrigerators, etc.) was promoted.</p> <p>1.4.2 Energy efficiency through the introduction of technologies to combat technical losses in the distribution network has been promoted.</p>
2. Thermal Energy - Facilitating access to clean sources of thermal energy, reducing the impact on the environment	2.1 Access to biofuels (wood and charcoal) for the entire population (mainly rural) is facilitated	2.1.1 Plots for planting fast-growing plant species for renewable fuelwood production have been created.
		2.1.2 Companies responsible for planting, maintenance, cutting, drying and replanting of plant species have been established.
		2.1.3 Enterprises processing wood into charcoal using modern technology (less than 3.5 kg of dry wood per kg of charcoal) have been established.
		2.1.4 A charcoal distribution system has been established.
		2.1.5 Improved stoves for charcoal use (steel stoves with standard design created by local companies) were distributed.
		2.1.6 Bio-coal distribution was promoted and produced.
	2.2 Access to LPG is promoted in urban centres with more than 1500 inhabitants	2.2.1 An industrial chain including the supply, filling, distribution and collection of LPG cylinders has been created.
		2.2.2 The purchase of LPG equipment (ovens and water heaters) was supported.
		2.2.3 Biogas was promoted, produced and distributed.
		2.2.4 The construction and use by households of solar thermal units (water heaters without solar panels) has been promoted.
3. Rationally exploit the mining, agro-industrial and artisanal potential	3.1 Geological and mining infrastructure by establishing multi-year national geological and mining mapping programmes and by implementing a mining cadastre developed	3.1.1 A 1:50,000 mapping programme has been carried out.
		3.1.2 A Geological and Mining Information System (GMIS) has been put into practice.
		3.1.3 A Mining Cadastre System has been put into practice.
	3.2 Underground resources explored	3.2.1 An airborne geophysical campaign was carried out.
		3.2.2 A regional geochemical campaign was carried out.
	3.3 Mines are operated and products processed throughout the value chain	3.3.1 The construction phase of the infrastructure of the Koumbia mine (Guinea) has been finalised.
		3.3.2 Detailed and construction engineering of the Farim phosphate project (Guinea Bissau) was completed.
		3.3.3 The feasibility study for phosphate mining in Kolda (Senegal) has been completed.
		3.3.4 The feasibility study for the exploitation of bauxite in Boé (Guinea Bissau) has been completed.
	3.4 Artisanal mines managed in a sustainable manner by regulating gold panning	3.4.1 Mineral extraction and processing techniques and technologies have been improved.

Strategic axes/objectives	Overall results (provisions)	Specific results (measures)
		3.4.2 The capacities of the actors in the sector have been strengthened.
	3.5 Agro-industry, arts and crafts and manufacturing developed.	3.5.1 Processing units for agricultural products were established and marketing and export channels for value-added products were organised.
		3.5.2 The development of arts and crafts and export-oriented activities has been promoted.
		3.5.3 The industrial superstructure - Agropole South Project, has been established.
		3.5.4 The infrastructure for the development of the Boké & Kankan agro-parks (PDZSTA-BK) has been completed.

5.2 TIMELINE OF MEASURES

Strategic Axes, Provisions, and Measures			Horizons																		
			2025				2030					2040									
			2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	
Strategic axis 1 - Electricity - Ensuring access to electricity for 80% of the population by 2040																					
Provision 1.1 - Continue the plan to build new medium and large renewable electricity generation facilities																					
Measure	1.1.1	Construction of the Sambangalou Hydroelectric Scheme (AHES), with 128 MW of installed capacity, 402 GWh/year of producible power, in Senegal, on the Gambia River, in the Kédougou region.																			
Measure	1.1.2	Construction of the Saltinho hydroelectric scheme, with 27 MW of installed capacity, 126 GWh/year of producible power (without the effect of regulation of upstream hydroelectric schemes), in Guinea-Bissau, on the Corubal river, in the Bafatá and Tombali regions.																			
Measure	1.1.3	Construction of the Digan hydroelectric scheme (AHED), with MW100 of installed capacity, 242 GWh/year of producible power, in Guinea, on the Gambia River, in the Labé region.																			
Measure	1.1.4	Construction of the Kourawel hydroelectric scheme (AHEK), with 135 MW of installed power, 350 GWh/year of producible energy, in Guinea, on the Komba river (tributary of the Koliba river), in the Labé region.																			
Measure	1.1.5	Construction of the Fellou-Sounga hydroelectric and agricultural scheme, with 82 MW of installed capacity, 339 GWh/year of producible energy, in Guinea, on the Koliba river, in the Boké region.																			
Measure	1.1.6	Construction of a 20 MW solar power plant in The Gambia.																			
Measure	1.1.7	Construction of a 150 MW solar power plant in The Gambia.																			
Provision 1.2 - Complete construction of 225 kV HV interconnection lines																					
Measure	1.2.1	Construction of a transmission line, substations and a dispatching centre (1677 km long), substations and two (02) dispatching centres (Linsan and Tambacouda).																			
Measure	1.2.2	Construction of a 500 km long power line to connect the Digan, Fello-Sounga, Kourawel and Saltinho hydroelectric power stations as well as the Soma (Gambia) and Tambacounda (Senegal) substations via the Bassé substation to be built.																			
Provision 1.3 - Ensure the distribution of energy to the population																					
Measure	1.3.1	Connection to the interconnected network of urban centres with more than 1000 inhabitants																			
Measure	1.3.2	Creation of micro-grids with solar source for small agricultural villages - 50 kWh/capita/year																			
Measure	1.3.3	Financing for the selection and installation of small individual solar systems - 400-600 kWh/household/year. Creation of small companies for installation and maintenance																			
Provision 1.4 - Promotion of energy efficiency																					
Measure	1.4.1	Launch awareness-raising campaigns on energy management and saving and promote the use of low-energy equipment among users																			
Measure	1.4.2	Promote energy efficiency through the implementation of technologies to combat technical losses in the distribution network																			

