



REPUBLIC OF MALI
MINISTRY OF ENERGY AND WATER



NATIONAL DIRECTORATE OF ENERGY

SREP MALI - INVESTMENT PLAN

Scaling Up Renewable Energy



Volume I: Investment Plan
Annexes

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List of Acronyms and Abbreviations

AfDB	African Development Bank
AMADER	Mali Agency for Domestic Energy and Rural Electrification
AMARAP	Mali Radiation Protection Agency
ANADEB	National Agency for Bio-fuel Development
ANICT	National Territorial Communities Investment Agency
API	Investment Promotion Agency
CDM	Clean Development Mechanism
CIF	Climate Investment Funds
CNESOLER	National Solar Energy and Renewable Energies Centre
CREE	Electricity and Water Regulatory Commission
DNE	National Energy Directorate
EDM	<i>Energie du Mali SA</i>
FER	Rural Electrification Fund
GDP	Gross Domestic Product
GHG	Greenhouse Gas
GIZ	German Technical Cooperation Agency
GoM	Government of Mali
GWh	Giga Watt per hour
HV	High Voltage
IAEA	International Atomic Energy Agency
IEA	International Energy Agency
IFC	International Finance Corporation
IP	SREP Mali Investment Plan
KMS	Knowledge Management and Sharing
KWh	Kilo Watt per hour
LV	Low Voltage
MDBs	Multilateral Development Banks
MV	Medium Voltage
MWh	Mega Watt hour
NGO	Non-Governmental Organization
PANA	National Program of Action for Adaptation to Climate Change
PEN	National Energy Policy
PNPE	National Environmental Protection Policy
PRSP	Poverty Reduction Strategy Framework
PV	Photovoltaic
RE	Renewable Energies
RGPH	General Population and Housing Census
RI	Interconnected Grids
SDA	Supply Master Plan
SIE	Energy Information System
SOGEM	<i>Société de Gestion de Manantali</i>
SREP	Scaling Up Renewable Energy Program
SSD	Decentralized Service Company
UNDP	United Nations Development Program
UNFCCC	United Nations Framework Convention on Climate Change
USAID	United States Agency for International Development
VAT	Value-Added Tax
WAEMU	West African Economic and Monetary Union
WB	World Bank
ZEM	Multi-Sector Electrification Zone



Executive Summary

Introduction

1. **SREP-Mali Investment Plan.** The main objective of the Scaling-Up Renewable Energy Program in Low Income Countries (SREP) is to demonstrate in selected countries, the economic, social and environmental viability of low-carbon development path with a view to increase energy access, by using renewable energy and creating new economic opportunities. The SREP will stimulate economic growth through the scaled-up development of renewable energy solutions. It will act as a catalyst for the transformation of the renewable energy market by obtaining support from the Government of Mali (GoM) for market creation, private sector implementation, and productive energy use.

2. Mali has been selected as one of the six countries to benefit from the SREP. The rationale of this choice is, on one hand, the nature and the scope of the climatic, environmental, demographic and energetic problems it faces, and, on the other hand, the significant efforts already made by the Government of Mali (GoM) to meet key energy challenges. The SREP Expert Group's report highlights in particular: (i) a low rural access to electricity; (ii) a sound institutional base for solar photovoltaic (PV) implementation; (iii) a positive track record in developments to date; (iv) a potential for productive use of energy in agriculture and small commercial entities; and (v) sustainable biomass and biodiesel programs in place.

3. The SREP Mali Investment Plan (IP) has been prepared under the leadership of the GoM, represented by the Ministry of Energy and Water, and by different specialized national agencies. It is therefore a country-led program, in line with key strategies of the national energy sector, as well as with the main principles of its *Growth and Poverty Reduction Strategy* and the *National Climate Change Strategy*. It proposes a coherent programmatic approach for transformational changes and promotes both public and private sector operations to remove barriers that might otherwise prevent scaled-up investments.

Key Constraints and Challenges of the Energy Sector

4. **Sector Challenges.** At present, the energy sector in Mali is facing a number of challenges:

- The sector is characterized by a high dependence on oil, whose importations are constantly increasing due to the demands of a fast growing population (doubling every 25 years) and economic growth. This is exposing the economy at a whole to the volatility of oil price and putting the economy under foreign reserves pressure. Local energy service providers in rural areas that are operating isolated fossil fueled mini-grids are in particular affected by rising and volatile fuel prices, as well as considerable fuel transport costs inside Mali.
- About 80% of household energy needs are satisfied by biomass resources (wood and charcoal), which causes health problems among the rural population through indoor air pollution, and aggravates environmental degradation such as deforestation and land degradation.

- Electrification rates are still very low, especially in rural areas (14.89% of rural towns and villages *versus* 55.27% in urban centers), and most households in rural areas satisfy their energy needs by using kerosene and batteries, which are expensive and unreliable. The power transmission and distribution system is mainly managed by EDM and local energy service providers operating in public private partnerships with national agencies in isolated rural areas. The projected expansion of the national electricity grid is unlikely to connect a large number of isolated low income populations in the next decade, thus creating a considerable market for isolated off-grid rural electrification schemes.
- Current regulations do not adequately promote the private sector from being fully involved in the energy sector, though the local private sector has been increasingly involved for rural electrification in the past five years.
- The impacts of climate variability are making the country's electricity supply, which depends on hydroelectric power for more than 55 percent of its on-grid supply, increasingly vulnerable. Climate change is expected to exacerbate this situation further and to impact biomass production as well.

5. From a social point of view, inadequate access to affordable energy is limiting social opportunities for the poor, women and the youth in particular; gender disparities in access to energy are drawing back social development of communities, in particular in rural areas.

6. Renewable energy has a significant potential to play an important role in addressing many of these sector challenges as well as to contribute to socio-economic development and poverty reduction. However, at present, it represents only 3% of electricity generation (excluding hydro generation above 10 MW), its development remains slow, and it is expected to reach only 10% of the generation-mix by 2015 (National Policy target), in spite of considerable solar, hydro and biomass potential throughout the country.

7. ***Constraints to Renewable Energy Development.*** In this context, the GoM has set specific objectives to achieve a rural electrification rate of 55% and a 10% contribution of renewable energy to the country's energy mix by 2015. Nonetheless, there are a number of major constraints to achieve these goals:

- Institutional: Coordination among proliferating agencies concerned with renewable energy development; weak planning processes; incomplete framework for public-private partnerships, in particular for utility scale IPPs.
- Economic and financial: Weak domestic financial institutions; high up-front cost of renewable energy technology; inadequate financial incentives to attract the private sector; weak canalization of finance from international sources for larger scale RE development.
- Technical: Limited capacity of human resources in the sector. Limited studies and impact assessments on REs for electricity generation do not yet create adequate conditions for a robust, standardized and programmatic approach to Res.

- Social: Inadequate provision of information and awareness of consumers on renewable energy opportunities and challenges. Poverty of Malian rural households leads to difficult affordability, access and use of modern REs without subsidy schemes.

Key Achievements

8. In Mali, over the last ten to fifteen years, a number of key achievements were made. Among them, the most important are the following:

- Technological achievements. A number of technologies have been tested with successful results (hydroelectric dams, solar photovoltaic pumping systems, public lighting, refrigeration, telecommunication systems, and water heaters among others). Additional promising technologies have been identified and are ready to be further developed (household biogas systems, industrial biogas systems, and biofuel production among others). Solar energy systems have been successfully introduced in the last decade, namely with the support of the World Bank (WB), the Global Environmental Facility (GEF) and the Rural Electrification Fund (REF). It is worth mentioning that nearly 10 % of rural energy supply is nowadays provided by renewable energies.
- Policy achievements. The GoM's vision and targets have been formulated in key policy papers. These are: (i) the *National Energy Policy* (2006); (ii) the *National Strategy for the Development of Renewable Energies* (2006); (iii) the *National Strategy for the Development of Biofuels* (2006); and (iv) the *National Energy Sector Policy Letter* (2009-2012).
- Institutional achievements. In recognition of the crosscutting dimension of energy, Mali has created and strengthened a number of institutions that play key roles in the development of the renewable energy sub-sector. The Prime Minister Cabinet is directly involved through the supervision of the Commission for Electricity and Water Regulations and of a number of departments and agencies. The National Energy Directorate (DNE) formulates national energy policies and ensures the coordination and technical supervision of regional and sub-regional departments. Electricity services are essentially provided by EDM and by local private energy companies supported by the AMADER and the Rural Electrification Fund. Other important institutions in the sector include the National Research Center for Solar and Renewable Energy (CNESOLER) and the National Agency for the Development of Biofuels (ANADEB).
- Environmental and Social achievements. Environmental and social impacts of energy projects follow standard national review procedures under the Ministry of Environment; safeguard frameworks acceptable to MDB requirements are in place for rural energy projects. A *National Climate Change Strategy* has been finalized in September 2011. Considerable potential for gender specific activities in rural electrification, that are inherently linked to productive energy uses and the strengthening of the public private partnership between local energy service providers and national agencies, are been identified in a gender assessment financed by World Bank and will be further strengthened under the IP.
- Rural energy access expansion achievements: The GoM launched an ambitious rural energy access program in the last decade to achieve the rural electrification goals set in the *National Energy Policy*. In rural areas, private local energy companies and local initiatives (communities, women

associations), with support from AMADER, are the drivers of Mali's successful rural energy access agenda. Mali's rural energy access rate increased correspondingly from 1 % in 2000 to 15 % in 2010. It is estimated that about 10% of rural energy services are provided from RE, including mainly small scale applications such as Solar Home Systems (SHS).

9. ***Scaling-up key renewable energy technologies as part of the SREP-Mali Program.*** The proposed renewable energy technologies to be scaled up under the SREP program comprise solar PV, mini-hydro, and bio-fuel technologies, with a focus on electricity production and productive energy uses. The proposed RE technologies under the SREP program aim to account for Mali's specific renewable energy potential (solar potential is abundant in all regions, while sustainable hydro and bio-energy uses are mainly limited to areas south of the Niger river). The proposed program activities will (i) build on the above mentioned technology, institutional, policy and environmental achievements, while also addressing the constraints identified, (ii) contribute to a geographically equitable scaling up of renewable energies in the country's energy mix, and (iii) be used to pilot and scale up a number of different business models to make sure on-grid and off-grid electrification will be implemented in a sustainable manner, including increased private sector participation.

Program Description

10. ***Identifying the Program through an Inclusive Process.*** The SREP Mali is the result of an inclusive and participatory process, which included an in-depth diagnostic study, the organization of two national workshops, extensive consultations with different public and private stakeholders, both at national and local level with the assistance of Multilateral Development Banks (MDBs) and the UN System. The SREP aims at creating the conditions for implementing a programmatic approach for renewable energies. To be established over a period of 5 years, the SREP was progressively built on:

- Initial identification of *five priority areas* for the development of renewable energies in Mali (eventually validated by key stakeholders and endorsed by the SREP National Commission), namely: (i) Institutional, legal, regulatory and strategic frameworks; (ii) Research and analytical studies on renewable energies; (iii) Sensitization, information and capacity building of key stakeholders; (iv) Prioritization of investments; and (v) Knowledge management and lessons sharing.
- Successive identification of *three strategic axes* for the SREP to better operationalize the above priority areas. These are: (i) sustainable investments, (ii) policy and institutional strategies, and financial and regulatory frameworks, and (iii) knowledge management and capacity building. Key program activities have been defined for each strategic axis; the investment projects have been built around these key activities.
- Finally, the design of *three investment projects*, supported by a program Strategic Coordination Mechanism, to respectively stress: (i) the key role of the private sector in promoting renewable energy and promote adequate actions to remove barriers inhibiting the scaling-up of private sector investments (*project one*); (ii) the need to increase electricity access and the proportion of RE in rural areas through standardized business models for solar PV and biofuel hybrid mini-grid schemes (*project two*) and through mini/micro hydroelectricity (*project three*). Although distinct,

these three projects will harmoniously target proven technologies and best practices that will allow productive use of energy and improve the livelihoods of Malian populations.

11. **Program Development Objective.** The Program Development Objective (PDO) is to develop renewable energies on a large scale, to attain poverty reduction and reach sustainable development. Consistent with the SREP Programming Modalities, the proposed program aims at creating a framework that brings transformative change to low carbon energy pathways and fosters renewable energy development. The objective will be achieved through (i) the provision of technical assistance to the improvement of the policy and regulatory framework, (ii) capacity building activities, (iii) new public-private partnerships, sustainable investments, new economic opportunities, (iv) improved access to energy services by rural populations, especially in poor areas and (v) the reduction of greenhouse gas (GHG) emissions.

12. **Expected Results, Catalytic Replication Outcomes and Transformational Effects.** SREP investments will not only support new projects but also the scaling up of various successful past pilot projects, to make a significant contribution to the country's voluntary commitments to reduce GHGs emissions, in a context of climate change and variability.

13. The main expected results and catalytic replication outcome of the program are the following (see section on monitoring and evaluation for more information):

- The conditions of access to and use of electricity by Malian populations are improved.
- Increase in the supply of GWh from renewable energies.
- Production costs of renewable energy are reduced.
- The share of renewable energy (%) in comparison with the country's energy mix is increased.
- The proportion of rural and urban population with access to renewable energy is increased.
- The enabling environment is improved through the optimization of the legal and regulatory framework and the increased capacity of relevant government authorities in carrying negotiations with the private sector.
- Jobs related to the adoption of renewable energy are created in targeted areas (for men and women).
- A system of knowledge management and information sharing is put in place at national and international levels.
- Additional financial resources for renewable energy are mobilized.

14. SREP investments made in private sector-led projects (Project 1) are expected to provide a catalytic effect for the development of large, privately sponsored, renewable energy projects. By enabling the first such project to take place, the SREP will allow all actors (private and public sector) to learn how to implement a successful project in a Malian context, therefore reducing the costs associated with these activities for future projects.

15. Public sector-led SREP investments (Project 2 and Project 3) will target rural electrification through renewable energies, enabling displacement of part of generation provided through fossil fuels. They will (i) create an environment conducive to attract an increasing number of local and international

private investors by strengthening the regulatory framework, (ii) pilot and standardize different business models to make sure grid and off-grid electrification will be implemented in a sustainable manner in rural areas, (iii) and contribute to the introduction of clean and low cost technologies in different regions in Mali, thereby promoting productive energy uses, stimulating the creation of jobs for isolated low income populations, contributing to the MDGs and reducing GHG emissions.