[illegible]

PROGRAMME OF MEASURES

[illegible]

5.3 COST OF MEASURES

Activities	Details	Budget (MUSD)	2025	2030	2040
Energy, Mining, Industry and Handicrafts			2 027	926	866
Strategic axis 1	Electricity - Ensuring access to electricity for 80% of the population by 2040	3 600	1 943	858	799
			54%	24%	22%
Provision 1.1	Continue the plan to build new medium and large renewable electricity generation facilities	1 991	1 210	117	664
Measure 1.1.1	Construction of the Sambangalou Hydroelectric Scheme (AHES), with 128 MW of installed capacity, 402 GWh/year of producible power, in Senegal, on the Gambia River, in the Kédougou region,	350	350		
Measure 1.1.2	Construction of the Saltinho hydroelectric scheme, with 27 MW of installed capacity, 128 GWh/year of producible power (without the effect of regulation of upstream hydroelectric schemes), in Guinea-Bissau, on the Corubal river, in the Bafatá and Tombali region.	117		117	
Measure 1.1.3	Construction of the Digan hydroelectric scheme (AHED), with MW100 of installed capacity, 242 GWh/year of producible power, in Guinea, on the Gambia River, in the Labé region.	126			126
Measure 1.1.4	Construction of the Kourawel hydroelectric scheme (AHEK), with 135 MW of installed power, 350 GWh/year of producible energy, in Guinea, on the Komba river (tributary of the Koliba river), in the Labé region.	185			185
Measure 1.1.5	Construction of the Fellou-Sounga hydroelectric and agricultural scheme, with 82 MW of installed capacity, 339 GWh/year of producible energy, in Guinea, on the Koliba river, in the Boké region.	353			353
Measure 1.1.6	Construction of a 20 MW solar power plant in The Gambia.	160	160		
Measure 1.1.7	Construction of a 150 MW solar power plant in The Gambia.	700	700		
Provision 1.2	Complete construction of 225 kV HV interconnection lines	1 164	733	431	0
Measure 1.2.1	Construction of a transmission line, substations and a dispatching centre (1677 km long), substations and two (02) dispatching centres (Linsan and Tambacouda).	814	733	81	
Measure 1.2.2	Construction of a 500 km long power line to connect the Digan, Fello-Sounga, Kourawel and Saltinho hydroelectric power stations as well as the Soma (Gambia) and Tambacounda (Senegal) substations via the Bassé substation to be built.	350		350	

PROGRAMME OF MEASURES

Provision 1.3	Ensure the distribution of energy to the population	355	0	220	135
Measure 1.3.1	Connection to the interconnected network of urban centres with more than 1000 inhabitants	270		135	135
Measure 1.3.2	Creation of micro-grids with solar source for small agricultural villages - 50 kWh/capita/year	35		35	
Measure 1.3.3	Financing for the selection and installation of small individual solar systems - 400-600 kWh/household/year. Creation of small companies for installation and maintenance	50		50	
Provision 1.4	Promotion of energy efficiency	90	0	90	0
Measure 1.4.1	Launch awareness-raising campaigns on energy management and saving and promote the use of low-energy equipment among users	10		10	
Measure 1.4.2	Promote energy efficiency through the implementation of technologies to combat technical losses in the distribution network	80		80	
TOTAL Strategic axis 1		3 600.0	1 942.6	858.4	799.0
Activities	Details	Budget (MUSD)	2025	2030	2040
Strategic axis 2	Thermal Energy - Facilitating access to clean sources of thermal energy, reducing the impact on the environment	142.0	13.5	63.5	65.0
			10%	45%	46%
Provision 2.1	Facilitating access to biofuels (wood and charcoal) for the entire population (mainly rural)	120.0	13.5	41.5	65.0
Measure 2.1.1	Creation of plots for the planting of fast-growing plant species for the renewable production of firewood - including planting, maintenance, cutting and replanting	111	13.5	32.5	65.0
Measure 2.1.2	Establishment of companies for the drying, thin cutting, and distribution of wood				
Measure 2.1.3	Establishment of enterprises to process wood into charcoal using modern technology (less than 3.5 kg of dry wood per kg of charcoal)	5		5	
Measure 2.1.4	Creation of a charcoal distribution system				
Measure 2.1.5	Distribution of improved stoves for charcoal use (steel stoves with standard design created by local companies)	4		4	
Provision 2.2	Promoting access to LPG and biogas in urban and suburban centres	22.0	0.0	22.0	0.0
Measure 2.2.1	Creation of an industrial chain including the supply, filling, distribution and collection of LPG cylinders.				
Measure 2.2.2	Support for the purchase of LPG equipment (ovens and water heaters)	2		2	
Measure 2.2.3	Biogas promotion, production and distribution.	10		10	
Measure 2.2.4	Promote the construction and use by households of solar thermal units (water heaters without solar panels).	10		10	
TOTAL Strategic axis 2		142.0	13.5	63.5	65.0