16. **Investment Projects.** The SREP program will be made up of three distinct and complementary investment projects that will add about 38.6 MW to the national installed capacity:

- (a) Project 1: Solar Photovoltaic IPP Project. The project will increase the contribution of renewable energy sources to the sector and will pave the way for the development of future Independent Power Producers (IPPs) in the country. Overall, this project aims to demonstrate the technical, social, economic and environmental feasibility of an integrated and self-sufficient energy model in Mali. Its proposed budget will amount **at about USD 60 million** (USD 12 million SREP contribution). SREP allocation will be mainly used to decrease costs through buy-downs. The project is expected to implement an overall additional generation capacity of around **20MW** (utility-scale). In addition to infrastructure investments, the project will ensure the provision of technical assistance specifically related to IPP projects.
- (b) Project 2: Hybrid Rural Electrification Project. The objective of this project is to support the GoM's efforts to increase access of isolated low income populations to basic energy services to help achieve economic growth and poverty reduction targets. SREP funds would evaluate and standardize the business models adopted for mini grid extensions in isolated rural areas. In particular, this project aims to accelerate renewable energy development through the development of a diversified portfolio of energy services managed by local energy service providers in isolated rural areas (hybrid minigrids, off grid lighting, energy efficiency, operation and maintenance). The SREP contribution to this project will be USD15.5 million for a total budget of **about USD 57.9 million**. SREP funds will mainly be used to provide targeted subsidies to decrease upfront capital investment costs of solar PV and biofuel technologies, thereby confirming reduced life cycle costs of electricity generated in rural areas. The project is expected to increase the renewable energy installed capacity (additional **4MW**) in the existing off-grid power stations and gradually expand the construction of renewable energy fueled mini-grids. In addition to infrastructure investments, the project will support capacity building initiatives targeting implementing capacities of local private sector companies/initiatives and initiating economic activities and productive energy uses relying on electricity services in rural areas.
- (c) Project 3: Micro/mini Hydroelectricity Development Project. The project will increase the share of renewable energy in the national system of electricity production and distribution (generating additional **14,6MW**) with a focus on rural electrification. By supporting the construction and operation of four micro and two mini-hydropower plants and their respective transmission lines, the project will benefit thousands of rural households, create new economic activities, decrease the cost of electricity, and reduce GHG emissions. SREP contribution amounts at USD 10 million for a total budget of **USD 136.5 million**. SREP funds will be used to decrease upfront capital investment costs of mini/micro hydropower plants. In addition to infrastructure investments, the project will strengthen the enabling environment conducive to the development of micro/mini-

hydropower plants in Mali, and undertake capacity building activities specifically related to mini/micro hydroelectricity in the context of rural electrification.

17. In addition, a **Strategic Coordination Mechanism** will aim at providing strategic coordination to the program, by ensuring that the three proposed investment projects do not operate as separate entities outside a programmatic approach defined by the GoM. The proposed mechanism will ensure that information on best practices and lessons learned will be shared at national and international levels, and that opportunities of renewable energy will be fully understood by the public. The budget of the Strategic Coordination mechanism is estimated at **USD4 million**, including a USD 2.5 million SREP contribution. This Strategic Coordination Mechanism will implement activities such as: knowledge management/lessons-sharing, communication and advocacy; monitoring and evaluation at the program level; and cross-sectoral capacity building.

Sources of Funds and Rationale for SREP Financing

18. **SREP-Mali estimated budget.** The SREP-Mali will adopt a pro-active strategy to mobilize additional required funding from the participating MDBs as well as from other development partners. The estimated total budget for the first phase of the SREP-Mali Program is **USD 258.4 million** with an SREP contribution of USD 40 million. The GoM wishes to benefit from its SREP allocation as USD40 million grants.

Sources of Financing for the First Phase of the Program (in USD million)

Project	GoM	SREP	AfDB	AfDB PS	WB	IFC	Private Sector	Other Sources*	Total
Solar PV IPP	-	12.0	-	15.0	-	15.0	18.0	-	60.0
Hybrid Rural Electrification Project	3.1	15.5	-	-	16.2	-	5.0	16.2	57.9
Mini/Micro Hydro. Project	10.0	10.0	25.0	-	-	-	15.0	76.5	136.5
Strategic Coordination Unit	1.0	2.5	-	-	-	-	-	0.5	4
Total	14.1	40.0	25.0	15.0	16.2	15.0	38.0	93.2	258.4

* Including other development partners, Trust Funds, Carbon Credits, etc.

19. **Reserve funds under SREP.** Reserve funds in Mali would be used to complement SREP projects under implementation by providing additional technical assistance, capacity building, and financial resources based on the results achieved during SREP preparation and implementation and focusing on mitigating remaining barriers identified. The GoM envisages tapping into SREP reserve funds in an estimated amount of USD 20 million as they will become available and are approved to the SREP pilot countries. Detailed proposals for reserve funds allocations will be transmitted for consideration by the SREP Sub-committee in due time.

20. **Rationale for SREP financing.** Regarding the private sector project, it is clear that without SREP financing, this infrastructure development could be delayed by a number of years and any tendering program at this later time would be far less attractive to the bidders, without the same level of public sector support. Under current financial conditions, the photovoltaic option is unlikely to be able to compete with traditional forms of power generation. While operation and maintenance costs would be lower over time, the higher capital costs constitute a serious financial barrier for non-recursive financing or even for public sector investment. In order to make the projects economics interesting to a private sponsor, and to bring the electricity tariff under the PPA down to competitive levels, the average cost of financing (including lenders and SREP resources) shall be small enough. Therefore, SREP allocation will be used as a capital cost buy-down.

21. Regarding the public sector projects, as many rural localities won't be targeted for an economically viable connection to the electricity grid in the next decade, SREP funds will be crucial to continue to systematically expand the GoM's rural electrification agenda. Traditional forms of power generation (thermal plants) being more and more expensive in terms of operating costs, renewable energies become a more attractive option. However, investment costs are still very high and such projects can be considered only with MDBs concessional loans and SREP grants that can lower down the associated costs and make the projects viable. With SREP grant funding made available in addition to MDBs contribution, the program will get more attractive for other donors/investors to finance the proposed projects.

Results Framework

RESULT	INDICATOR	BASELINE	TARGET
SREP Mali Transformative impact			
Transformed energy supply and use by poor households in Mali, to low carbon development pathways	a) Level of household "energy poverty" b) Percentage (%) of energy services from modern, and low carbon REs c) Percentage (%) of population (rural/urban households) consuming energy services from RE sources (country level) d) Change in the Energy Development Index	[TBD]	[TBD]
SREP Mali Catalytic Replication			
1. Increased in RE investments	a) Percentage (%) of RE investment of total energy sector investment b) Percentage (%) of private sector RE investments of total energy investments	[TBD]	a) At least 55% by 2022 b) At least 30% by 2022
2.Strengthened Enabling environment for renewable energy production and use	a)Adoption of and implementation of low carbon energy development plans b)Enactment of policies, laws and regulations for renewable energy	1 National Energy Policy 2 National Strategies (RE/Biofuels)	2012/2013 : PEN updated By 2022 : 2 add nat. plans for low carbon develpm. 2012/2013 : RE strategy updated, Orientation Law 2015 : Biofuel strategy updated By 2022 : At least 2 add bills & regulat. completed
3. Increased economic viability	a) Change in percentage (%) of total investment in	[TBD]	[TBD]

of RE sector	RE sector from private sector b) Change in percentage (%) of total energy sector employment working in RE (women/men) c) Cost of renewable energy USD/MWh compared to cost of fossil fuels USD/MWh over time		
4. Increased energy security	Increase in percentage (%) of total energy supply from renewable sources in the power industry and in the energy sector	3% of total energy supply from REs (for electricity sector) 10% of total energy supply from REs (for the energy sector)	10% by 2022 15% by 2022
5. Improved respiratory health of women, men, girls, and boys	Prevalence of Acute Respiratory Infections (ARI) (in children under 5 years) (rural/urban)	[TBD]	[TBD]
SREP Mali Projects Outputs and Outcomes			
1. Increased access to RE energy by Malian rural households	Number of targeted households with access to energy services from RE (women/men)	[TBD]	[TBD]
2. Increased GWh of RE energy services	a) % change in number of GWh from RE and per household b) Number of jobs in RE services created (women/men) c) % change in tones (millions) of CO ₂ – equivalent at USD per tone	[TBD]	a) + 10% /per year from 2014 onwards b) 3000 direct and indirect jobs c) [TBD]
3. Decreased cost of electricity from RE	Percentage (%) change in USD cost / GWh of RE for project beneficiaries grid-connected	[TBD]	[TBD]
4. Knowledge management and sharing	a) Number & type of knowledge assets created b) Number of non-SREP countries replicate SREP project approach (e.g., investment documents citing SREP pilot project documents)	Baseline: 0	a) + 35 products by 2016 b) +2 countries in the sub-region
5. New and additional resources for renewable energy projects	Leverage factor of SREP funding; USD financing from other sources	[TBD]	2012 : \$10,000,000 2014 : \$30,000,000 2016 : \$60,000,000 (cumulative)

Section I:

National and Energy Sector

General Context

22. **Geographic and climatic context.** Mali is a landlocked country in the Sahelian belt, West Africa. It covers an area of 1,241,248 km², of which 51% are desert lands and 4% arable lands¹. Such geographic situation, combined with the fact that Mali does not have any fossil fuel on its territory, forces the Government to import all the fossil fuel it needs and makes it highly dependent on prices volatility.

23. The climate, highly variable, is characterized by a long dry season and a rainy season averaging one month in the North (in the Timbuktu region) to 5 months in the South (in the Sikasso region). Rainfall ranging from 1,200 mm/year in the Sudano-Guinean zone to 200 mm/year in the Saharan zone) has resulted in a climatic stratification of the country into four main zones corresponding to four ecological zones with a highly diversified agricultural potential. Historical data indicate a rise in average temperature of about 0.7 degrees Celsius since 1960 and projections point to a continuation and acceleration of this rise as well as a decrease in the overall amount of rain (with more frequent extreme events such as floods)².

24. Electricity generation is vulnerable to climate variability since a significant portion of the supply, in the EDM SA network, comes from hydro power plants (57.3%)³. However, it is worth noting that the water system is made up of two large rivers, namely the Niger and the Senegal, forming immense watersheds (300,000 km² for the Niger, and 155,000 for the Senegal). The total flow potential of these two river systems is estimated at 56,000,000,000 m³ per year and the country's estimated hydro potential is currently nearly 1GW.

25. **Socio-economic context.** Mali has an estimated population of 14,517,176 (with an average annual growth of 3.4%)⁴. The majority of the population (about 73%) live in rural areas. The urbanization rate is 26.8% but growing steadily. Growing population is a major concern for the country's future since it implies a strong increase in basic needs, which will translate into additional pressure on energy production⁵. This also implies that a significant portion of the GoM's budget will need to be devoted to non-productive sectors (for example the share of the budget for education has steadily increased in recent years)⁶.

26. Over the last decade, Mali has made significant strides in the economic, political, and social spheres. The Gross Domestic Product (GDP) trebled in less than 10 years from USD 2.43 billion in 2000 to USD 8.74 billion in 2008, then to USD 9.70 billion in 2010⁷. Mali's economy is dominated by the primary

¹ Source: www.fao.org

² See: http://country-profiles.geog.ox.ac.uk/UNDP_reports/Mali/Mali.lowres.report.pdf

³ EDM.SA 2010 activity report

⁴ All figures given in chapter 1 concerning Mali's demographic profile are taken from the Fourth General Population and Housing Census of 2009.

⁵ The rising demand for electricity might lead to power outages in the years to come if the generation capacity is not enhanced.

⁶ In the last decade, public spending for education increased sharply. Between 1995 and 2005, the general education budget quadrupled. (Source: www.odi.org.uk)

⁷ For 2010, according to IMF estimates. See: www.imf.org/external/country/ML/index.htm

sector, which accounts for 36.5% of GDP and employs nearly 85% of the working population. The electricity and water subsector accounts for 1.91% of GDP⁸. Mali's governance indicators are quite good⁹ and the country is one of the most politically stable in West Africa. Some social indicators such as the children's enrolment rate¹⁰ in school are improving.

27. Despite this generally favourable trend, Mali remains one of the poorest countries in the world and is ranked in the 160th out of 169 countries¹¹. In 2010, GDP per capita is estimated USD 1,251¹² while the world GDP per capita is estimated USD 10,700. Most of the Millennium Development Goals are expected not to be achieved by 2015. Despite efforts in recent years and on-going major projects, Mali must still address major inadequacies in terms of access to basic services (water, sanitation and waste collection).

28. **Energy as a key sector for the country's sustainable development.** The GoM has developed its medium term development strategy in the national *Growth and Poverty Reduction Strategy Paper* (namely CSCRP). In the CSCRP 2007-2011, the energy sector is considered as a key support sector for the development of the country, as part its third pillar "Infrastructure Development and Support to Productive Sectors". The GoM is currently finalizing its new CSCRP 2012-2017, with the following overall objective: *Make Mali an emerging country and an agricultural power with good quality of life for its population*. To achieve this goal, the energy sector must be strongly developed, especially the renewable energy sub-sector that has great potential to be scaled up in the country.

Energy Sector Context

National Energy Sector Policy and Objectives

29. **National Energy Policy.** Mali's energy sector is governed by the *National Energy Policy* (PEN), adopted in 2006. The overall objective is to contribute to the country's sustainable development through the provision of affordable energy services in order to increase access to electricity and promote of socio-economic activities. The specific objectives of the *National Energy Policy* are: (i) meeting the energy needs in quality, quantity and cost; (ii) ensuring the protection of persons, property and environment against the risks of inappropriate energy services; (iii) strengthening the capacities of policy, management, monitoring and control of the energy sector; and (iv) strengthening the benefits of international cooperation in the field of energy. In terms of guiding principles, these are based on decentralization, liberalization, a programmatic and participatory approach, competitiveness and on the implementation of public-private partnerships. The PEN constitutes a tool for: (i) establishing a better match between energy availability and national socio-economic development; (ii) fostering synergies between the activities of major stakeholders in the energy sector; (iii) effectively directing the interventions of public, parapublic and

⁸ DNTCP/MF; recent trends of Mali's major macroeconomic and financial indicators and the 2011/2012 outlook. November 2010.

⁹ According to WB's *2010 Country Policy and Institutional Assessment (CPIA)*, Mali is in the first quintile of countries.

¹⁰ Primary enrolment rate for the 2005 – 2009 period was 79% for boys and 66% for girls (Source: www.unicef.org/french/infobycountry/malistics). The Educational Policy Letter of Mali 2010 – 2012.

¹¹ UNDP Human Development Index 2010.

¹² World Economic Outlook Database-April 2011, International Monetary Fund.

private actors of the energy sector for a rapid, balanced, and sustainable development of the country; and (iv) ensuring a better balance between energy supply and demand with a view to improve access to electrification and reduce geographic unbalances between the grid and off-grid areas covered.

30. **Other policies and strategies.** Besides the PEN, a *National Energy Sector Policy Letter*, a *National Strategy for the Development of Renewable Energy*, a *Rural Electrification Framework* and a *National Strategy for the Development of Biofuels* are further specifying the GoM's visions and objectives for the development of the energy sector. Furthermore climate change related policies and adaptation strategies have been recently put in place. These policies and strategies will be described further in Section II.

Key Characteristics of the Energy Sector

31. **High dependence on fossil fuel imports.** Mali's oil and gas subsector is characterized by total dependence on petroleum imports. This is exposing the economy at a whole to the volatility of oil price and putting the economy under foreign reserves pressure, including the development of the energy sector. Annual imports represented 710,642 tonnes in 2010, for over USD 722.75 million. Volume of fuel consumption of the utility EDM SA tripled in the period from 2005 to 2010. From 2009 to 2010 volume of fuel consumption increased considerably by 23.7%.¹³ Current economic growth (4.4% in 2009)¹⁴ requires rapid increase of energy generation that will comprise the construction of new thermal power plants¹⁵. Local energy service providers in rural areas that are operating isolated fossil fueled generators and mini-grids are in particular affected by rising and volatile fuel prices, considerable fuel transport costs inside Mali, and environmental pollution (GHG emissions, noise pollution) in the rural villages. Fuel charges currently amount to up to 75-80% of operational expenditures for local energy service providers in rural areas. In view to enhance energy security, the GoM is keen to reduce fossil fuel imports and embark on a low carbon emission development path for both grid and off-grid electrification schemes.