Activities	Details	Budget (MUSD)	2025	2030	2040
Strategic axis 3	Exploiting mining, agro-industrial and handicraft potential	77.7	71.0 74%%	4.4 17%%	2.3 9%%
Provision 3.1	Develop geological and mining infrastructure by establishing multi-year national geological and mining mapping programmes and by implementing a mining cadastre	14.1	14.1		
Measure 3.1.1	Carry out a 1:50,000 mapping programme	13.6	13.6		
Measure 3.1.2	Establish a Geological and Mining Information System (GMIS).	0.34	0.34		
Measure 3.1.3	Setting up a Mining Cadastre System	0.175	0.175		
Provision 3.2	Exploring underground resources	2.5	1.25	1.25	
Measure 3.2.1	Conducting airborne geophysical mapping programme	1.5	0.75	0.75	
Measure 3.2.2	Conducting regional geochemical mapping programmes	1.0	0.5	0.5	
Provision 3.3	Mining and processing products across the value chain	12.0	10.75	1.00	0.25
Measure 3.3.1	Finalise the construction phase of the infrastructure of the Koumbia bauxite mine (Gaoual, Boké)	10.0	10.0		
Measure 3.3.2	Carry out detailed and construction engineering for the Farim phosphate mining project (Guinea Bissau)	1.0	0.5	0.5	
Measure 3.3.3	Carry out the feasibility study for the exploitation of phosphates in Kolda (Senegal)	0.5	0.25	0.25	
Measure 3.3.4	Carry out the feasibility study for the exploitation of bauxite in Boé (Guinea Bissau)	0.5		0.25	0.25
Provision 3.4	Develop artisanal mining in a sustainable manner by regulating gold panning activities	0.6	0.45	0.15	
Measure 3.4.1	Improving mineral extraction and processing techniques and technologies	0.3	0.3		
Measure 3.4.2	Strengthening the capacity of the sector's actors	0.3	0.15	0.15	
Provision 3.5	Developing agro-industry, handicrafts and manufacturing	48.4	44.4	2.0	2.0
Measure 3.5.1	Establish units for processing agricultural products and organise marketing and export channels for value-added products	3.0	1.0	1.0	1.0
Measure 3.5.2	Promoting the development of handicrafts and export-oriented activities	3.0	1.0	1.0	1.0
Measure 3.5.3	Establishment of the industrial superstructure - Agropole South project	38.44	38.44		
Measure 3.5.4	Development of infrastructure for the servicing of the Boké & Kankan agro-parks (PDZSTA-BK)	4.0	4.0		
TOTAL Strategic axis 3		77.7	71.0	4.4	2.3
Overall programme budget		3 819.7			

5.4 OWNERSHIP OF THE MEASURES

Project owner	List of provisions / measures	Estimated cost MUSD	2022-2025	2025-2030	2030-2040	Planned / anticipated financing
Strategic Area 1 - Electricity - Ensure universal access to electricity for the populations of the OMVG area by 2040						
OMVG	1.1.1	350	350	-	-	60BAD
OMVG	1.1.2	117	-	117	-	BAD
OMVG	1.1.3	126	-	-	126	BAD
OMVG	1.1.4	185	-	-	185	-
OMVG	1.1.5	353	-	-	353	BAD
Ministry in charge of renewable energy in The Gambia	1.1.6	160	160	-	-	160 EIB, EU, WB
Ministry in charge of renewable energy in The Gambia	1.1.7	700	700	-	-	WAP
OMVG	1.2.1	814	733	81	-	452
OMVG	1.2.2	350	-	350	-	-
OMVG	1.3.1	270	-	135	135	-
OMVG	1.3.2	35	-	35	-	-
OMVG	1.3.3	50	-	50	-	-
OMVG	1.4.1	10	-	10	-	-
OMVG	1.4.2	80	-	80	-	-
Strategic Area 2 - Thermal Energy - Facilitating access to improved sources of thermal energy, reducing the impact on the environment						
OMVG / Ministry of Agriculture	2.1.1	111,0	13,5	32,5	65,0	-
Ministry of Industry	2.1.2	-	-	-	-	-
Ministry of Industry	2.1.3	5,0	-	5,0	-	-
Ministry of the Economy	2.1.4	-	-	-	-	-
Ministry of Industry (to be confirmed)	2.1.5	4,0	-	4,0	-	-
Ministry of Industry	2.2.1	-	-	-	-	-
Ministry of Industry	2.2.2	2,0	-	2,0	-	-
Ministries of Energy and Agriculture	2.2.3	10,0	-	10,0	-	-
Ministry of Energy	2.2.4	10,0	-	10,0	-	-
Strategic Area 3 - Tapping the mining, agro-industrial and handicraft potential rationally						
Ministries in charge of Mines and Geology	3.1.1	13,6	13,6	-	-	IDA, EU, AfDB, government budgets
Ministries in charge of Mines and Geology	3.1.2	0,34	0,34	-	-	IDA, EU, AfDB, government budgets
Ministries in charge of Mines and Geology	3.1.3	0,175	0,175	-	-	IDA, EU, Canadian Cooperation, State budgets
Ministries in charge of Mines and Geology	3.2.1	1,5	0,75	0,75	-	IDA, EU, Canadian Cooperation, State budgets
Ministries in charge of Mines and Geology	3.2.2	1,0	0,5	0,5	-	IDA, EU, Canadian Cooperation, State budgets
Alliance Mining Commodities and technical partners	3.3.1	10	10,0	-	-	Alliance Mining Commodities and technical partners
GB Minerals and technical partners	3.3.2	1,0	0,5	0,5	-	GB Minerals Company

Project owner	List of provisions / measures	Estimated cost MUSD	2022-2025	2025-2030	2030-2040	Planned / anticipated financing
						State of Guinea Bissau State of Guinea
Damash Minerals Ltd and technical partners	3.3.3	0,5	0,25	0,25	-	Damash Minerals Ltd, State of Senegal
Bauxite Company Angola and technical partners	3.3.4	0,5	-	0,25	0,25	Bauxite Company Angola, State of Guinea Bissau
Ministry of Mines and Geology	3.4.1	0,3	0,3	--	-	State budgets
Ministry of Mines and Geology	3.4.2	0,3	0,15	0,15	-	State budgets
Ministries in charge of Trade Ministries in charge of Industry	3.5.1	3,0	1,0	1,0	1,0	IDA, EU, State budgets
Ministries in charge of crafts	3.5.2	3,0	1,0	1,0	1,0	IDA, EU, State budgets
Ministry of Economy and Finance	3.5.3	38,44	38,44			AfDB, IsDB and Government (including FONSIS)
Government of Guinea	3.5.4	4,0	4,0			African Development Fund

The Ministries in charge of Mines and Geology will be responsible for the implementation of geological and mining infrastructures and for the exploitation of artisanal and small-scale mines (EMAPE).