32. **Energy consumption dominated by traditional biomass sources.** Regarding traditional energy sources, the fuel wood resource – the most important source of household energy¹⁶ - is derived from the country's forests, whose capacity is estimated at nearly 33 million hectares, with 520 million m³ of standing trees. In a country that is vulnerable to climate change and where the degradation of land and natural resources constitutes a major problem, the fuel wood resource cannot provide an adequate response to growing energy needs. The uncontrolled logging has resulted in the implementation of a set of reforms aimed at preserving the forest resource (Forestry Code and Supply Master Plan). The implementation of a fuel wood supply and control system has fostered the organization of the commercial industry (logging, transportation, and distribution), further translating into the creation of the 'Rural Wood Market' system. To date, the long-term sustainability of these markets is still challenged by the existence of parallel and uncontrolled markets. Pressure on the country's forests and wood markets will

¹³ EDM SA business report 2010

¹⁴ DNTCP/MF; Recent Trend of Mali's Macroeconomic and Financial Indicators: Outlook for 2011-2012. November 2010

¹⁵ The recent thermal plants include notably; the Kayes and Kita plants in 2002, CAT (2, 4, 6) in 2006, the Balingué plant (Indian generators) in 2007, the BID and SOPAM plants in 2010. Part of the thermal energy is also imported from Nouakchott (AGGREKO) since 2007.

¹⁶ According to the Population and Health Survey, 4th edition (2006) (ESDM IV), 5.3% of rural households compared to 40% in the urban area use charcoal as fuel; 91.2% of rural and 55.1% of urban dwellers use firewood.

continue to be high if no alternative, sustainable and affordable energy sources are introduced, in particular in rural areas in synergies with potentials for productive energy uses and employment creation.

Key Characteristics of the Electricity Sub-sector

33. Key energy sector institutions.

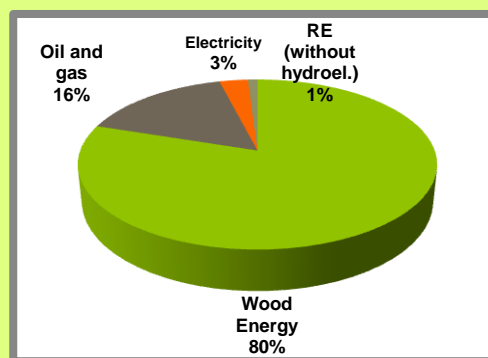
Electricity is supplied by: (i) EDM - the state-owned utility; (ii) decentralized private energy services companies and local initiatives supervised by the rural energy national agency AMADER; (iii) independent auto-producers (mines, other industries and private producers), under a licence. The Electricity and Water Regulatory Commission (CREE) regulates the electricity and water sector, while off-grid energy service providers with generation systems below 250 kW are regulated by AMADER.

34. Electricity supply. Mali has started to exploit its hydroelectric potential, based on the Senegal and Niger River systems (estimated at about 1,500 MW capable of producing 5,000 GWh per year on average). Of this potential, about 250 MW have been developed so far: Selingué and Sotuba dams on the Niger River, Manantali dam on the Senegal River (whose output is shared with Senegal and Mauritania). Also on the Senegal River, the Félou hydro power plant is under construction and will bring about 135GWh of additional generation for Mali. In addition, in order to meet peak demand, Mali has invested in two medium sized thermal generation project (HFO plants) for a total of 90 MW. Malian grid is already regionally interconnected to Mauritania and Senegal. An interconnection with Cote d'Ivoire is under construction. Increased regional integration could lower the cost of power in the medium term and allow Mali to purchase power from Cote d'Ivoire (hydro and gas-fired) and Senegal (coal-fired power plant).

35. Electricity demand growth. Electricity demand in the interconnected network is growing annually by 10%.¹⁷ From this percentage, only 2% correspond to household energy consumption. Demand estimates for rural areas are not available in national statistics, and projected as much higher due to the low rural access rate of 14.89% against urban access rate of 55.27%. Keeping up with the increase in demand represents a significant challenge for the sector. The GoM's ongoing energy access program involves expansion of both grid and off-grid renewable and non-renewable sources of energy to face the

Figure 1: Energy Consumption in Mali

The 2008 energy balance indicates that total national energy consumption represents about 2391 ktoe, between biomass (fuel wood and charcoal) (80%), petroleum products (16%), electricity (3%), and, lastly, renewable energies (other than hydroelectricity) 1%.



In 2007, final energy consumption was 0.20 toe/per capita whereas the African average was 0.5/per capita. The volume of biomass used in Mali as energy source is 60% above the African average.
(Source: 2009 SIE Report)

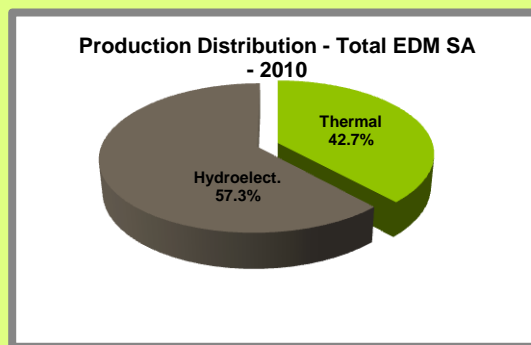
¹⁷ Estimation of the growth of the demand in urban areas. There are no estimations of the growth of the demand in rural areas (although it is largely greater).

growing national electricity demand. Going forward, increased regional integration could help Mali meet its energy needs through imports of electricity.

36. **Low rural energy access.** The national electricity access rate is 27.1% in 2010¹⁸. The access rate in urban areas is 55.27%¹⁹, compared to only 14.89% in rural areas²⁰. The latter is low even compared to the African average rural access rate of 22.7%. According to the quantified objectives of the PEN, rural electrification rate is expected to increase from 1% in 2005 to 55% in 2015. As Mali has a very low population density of 12 persons per square kilometre and since villages are often widely dispersed and the main grid is not yet expanding to all major cities, past experience showed that it has been faster and cheaper in Mali to embark on parallel on-grid and off-grid energy access expansion approach, allowing both local private energy service companies / initiatives and the utility to sell electricity to customers in their respective concession areas. Over the last decade, rural energy access increased to 15 % in 2010, showing commitment and a track record of local private energy sector companies and initiatives to carry out the GoM's rural energy access expansion program in public private partnership with GoM's rural energy service agency AMADER. Building on the GoM's commitment to continue an aggressive energy access agenda in grid and off-grid areas in the next five years, the country is currently on track to achieving the objectives set.

37. **On-grid/utility characteristics.** The national utility's generation, transmission, and distribution system consist of two components: (i) the interconnected grid (main grid) connecting a number of urban centres and the capital; and (ii) 21 isolated centres, served mainly by thermal plants operated by EDM (total capacity 56 MW). On the interconnected grid, 57.3% of the electricity is generated by hydro power plants and 42.7% by thermal plants. The share of hydroelectricity in the grid decreased from 80 % in 2004 to 57 % in 2010, because the constructions of key regional/national hydro power plants and regional interconnections were delayed, forcing the GoM to increase costly emergency and thermal power supply in the short term²¹. Investments in key transmission lines is supported by the US\$ 120 million Energy Sector Development Project²² to allow that power generated from additional generation capacity can be evacuated to EDM's customers. There is only one experience in renewable energy (RE) on the EDM grid, namely a hybrid plant (diesel/photovoltaic solar), which was inaugurated in February 2011 (216 KWp). Overall, EDM supplied an equivalent to 1,212.8 GWh in 2010. Emergency thermal power imports thereby accounted for 629 GWh²³. EDM is currently serving about 232 000 LV

Figure 2: Mali Energy Mix (on-grid)



(Source: EDM SA)

¹⁸ Compared to 25.4% in 2008; this stagnation is accounted for by the high increase in the country's population from 1998 – 2009.

¹⁹ Urban electricity access rate decreased significantly by 5 points as a result of urban expansion.

²⁰ In rural areas, access rate rose from 1% to 14.9% in 2010, indicating special effort by the department through AMADER

²¹ The share of hydroelectricity in the entire grid decreased from 80.8% in 2004 to 57.3% in 2010, because less investment is required to build a thermal plant than a hydroelectric plant.

²² See Annex V for further details

²³ However, the PEN estimates indicate a peak power need of 430 Mw by 2015, and 545 Mw by 2020 on the entire EDM grid.

customers, adding about 15 000 LV customers per year over the last 5 years.

38. **Electricity pricing and tariffs (on-grid).** Based on 2010 figures, the average cost of production of electricity by EDM is estimated at USD 0.24/kWh²⁴. Average cost of production in isolated centers is much higher at about USD 0.35/kWh²⁵. Currently, production costs of the utility are estimated at USD 0.07/KWh for the mainly large scale and established hydro generation plants and USD 0.24/KWh for thermal generation plants (diesel and heavy fuel). With support from the Energy Sector Development Project, tariff studies are being prepared by the regulator CREE to account for the tariff implications of the production mix shifting from predominantly low cost hydro generation to more expensive thermal generation. So far, the current financial situation of EDM is weak and adjustments of EDM's tariffs are currently under discussion.

39. **Off-grid characteristics.** In the rural areas, private local energy companies and local initiatives (communities, women associations), with support from AMADER, are the drivers of Mali's rural energy access agenda. The GoM launched an ambitious rural energy access program in the last decade to achieve the rural electrification goals set in the National Energy Policy. The GoM established a rural electrification fund, *Rural Energy Fund* (REF)²⁶ in 2000, and AMADER, a specialized rural energy services agency, in 2003. About 54 000 off-grid connections in households and for public lighting have been made to provide electricity access to more than 750,000 beneficiaries in 2010. In addition about 825 public institutions, 181 schools and 146 health centers have also been provided off-grid electricity access. Mali's rural energy access rate increased correspondingly from 1 % in 2000 to 15 % en 2010. Generation technologies introduced so far are essentially diesel generators and associated transmission and distribution systems, but there are also many SHS introduced and a few pilot hybrid solar/biofuel mini-grids piloted on a project by project basis. The total installed capacity in off grid areas is around 10 MW, with less than 10% accounting for renewable energy uses.

40. **Electricity pricing and tariffs (off-grid).** Private energy service companies are establishing tariffs on the basis of the procedures and framework of the Rural Energy Fund, including business plans and surveys of their customer's willingness to pay for electricity. Different service categories are set up according to rural customer's electricity needs. To allow access to energy services for poor customers, payments of a monthly lump sum for fixed kW consumption (which are between USD5-24) and a monthly contribution to street lighting is defined. Rural energy subscribers with higher power demands are billed according to their metered consumption at a tariff of about USD 0.47/KWh²⁷. Once the connection is made, no operating subsidies for the mini-grid operator or consumption subsidies for the operator's customers are provided. To maintain their commercial viability in the absence of further subsidies, the

²⁴ S. O. Traoré (2009), Development of Renewable Energy in Mali (CNESOR)

²⁵ EDM SA 2008 figure

²⁶ Mali's rural electrification fund was created in 2000 through the application degree 00-019/P-RM. The fund provides financial support, amongst others, for (i) feasibility studies of rural electrification projects; (ii) subsidies to the upfront investment costs of rural electrification projects; (iii) provide guarantees for rural electrification schemes; and (vi) promotes the country's rural electrification agenda through pilot projects, communication and awareness raising campaigns.

²⁷ AMADER billing, Decision 08 on approval of Decentralized Service Company operators' electricity tariffs (Source: AMADER). Based on the rural electrification master plan, capital investment cost subsidies of minimum 70% have been assessed necessary in Mali in order to arrive at average end user tariffs of about US\$ 0.50/kWh (PRODER, 2003). Without capital cost investment subsidies, rural electrification schemes are expected to be 4-5 times above average utility tariffs.

local private operators of these isolated mini-grids currently charge their customers prices that are two to three times higher than the prices charged to social tariff customers by the national utility. Over the last years, the rural energy service agency AMADER recognized a growing demand from local energy service companies to switch to renewable energies as a means to reduce the cost of electricity provided and expand affordable and renewable electricity access in all regions of Mali.

41. **Captive power generation.** Auto-power producers in Mali are mainly mining companies and manufacturing industries²⁸. The equipment generally used is an isolated diesel generator, which has high running costs. Captive power generation in only two main regions of Mali is estimated at 132 MW²⁹, which is equivalent to approximately 40% of the EDM's grid electricity supply. Currently, some agro-industrial industries are starting to green their energy mix, including use of agricultural residues for electricity generation. This method, which is growing, involves the use of rice husks or sugarcane residues, for instance.

42. To summarize, in 2010, the Malian energy mix of the on-grid and off-grid electricity supply is essentially made up of thermal (53.47%), hydroelectricity (46.44%) and solar PV (0.09%) as shown in Table 1 below. Renewable Energies (excluding large hydro > 10 MW) have never been properly and completely accounted for in any analysis, but could represent around 3% of conventional electricity generated, or about 9 MW.

Table 1: Malian Energy Mix in 2010

Category	Installed Capacity (MW)	%
Thermal – National Generation		
○ EDM SA (Grid and isolated centers)	174	50
○ AMADER (off grid areas)	10	3
Hydro		
• Large Hydro (>10 MW) – including regional imports from WAPP	150.2**	45
• Small Hydro (<10 MW)	6.3	1.9
Solar PV (grid and off-grid)	0.33	0.1
Total (National generation)	330.6	100%
Thermal – Imports (Emergency energy supply - Aggrekko)	50	
Total (National generation +thermal imports)	380.6	

*Excluding auto-producers.

**Including only the Malian share (104 MW) of the 200 MW of Manantali.

²⁸ Among captive generators in Mali are, among others, the following: mining societies (Semos, Morila, Syama, Yatela, Sadiola, etc.) and manufacturing industries (CMDT, HUICOMA, BRAMALI, UMPP, etc.).

²⁹ DNE census in 2001. Recently available data (DNE Census of November 2010 related to Energy Information System concerning only two regions (Kayes and Sikasso), indicating a total of 132.82 Mw of installed power: 13.87 Mw by CMDT in the Sikasso Region, 118.95 Mw by mining companies in the two regions (63.6 for Kayes and 55.35 for Sikasso)

Institutional Landscape, Regulatory and Legal Framework

43. **Overview on energy sector institutions and landscape.** Concerning sector institutional landscape, the energy sector in Mali is characterized by the presence of a multitude of actors (Figure 3). The sector is managed by the *Prime Minister's Office* with responsibility for the regulatory organ, namely the Electricity and Water Regulatory Commission, five ministries³⁰, four central technical services³¹ and four personalized departments under the Ministry of Energy and Water³². In particular, the aim of the DNE is to formulate the national energy policy and cater for the coordination and technical control of regional and sub-regional services as well as relevant services that contribute to implementation of the policy.

44. **Energy Sector Policy Letter.** In addition to the National Energy Policy, the sector policy framework is complemented by *the Energy Sector Policy Letter* covering the period between 2009 and 2012. This Letter constitutes a reference and guiding framework of the GoM's energy vision. The main goal is to carry out the necessary adjustments and reforms in the electricity subsector, such as the completion of the restructuring of EDM and tariff reforms, and take steps to ensure its sustainable development. It is focusing on the following main objectives: (i) to provide wide access to rural energy services at an affordable cost; (ii) to develop all available renewable energy sources; and (iii) to promote access to finance.