The mining companies holding concessions for the exploitation of phosphate mines in Guinea Bissau and Senegal and of bauxite in Guinea Bissau will ensure the management of their projects.

The project management of the measure relating to the establishment of processing units for agricultural products and the organisation of marketing and export circuits for agro-industrial production will be carried out under the joint supervision of the Ministries in charge of Industry and Trade.

5.5 IMPLEMENTATION FRAMEWORK

Energy, Mines, Industry and Crafts	Description	IOV indicator (Baseline)	Budget (USD million)	Actors	Period	Verification sources	Risks and assumptions
Strategic areas	Strategic Area 1 - Electricity - Ensure universal access to electricity for the OMVG population until 2040						
	Strategic Axis 2 - Thermal Energy - Facilitating access to clean sources of thermal energy, reducing the impact on the environment						
	Strategic Area 3 – Tapping the mining, agro-industrial and artisanal potential rationally						
Action Plan 1 (Part 1) Electricity	Measure 1.1.1 - Construction of the Sambangalou hydroelectric scheme (AHES), with 128 MW of installed power, 402 GWh/year of producible energy, in Senegal, on the Gambia River, in the Kédougou region.	Increased availability of electricity	350	OMVG	2023 - 2025	OMVG Annual Report	Member States and Donors have mobilised the necessary funds for the project
	Measure 1.1.2 - Construction of the Saltinho hydroelectric scheme, with 27 MW of installed power, 128 GWh/year of producible energy (without the effect of regulation of the upstream hydroelectric schemes), in Guinea-Bissau, on the Corubal river, in the region of Bafatá and Tombali.	Increased availability of electricity	117	OMVG	2027- 2029	OMVG Annual Report	Member States and Donors have mobilised the necessary funds for the project
	Measure 1.1.3 - Construction of the Digan hydroelectric scheme (AHED), with 100 MW of installed power, 242 GWh/year of producible, in Guinea, on the Gambia River, in the Labé region.	Increased availability of electricity	126	OMVG	2031- 2034	OMVG Annual Report	Member States and Donors have mobilised the necessary funds for the project
	Measure 1.1.4 - Construction of the Kourawel hydroelectric scheme (AHEK), with 135 MW of installed power, 350 GWh/year of producibility, in Guinea, on the Komba river (tributary of the Koliba river), in the Labé region.	Increased availability of electricity	185	OMVG	2033- 2036	OMVG Annual Report	Member States and Donors have mobilised the necessary funds for the project
	Measure 1.1.5 - Construction of the Fellou-Sounga	Increased availability of electricity	353	OMVG	2035- 2038	OMVG Annual Report	Member States and Donors have mobilised

Energy, Mines, Industry and Crafts	Description	IOV indicator (Baseline)	Budget (USD million)	Actors	Period	Verification sources	Risks and assumptions
	hydroelectric and agricultural development, with 82 MW of installed power, 339 GWh/year of producible, in Guinea, on the Koliba river, in the Boké region.						the necessary funds for the project
	Measure 1.1.6 - Construction of a 20 MW solar power plant in Jambur, Gambia	Increased availability of electricity	160	Ministry in charge of renewable energy in The Gambia	2024-2025	Annual report of the Ministry in charge of renewable energy in The Gambia	Member States and Donors have mobilised the necessary funds for the project
	Measure 1.1.7 - Construction of a 150 MW solar power plant in Soma, Gambia	Increased availability of electricity	700	Ministry in charge of renewable energy in The Gambia	2024-2025	Annual report of the Ministry in charge of renewable energy in The Gambia	Member States and Donors have mobilised the necessary funds for the project
	Measure 1.2.1 - Construction of a 225 kV HV transmission line (1677 km long), substations and two (02) Dispatching Centres (Linsan and Tambacouda).	Increased availability of electricity	814	OMVG	2022-2026	OMVG Annual Report	Member States and Donors have mobilised the necessary funds for the project
	Measure 1.2.2 - Construction of a 225 kV power line about 500 km long to connect the hydroelectric power stations of Digan, Fello-Sounga, Kourawel and Saltinho as well as the substations of Soma (Gambia) and Tambacounda (Senegal) via the substation of Bassé to be built	Increased availability of electricity	350	OMVG	2027-2029	OMVG Annual Report	Member States and Donors have mobilised the necessary funds for the project
	Measure 1.3.1 - Connection to the interconnected network of localities with more than 1000 inhabitants.	Increased availability of electricity	270	OMVG / Municipalities / Electricity companies	2025 - 2035	OMVG Annual Report	Member States and Donors have mobilised the necessary funds for the project
	Measure 1.3.2 - Creation of micro grids with solar source for	Increased availability of electricity	35	OMVG / Local authorities	2025 - 2030	OMVG Annual Report	Member States and Donors have mobilised the necessary