45. **Rural electrification framework – Rural Energy Service Agency and Rural Energy Fund.** A reference framework for rural electrification development was adopted in 2003 in Mali, leading to the creation of AMADER, with a mandate to promote rural energy services and household energy. A Rural Electrification Fund to promote rural energy access was set up in 2000 and is managed by AMADER since 2005. The Rural Electrification Fund is designed to partially finance specific studies for the development of rural energy projects and to provide targeted subsidies for upfront capital investment costs against clear targets, such as number of connections and capital/operational costs specified in business plans, and provide guarantees and credit lines for rural electrification. Within the REF funds from the Government, local communities, multi-lateral and bilateral institutions are matched, to channel subsidy funding from different sources through a single channel rather than through many separate subsidy channels. Local private sector operators contributed an average 25 % of capital investment costs to isolated mini-grids.

46. **Regulatory framework enabling private sector participation in energy sector.** The regulatory environment is relatively favourable for energy investments in general. It is governed by the following mechanisms: (i) the Rural Energy Fund described above; (ii) Mali's Industrial Development Policy (aimed at an orderly, rapid, sustainable, balanced and employment-generating industrial development); (iii) Public-Private Partnerships (PPPs) Framework (in the form of BOOT schemes)³³; (iv) the Investment Code (establishing a preferential customs and tax regime for the promotion of investments); (v) the role of the

³⁰ Namely: Ministry of Energy and Water (MEE), Ministry of Environment and Sanitation (MEA), Ministry of Economy, Industry, and Trade (MEIC), Ministry of Agriculture (MA), Ministry of Promotion of Women, Children, and Families (MPFEF).

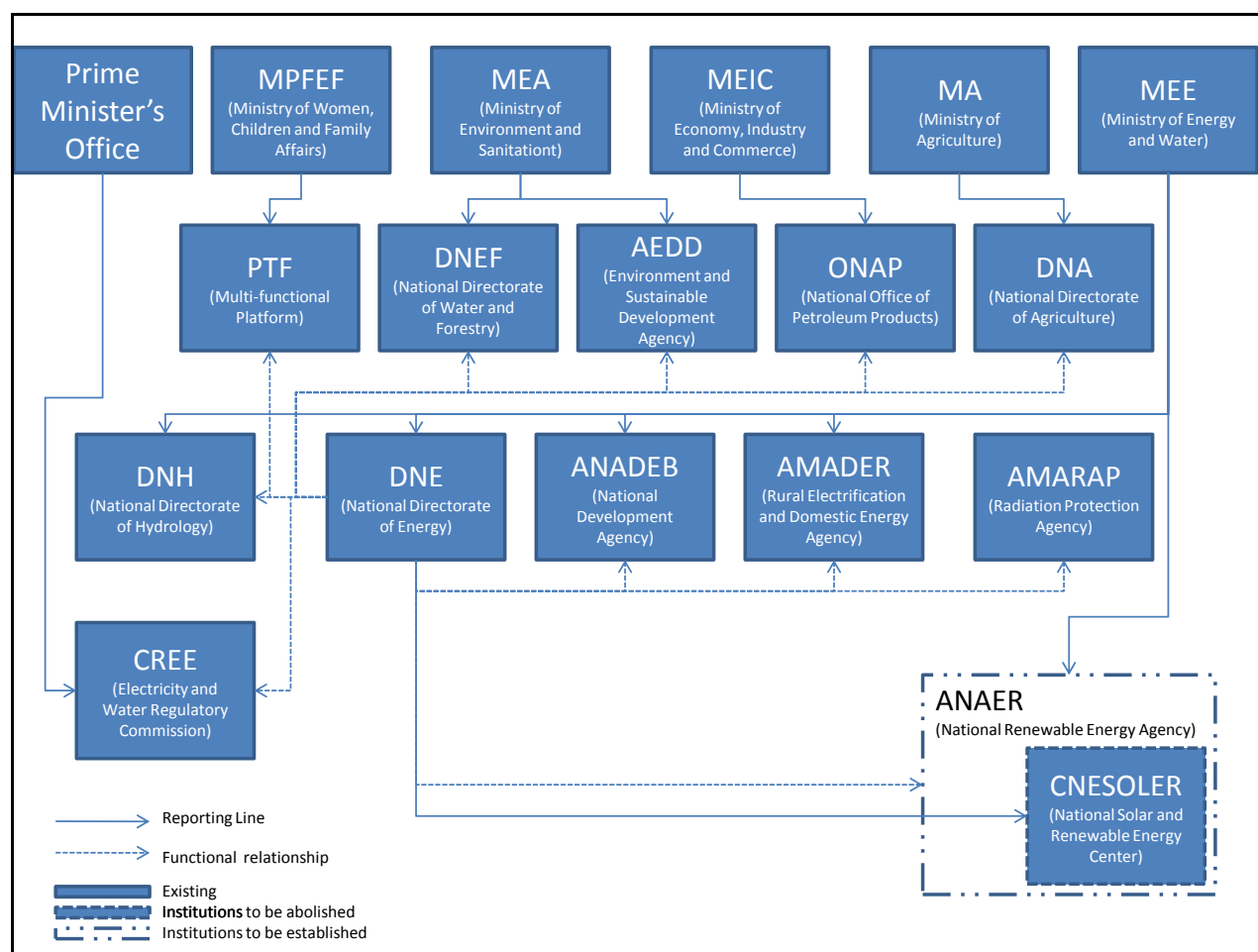
³¹ The DNE and the National Water Resource Directorate (DNH) under the supervision of the MEE; National Agriculture Directorate (DNA) and National Water and Forestry Directorate (DNEF) under the supervision of MEA.

³² AMADER, ANADEB, and AMARAP.

³³ Under the BOOT contract, a company or a consortium of companies, finances, builds, operates, and acquires a new project or system, which is then transferred to the authorities after a predetermined period.

Investment Promotion Agency (API), providing a one-stop shop for all business start-up procedures, assistance to investors and issuance of certification in accordance with the Investment Code; and (vi) the guidelines for an application degree³⁴ guaranteeing open competition and organization of the Public Electricity Service (including the role and skills of various sector actors, conditions of public electricity service management, conditions for delegating and operating a public electricity service, and tariff and accounting principles in the sector³⁵).

Figure 3: Energy Sector Institutional Landscape



Strengths and Weaknesses of the Energy Sector

47. **Strengths of the energy sector.** Mali's energy sector has many assets that will favour the development of renewable energies through the SREP Program. Overall, from an institutional and political perspective, key assets include: (i) existence of core documents governing the sector and subsector (various policies and strategies); (ii) opening of the energy sector to private operators (notably a track

³⁴ Order no. 00-019-P-RM of 15 March 2000

³⁵ In this regard, several forms of partnerships aim at supporting private investment-friendly environments (in the form of various contractual methods including concession, lease and management).

record in rural energy access expansion over the last decade by decentralized energy services companies operating in public private partnership with AMADER); (iii) opening of the national electricity grid to neighbouring countries (interconnection with Senegal and Mauritania-OMVS; on-going regional interconnection with Ivory Coast and Ghana-Burkina Faso lines in the context of the West African Power Pool; and especially (iv) stated political will for the development of the sector. The GoM has also made significant progress in sector reforms, such as the separation of the water and electricity sub-sectors, the restructuring of the national utility EDM, and the opening of the electricity subsector to competition, thus contributing to increase the effectiveness of the energy sector as a whole, accelerating the withdrawal of the public sector from operations and expanding service coverage.

48. **Main energy sector challenges.** To meet the country's goal of accelerated and shared growth, the following main challenges have to be addressed in the energy sector: (i) a successful restructuring of EDM SA to become a financially viable and operationally efficient utility; (ii) an adequate and affordable supply of electricity by diverse sources to meet the growing demand of about 10 percent per annum; and (iii) a sustained energy access expansion in rural and peri-urban areas to support productive activities and to enhance social programs.