Energy, Mines, Industry and Crafts	Description	IOV indicator (Baseline)	Budget (USD million)	Actors	Period	Verification sources	Risks and assumptions
	small rural villages - 50 kWh/inhabitant/year.						funds for the project
	Measure 1.3.3 - Financing for the selection and installation of small individual solar installations - 400 to 600 kWh/household/year. Creation of small companies for installation and maintenance.	Increased availability of electricity	50	OMVG / Local authorities / Electricity companies	2025 - 2030	OMVG Annual Report	Member States and Donors have mobilised the necessary funds for the project
	Measure 1.4.1 - Carry out an awareness-raising campaign on energy management and saving and promote the use of low-energy equipment among users (lamps, refrigerators, etc.).	Increased utility of available electricity	10	OMVG / Local authorities / Electricity companies	2025 - 2030	OMVG Annual Report	Member States and Donors have mobilised the necessary funds for the project
	Measure 1.4.2 - Promote energy efficiency through the implementation of technologies to combat technical losses in the distribution network.	Increase in the effective availability of electricity	80	OMVG / Local authorities / Electricity companies	2025 - 2030	OMVG Annual Report	Member States and Donors have mobilised the necessary funds for the project
Action Plan 2 (Part 2) Thermal Energy	Measure 2.1.1 - Creation of plots for the plantation of fast-growing plant species for the renewable production of firewood.	Increased availability of fuelwood.	111	OMVG / Ministry of Agriculture	2025 - 2035	Annual report of the OMVG and the Ministry of Agriculture	Member States and Donors have mobilised the necessary funds for the project
	Measure 2.1.2 - Creation of companies in charge of planting, maintenance, cutting, drying and replanting of plant species.	Increased availability of fuelwood.	-	Ministry of Industry and Ministry of Agriculture	2025 - 2035	Annual report of the Ministry of Industry and the Ministry of Agriculture	Member States and Donors have mobilised the necessary funds for the project
	Measure 2.1.3 - Establishment of enterprises for the transformation of wood into charcoal using modern technologies (less than 3.5 kg of dry wood per kg of charcoal)	Increased availability of fuelwood.	5,0	Ministry of Industry / Ministry of Agriculture	2028 - 2040	Annual report of the Ministry of Industry	Member States and Donors have mobilised the necessary funds for the project
	Measure 2.1.4 - Creation of a distribution system for firewood and charcoal	Increased availability of fuelwood.	-	Ministry of Economy / Ministry of Trade	2028 - 2040	Report of the Ministry of Economy and Trade	Member States and Donors have mobilised the necessary

Energy, Mines, Industry and Crafts	Description	IOV indicator (Baseline)	Budget (USD million)	Actors	Period	Verification sources	Risks and assumptions
							funds for the project
	Measure 2.1.5 - Distribution of improved stoves for charcoal use (steel stoves with standard design created by local companies)	Increased efficiency of wood use and better health for families.	4,0	Ministry of Industry	2025 - 2030	Annual report of the Ministry of Industry	Member States and Donors have mobilised the necessary funds for the project
	Measure 2.2.1 - Creation of an industrial chain including the supply, filling, distribution and collection of LPG cylinders	Increased use of LPG in households and better health for families.	-	Ministry of Industry / Oil companies	2021 - 2035	Annual report of the Ministry of Industry	Member States and Donors have mobilised the necessary funds for the project
	Measure 2.2.2 - Support for the purchase of LPG equipment (ovens and water heaters)	Increased use of LPG in households and better health for families.	2,0	Ministry of Industry	2025 - 2035	Annual report of the Ministry of Industry	Member States and Donors have mobilised the necessary funds for the project
	Measure 2.2.3 - Promotion, production and distribution of Biogas.	Increased use of biogas in households and better health for families.	10,0	Ministry of Agriculture and Industry	2025 - 2035	Annual report of the Ministry of Agriculture	Member States and Donors have mobilised the necessary funds for the project
	Measure 2.2.4 - Promote the construction and use by households of solar thermal units (water heaters without solar panels).	Use of solar energy for domestic water heating	10,0	Ministry of Industry	2025 - 2035	Annual report of the Ministry of Industry	Member States and Donors have mobilised the necessary funds for the project
Action Plan 3 (Part 3) Mining, Industry and Crafts	Measure 3.1.1 - Carry out a 1:50,000 mapping programme	The 1:50,000 geological maps of the 4 basins are available	13,6	Ministries in charge of mines and geology	2022-2025	Annual report of the ministries in charge of mines and geology	Member States and Donors have mobilised the necessary funds for the project
	Measure 3.1.2 - Set up a Geological and Mining Information System (GMIS)	The SIGM is available for each Member State	0,34	Ministries in charge of mines and geology	2022-2025	Annual report of the ministries in charge of mines and geology	Member States and Donors have mobilised the necessary funds for the project
	Measure 3.1.3 - Establish a Mining Cadastre System	Mining Cadastre System available for The Gambia and Guinea Bissau	0,175	Ministries in charge of mines and geology	2022-2025	Annual report of the ministries in charge of mines and geology	Member States and Donors have mobilised the necessary funds for the project
	Measure 3.2.1 - Carry out an airborne geophysical campaign	Airborne geophysical coverages covering the 4	1,5	Ministries in charge of mines and geology	2022-2030	Annual report of the ministries in charge of	Member States and Donors have mobilised the necessary

PROGRAMME OF MEASURES

Energy, Mines, Industry and Crafts	Description	IOV indicator (Baseline)	Budget (USD million)	Actors	Period	Verification sources	Risks and assumptions
		basins are available				mines and geology	funds for the project
	Measure 3.2.2 - Carry out a regional geochemical campaign	Stream-sediment geochemical coverages covering the 4 basins are available	1,0	Ministries in charge of mines and geology	2022-2030	Annual report of the ministries in charge of mines and geology	Member States and Donors have mobilised the necessary funds for the project
	Measure 3.3.1 - Finalise the construction phase of the Koumbia mine infrastructures	Construction phase of the mine infrastructure is completed	10	Alliance Mining Commodities And technical partners	2022-2025	Annual report of Alliance Mining Commodities	Member States and Donors have mobilised the necessary funds for the project
	Measure 3.3.2 - Carry out the detailed engineering and construction of the Farim phosphate mining project (Guinea Bissau)	The detailed engineering and construction study document for the Farim phosphate mining project is available	1,0	GB Minerals and technical partners	2022-2030	Annual report of GB Minerals	Member States and Donors have mobilised the necessary funds for the project
	Measure 3.3.3 - Carry out the feasibility study for the exploitation of phosphates in Kolda (Senegal)	Feasibility study document for the Kolda phosphate mining project is available	0,5	Damash Minerals Ltd and technical partners	2022-2030	Annual report of Damash Minerals Company	Member States and Donors have mobilised the necessary funds for the project
	Measure 3.3.4 - Carry out the feasibility study for the exploitation of the bauxite of Boé (Guinea Bissau)	The feasibility study document for the Boé bauxite mining project is available	0,5	Bauxite Company Angola and technical partners	2025-2040	Annual report of the Bauxite Angola Company	Member States and Donors have mobilised the necessary funds for the project
	Measure 3.4.1 - Improve mineral extraction and processing techniques and technologies	Guides to improving mining and processing techniques for EMAPE minerals are available	0,3	Ministry of Mines and Geology	2022-2025	Annual report of the Ministries of Mines and Geology	Member States and Donors have mobilised the necessary funds for the project
	Measure 3.4.2 - Strengthen the capacities of the actors of the sector	The clandestine use of prohibited products (cyanide, mercury) has decreased considerably. The performance of artisanal gold mining has improved without the use of mercury.	0,3	Ministry of Mines and Geology	2022-2030	Annual report of the Ministries of Mines and Geology	Member States and Donors have mobilised the necessary funds for the project

Energy, Mines, Industry and Crafts	Description	IOV indicator (Baseline)	Budget (USD million)	Actors	Period	Verification sources	Risks and assumptions
		River dredging has stopped.					
	Measure 3.5.1 - Establish units for the processing of agricultural products and organise marketing and export channels for value-added products	Processing units for agricultural products have been set up	3,0	Ministries in charge of trade. Ministry in charge of Industry	2022-2040	Annual report of the ministries in charge of trade and industry	Member States and Donors have mobilised the necessary funds for the project
	Measure 3.5.2 - Promote the development of arts and crafts and export-oriented activities	Arts and crafts promotion centres/villages are created. Exports of arts and crafts products have increased.	3,0	Ministry in charge of crafts	2022 - 2040	Annual report of the ministry in charge of crafts	Member States and Donors have mobilised the necessary funds for the project
	Measure 3.5.3 - Establishment of the industrial superstructure - South Agropole Project	To improve the living conditions of the population, through the creation of added value on agricultural products and the sustainable increase of the productivity of priority agro-industrial sub-sectors.	38,44	Ministry of Economy and Finance	2022-2025	Annual report of the Ministry of Economy and Finance	Member States and Donors have mobilised the necessary funds for the project
	Measure 3.5.4 - Realization of infrastructures for the development of agro-parks of Boké & Kankan (PDZSTA-BK)	Reduction of agri-food imports and improvement of Guinea's food and nutritional security.	4,0	Government of Guinea	2022-2024	Annual report of the ministries in charge of agro-industry	Member States and Donors have mobilised the necessary funds for the project

In order to achieve the expected results of the various measures of the Mining, Industry and Handicrafts sub-sector plan, an institutional, financial and technical framework for the implementation of projects over the period 2023-2040 will have to be put in place.

The institutional framework

Inter-state geological and mining infrastructure projects, as well as those relating to the exploitation of EMAPE, the development of agro-industry and arts and crafts will be carried out by OMVG in relation to the ministries concerned.

The financial framework

An inter-state financial framework will be set up to ensure the mobilisation of investment funds and the financial management of projects. The financing mechanisms, the commitments of the States, the private sector and the donors will be defined within this framework.

The technical framework

A technical, management and monitoring-evaluation framework will be set up to ensure that the projects are properly implemented and achieve the expected results. It will be composed of experts in the various sectors concerned.

In relation to the donors, a technical assistance framework will be set up for each of the projects to carry out geological, mining and industrial measures.

Finally, at the level of the OMVG, a technical unit dedicated to the implementation of the projects will be created. This unit will include: a Secretariat, a geologist, a mining engineer, a project manager, a geomatician specialised in digital cartography, GIS and database management).

5.6 RISKS OF NON-IMPLEMENTATION OF MEASURES

Risk of non-implementation	Possibility of occurrence (-, +, +++)	Importance of the impact (-, +, +++)	Proposed risk management measure
No agreement or convention between Member States	(-)	(-)	Organisation of round tables to promote ownership of the measures and the signing of agreements and conventions on the steering of the measures
Political dispute between Member States that could lead to a freeze or cancellation of projects	(+)	(++)	Establishment of inter-state consultation frameworks for the adoption of modalities for the further implementation of projects
Change of vision and strategies following a change of government	(++)	(++)	Establishment of a plan to revise the vision and strategic axes and a negotiation round table for the adoption of a new master plan
Difficulties in mobilising funding for the provisions and measures of the master plan	(+++)	(++)	Establishment of provisional plans for financing projects and organisation of consultation frameworks to seek innovative financing from governments, donors and the private sector
Lack of qualified human resources for the implementation of the measures of the Master Plan	(++)	(++)	Implementation of training plans and forward-looking employment and skills management plans
Inadequate consultation between state institutions to develop projects	(++)	(+++)	Establishment of inter-state steering committees and information and monitoring systems for project implementation
Lack of interest from donors in some projects	(++)	(+++)	Organisation of round tables with private investors operating in the sub-sector concerned by the measures
Inadequate efficiency in project implementation structures	(+++)	(+++)	Establishment of a project monitoring and evaluation unit to assess the quality of project implementation structures

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

6.1 POTENTIAL IMPACTS IDENTIFIED ON WATER RESOURCES AND ECOSYSTEMS

Energy Sector

The actions proposed for the energy sector will have both positive and negative impacts on the environment and water resources, but overall the positive impacts will be greater than the negative ones.

With regard to dams for energy production, the negative impacts will obviously be the submergence of land and habitats and dwellings in the areas of the reservoirs, which can be significant in size (181 km² for Sambangalou, for example); also, the dam will cut off the river ecosystem, preventing the migration of fish and other animals along the river.

In terms of water resources, the reservoirs will lose water through evaporation and also water supplied for irrigation. On the other hand, the remaining flows will be more regular and the low flows will be higher, which will be important for different species. The higher low water flows will also reduce the saline penetration into the estuary. This has a positive impact on human activities downstream of the dam but may have a negative impact on fish, whose reproduction is often synchronised with floods. The operation of the reservoirs will have to take this aspect into account, by providing for small releases during the normal flood period, to simulate the normal regime of the wadi and minimise the impact on the ecology.

The construction of the transmission and distribution lines will have a minimal impact on the environment. Two risks are the impact on birds (impacts with poles and wires) and also the risk of fire in case of short circuit, mainly in case of strong wind.

Solar generation systems will have no impact on the environment.

Plantations of fast-growing trees for fuelwood production will have a negative local impact, as eucalyptus monoculture forests are almost deserts in terms of biodiversity. On the other hand, the wood produced in these areas will reduce the pressure on the environment and allow its recovery.

Mining-Industry-Craft sector

The mining industry consumes a lot of water which is used in the processing of ores, dust removal, transport of sludge and personnel needs.

In mining areas, the quality of the water resource may be degraded to a greater or lesser extent due to the interaction of groundwater or surface water with mined areas and/or mining waste. It may also be affected by deliberate or accidental discharges of chemicals or mining waste.

Among the most incriminated water resource pollutants are those associated with acid mine drainage (AMD) in relation to sulphide ores. AMD is the chemical process by which sulphide-bearing mine tailings produce sulphuric acid when exposed to air and water. The effect of DMA is to make the effluent acidic and to increase the mobilisation of higher levels of heavy metals such as iron, zinc, lead, cadmium, manganese.

Gold panning is a very old activity in Guinea and Senegal, particularly in the Gambia River basin where the mercury used in the treatment of gold-bearing alluvium by dredging can be found in several places along the banks, downstream from the operations, leading to risks of intoxication for fish and slow and lasting intoxication by bioaccumulation for the riparian populations. The use of mercury by gold miners also poses a serious threat to the Niokolo-Koba National Park, a protected site that has been listed as a World Heritage Site in Danger since 2007.

6.2 AVOIDANCE, MITIGATION OR COMPENSATION MEASURES

ENERGY SECTOR

In order to mitigate the environmental impacts caused by the construction of the dams, the reservoir should be operated taking into account the simulation of the natural regime, with small floods during the wet season.

Provision can also be made for the passage of migratory fish, either through the construction of passage devices or by upstream transport of fish that concentrate at the foot of the dam.

For the transmission lines, a protective strip without vegetation should be prepared to avoid the risk of fire. Specific areas may also be prepared in the poles for migratory birds to make their nests.

Finally, in areas where fast-growing trees are cultivated, a protective margin without trees (about 20 m) can be left to prevent the spread of forest fires.

MINING-INDUSTRY-CRAFT SECTOR

In order to preserve water resources, the Mining Codes in force in each of the OMVG Member States require mining project developers to conduct Environmental and Social Impact Assessments (ESIA) prior to the start of any mining project. The mitigation of the negative impacts of the project on the environment is then envisaged within the framework of environmental and social management plans, environmental monitoring measures, including the monitoring of the water withdrawal schedule, the monitoring of the river level, the monitoring of various pollutions and contaminations of the water body, as well as the monitoring of the physical, chemical and microbiological quality of the water.

The sustainability of EMAPE is ensured by the implementation of sustained efforts in training, capacity building, awareness raising and supervision of the actors. It is within this framework that alternatives to polluting chemicals (cyanide, mercury) are developed, in particular the use of: (i) ore processing techniques through finer grinding, (ii) ore concentrators based on the principle of centrifugation, (iii) trommels for settling gold-bearing alluvium and eluvium.

7 CONCLUSIONS AND RECOMMENDATIONS

7.1 ENERGY

The analysis carried out showed that the per capita primary energy consumption in the region is 3,400 kW/year, of which a large part (almost 70%) is used by households for domestic activities. The main energy sources used in the study area are

- Biomass (**firewood, charcoal and agricultural waste**) as a domestic fuel, accounting for just over half of the region's total energy consumption;
- **Oil** and liquefied **petroleum gases** for transport, power generation and domestic use and ;
- **Electricity** (only 5% of total energy consumption).

Total electricity production per capita is limited: 143 kWh/inhab in Senegal, 174 kWh/inhab in The Gambia, 21 kWh/inhab in Guinea Bissau and 166 kWh/inhab in Guinea. These values can be compared with the average consumption in Africa (567 kWh/year) and in the world (3260 kWh/inhab), which indicates that there is a very large margin for potential development.

Household energy use (mainly for cooking, water heating and lighting) is responsible for about two thirds of total energy consumption (firewood, charcoal and LPG). Transport (road and air) is responsible for a quarter of total energy demand (obviously using oil derivatives). Industry consumes on average 10% of total energy and other uses (utilities, agriculture, water pumping) use about 4% of total energy consumption.

In terms of electricity, access is low in the OMVG region, mainly in rural areas, except in Senegal. Average electricity consumption is around 5% of household consumption. It will therefore be impossible, even in the medium term, to replace traditional energy sources in households with electricity. For this reason, increased electricity penetration will have to be focused on the more noble and lower demand uses such as lighting, telecommunications, refrigeration, commerce and small industries.

In future terms, taking into account the current situation, the following Global Vision is envisaged for the energy component:

- **Access to improved, reliable and affordable energy services for all, a significant increase in the share of renewable energy in the regional energy mix, improved energy efficiency.**
- **Modern, reliable and efficient energy will stimulate growth, catalyse economic transformation and contribute to higher socio-economic living standards.**

A total of 642 MW of electrical capacity is planned to be installed until 2040, producing an average of 1886 GWh/year, which will correspond to an annual growth rate of over 10%, an acceptable value in historical terms. The planned generation capacity will be sufficient to meet the overall electricity targets, if the transmission and distribution networks are also implemented.

For other forms of thermal energy (firewood, LPG) no specific project is currently planned. Two lines of energy projects complementary to the basic electrification project have been identified:

- **Electricity** - Individual electrification in rural areas using solar energy
- **Thermal energy** - renewable fuelwood production and increased LPG penetration

The first line tries to increase the speed of electrification in rural areas, by implementing individual or collective electricity systems based on solar energy.

The second line draws on the strongest source of energy used in the region - firewood and charcoal - in order to increase the availability of good quality dry wood without harming the environment. Also in the context of thermal energy it is proposed to increase the availability of LPG in the urban areas of OMVG. Both interventions will have a positive effect on the health of the population - mainly women - due to the reduction of smoke production.

In terms of electricity, for the medium and long term it seems reasonable to pursue the project corresponding to the construction of large hydroelectric schemes financed by the OMVG, although the corresponding high voltage interconnection system.

However, to increase the availability of electricity in the short term, and to expose people, mainly in agricultural areas, to the positive impacts of electrification, it is suggested that individual and collective solar-based systems be installed, capable of providing small amounts of energy for lighting, telecommunications and refrigeration. These are important aspects for the quality of life of the population and are energy efficient.

For the thermal energy component for domestic use, there are some aspects that need to be improved in the face of current conditions:

- Facilitating household access to domestic fuels;
- Reduce smoke generated by the use of fuels;
- Reducing waste by increasing efficiency;
- Reduce the environmental impacts of biofuel use.

7.2 MINING, INDUSTRY AND HANDICRAFTS

The basins of the OMVG area are endowed with an important potential in mineral resources, diversified, but not enough known in detail, little exploited and little valorised in the whole value chain. This is why their contribution to the economies of the countries remains far below the expectations of decision-makers and populations.

The limited knowledge of mineral resources is linked to the lack of basic geological infrastructure covering all basins. These include detailed geological maps, at 1:50,000 scale^{ième}, mining cadastral systems (for The Gambia and Guinea Bissau), geological and mining information systems, regional airborne geophysical coverages and stream-sediment geochemical coverages. These infrastructures are essential for carrying out strategic exploration campaigns that will enable the mining potential of the basins to be properly assessed and then, in partnership with private companies, to carry out tactical prospecting campaigns on the most promising areas defined in prospecting permits.

The establishment of basic geological infrastructure and the conduct of strategic subsoil exploration campaigns should be the responsibility of the states, as activities to gain knowledge of the subsoil and to appropriate its mineral resources. The historical costs of these activities will be monetised in shares in the operating companies which are created in joint venture with the private mining companies involved in tactical and detailed prospecting.

Current mining operations in the OMVG basins are limited to construction materials, industrial clays (ceramics), bauxite, industrial gold and artisanal gold. Mining products, notably gold and bauxite, are exported in raw form, without any added value. This has two consequences which are increasingly decried by governments: on the one hand, it contributes little to the economic development of countries and, on the other, it hinders the industrialisation of economies.

The quantities of gold produced artisanally in 2019 in Guinea (25.47 tonnes) and in Senegal in the Gambia River basin (4.3 tonnes) are considerable. However, gold panning areas are very often the scene of sometimes violent conflicts between the gold panners themselves, between the gold panners and the companies holding industrial mining concessions and finally between the gold panners and the States and their subdivisions. These conflicts arise from the difficulties of the states in regulating the activities of gold miners by making them respect the mining codes in force. In particular, the dredging of rivers and the clandestine use of polluting substances (cyanide, mercury) to improve gold recovery rates are still common knowledge. In addition to the negative impact on the environment, water resources, biodiversity and soil, gold panning, including river dredging, also affects the health of the population, including women and children, whose work in the mines is prohibited. Governments are aware of the socio-economic importance of EMAPE, coupled with the strong degradation of the environment and human health, and must tackle the problems of the sector head on, organising it in line with its socio-economic importance in order to make it a sustainable activity, respectful of the environment and human health.

Industry is poorly developed in the OMVG region because the economy is essentially based on the export of raw materials, particularly mining and agricultural products. The weakness of industrial activity, despite the existence of significant potential, is also due to the inadequacy of electrical infrastructure and the isolation of regions with high agricultural potential that are supposed to supply agro-industrial units with raw materials for processing. Governments are aware of the urgent need to link industrial development to processing throughout the value chain of mineral and agricultural resources. To this end, it is recommended to proceed with the establishment of processing units for agricultural products and the organisation of marketing and export circuits for value-added products. In addition, the State is increasingly willing to integrate a value-added component into mining projects, following the example of bauxite mining projects in Guinea, for which the President of the Republic has instructed that the production of alumina and aluminium metal be considered.

The 2040 Vision of making the handicraft sector in the OMVG area an engine of inclusive economic and social growth must be backed by the valorisation of local raw materials to satisfy the essential needs of the populations and exports, so that the sector can contribute to the economic and social development of the countries. It is recommended that the state authorities give high priority to the development of local know-how in various sectors (sewing, shoemaking, jewellery, carpentry, pottery, etc.), the promotion of arts and crafts and export-oriented activities, through the supervision and training of actors, support for financing and promotion of the sector.



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