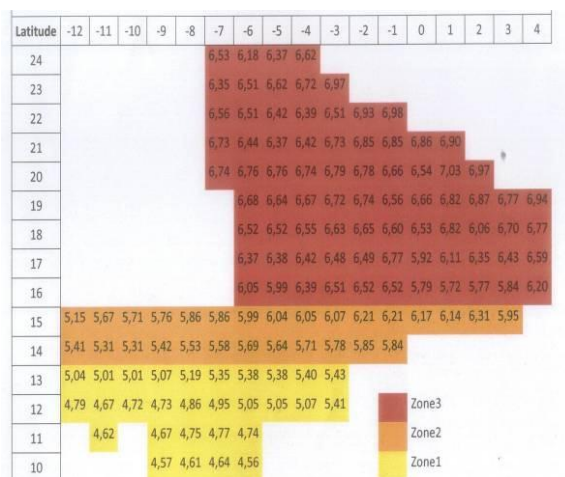
Section II: Renewable Energy Sector

Resource potentials of Renewable Energies

49. Mali has a high potential for Renewable Energies, essential in Solar, Hydro and Biomass/Biofuel³⁶. Renewable Energies have never been properly and completely accounted for in any analysis. It is estimated that current installed capacity of RE could represent around 3% of conventional electricity generated, or about 9 MW, thereby mainly benefitting from a few on-grid hydro power plants.

- *Solar Potential:* Average solar radiation in Mali is well distributed over the national territory with an estimated 5-7 kWh/m²/day³⁷ with a daily sun lighting duration of 7-10 hours. The global typical average is only around 4-5 kWh/m²/day.

Figure 4: Solar Radiation in Mali



- *Hydroelectric potential:* The inventory of hydroelectric sites helped to identify about 10 sites mainly situated on the Niger and Senegal River with total estimated power of around 1,150 MW and an annual average energy generation of about 5,000 GWh. Of this potential, about 250 MW have been developed so far: Selingué and Sotuba Hydro Power Plants on the Niger River, Manantali Hydro Power Plant on the Senegal River (whose output is shared with Senegal and Mauritania). In addition, the Felou Hydro Power Plant on the Senegal River is currently been upgraded from 0.6 MW to 60 MW with joint support from World Bank and European Investment Bank. Further large scale hydro power plants are under evaluation by IFC, including Kenie (42 MW). Among the potential mini and micro-hydro power sites identified, five represent potential mini-hydro power investments. There are also many sites for micro-hydro power plants.

³⁶ The RE potential has been partly evaluated; the work is currently on-going notably through the mapping of the solar and wind potential. The findings are expected in a few months.

³⁷ February 2011, SREP Mali, Stocktaking Report

Biomass/biofuel Potential: Mali has: (i) in terms of fuel wood, about 33 million hectares with a standing volume of 520 million cubic metres and a weighted productivity in the entire country of about 0.86 cubic metre/ha/year; (ii) several million tonnes of agricultural residues and plant waste; (iii) an overall annual production capacity of 2,400,000 litres of alcohol since 1997; and (iv) about 2000 hectares of jatropha³⁸ plantations for sustainable bio-fuel production. Opportunities also exist to develop the capacity of sustainable biomass and biofuel uses, giving the strong agricultural base of the economy. In particular opportunities to scale up biofuel projects, diversifying Jatropha uses for household electrification and to power productive uses for agricultural businesses in rural areas (such as grinders and de-huskers) could be explored further. A specific atlas to estimate the potential of agricultural residues that can be developed for energy generation is under finalisation.

- *Wind Potential:* A relatively significant wind energy potential is estimated, depending on the region of Mali. In the Sahelian and Saharan zones, the annual average wind speed is estimated at 3 to 7m/s. A wind resource mapping is currently under finalisation.

Overview of Renewable Energy projects and programs implemented to date

50. In the past 15 years, Mali has begun to harness this potential through mainly small scale installations and appliances, targeting all available renewable energy sources and building the capacity of involved actors. While large hydro projects have been under implementation for many decades in Mali, a considerable development and testing of small scale renewable energy applications took place over the past 15 years. These pilot schemes and various projects have yielded the following results:

- *Solar:* Various small scale solar thermal and PV applications have been tested and adopted to local conditions for various uses (lighting, pumping, refrigeration, cooking, drying in farming or fruit production, heating in health centres and in households, solar home systems for households and community institutions, etc.). However, only a few of them have sufficient scale and/or installed capacity to providing quality electricity supply to households and promote productive energy uses to a wider range of appliances relying on electricity supply³⁹;
- *Hydro:* A few mini-hydro projects have been under implementation for the past few years, managed by the utility EDM (such as the 5.7 MW Sotuba Hydro Power Plant on the Niger River). Further sites for mini and micro hydro power plants have been identified and feasibility studies are proposed as part of the SREP Program.
- *Biomass/biofuel:* Various biomass uses have been introduced and tested in Mali, some with mixed results in the longer term, such as domestic or community managed biogas projects. Wastes and residues are used at both domestic and community level for composting, but mainly in agro-industrial plants such as the Malian Textile Development Company and co-generation plants using sugarcane or rice residues in the Niger zone; community level bio-ethanol production using

³⁸ A locally adopted, non-food crop, relatively resistant to climate changes such as droughts

³⁹ The SREP expert group report justifying the selection of Mali under the SREP program in particular highlights the need to expand and strengthen solar based activities in Mali, particularly in the area of provision of energy access in rural areas, since the rural energy access is considerably lower than urban energy access. Clear opportunities exist for the increased use of solar photovoltaic technologies for rural electrification as well as agricultural and small community and productive uses, for example for rural medical clinics.

sugarcane and biodiesel or pure vegetable oil are under implementation (currently, the ethanol produced is mainly used for industrial and pharmaceutical products).

- Wind: For the moment, wind power is mainly used for water pumping (generator systems are few and have low power output).

51. Recently, a limited number of larger scale projects (with an installed capacity above 200 kW) have been piloted for electricity generation, both for off-grid and on-grid electrification (mainly solar PV, biofuel, and hybrid mini-grids). Results of the operation of these power plants will feed in the detailed design of selected SREP proposed projects, as these are critical in providing adequate quality and quantity of electricity services to scale up productive uses and job creation in rural areas. Experiences concerning the coupling of photovoltaic technologies with the existing distribution grid are few.

52. In a nutshell, REs offer a major potential that would be worth harnessing for a sustainable socio-economic development in Mali. In particular, solar, mini/micro hydroelectric schemes and bioenergy potential should be further developed and up-scaled to reach transformative impacts at a national level. In this sense, the experiences conducted over the last years are highly promising and have guided the development of the SREP program.

Climate change implications

53. **Green House Gas Emission in Mali.** In Mali, the main source of emission is traditional biomass, which accounts for 81% of CO₂ emissions. With about 15,450 tonnes of CO₂ emitted annually, Mali represents 0.052%⁴⁰ of global emissions and, therefore, represents a low emission country. With regard to GHG emissions, overall, the use of REs has a positive impact on the environment and the climate because the amount of greenhouse gases released into the atmosphere is limited compared to fossil fuels. According to the EPIA⁴¹, the generation of 1 KWh of electricity from fossil fuel (oil) produces about 850g of CO₂, 45g from biomass, a maximum of 37g from a photovoltaic solar source, and 11g from a wind source. Considering that the quantity of electricity produced in Mali by renewable energies (and notably solar) is about 0.76GWh⁴², it may be estimated that 617.88 tonnes⁴³ of greenhouse gases are avoided annually. Although the current level of GHG emissions in Mali is relatively small, it is nonetheless expected to grow as shown in the baseline provided in the Figure 5 below.

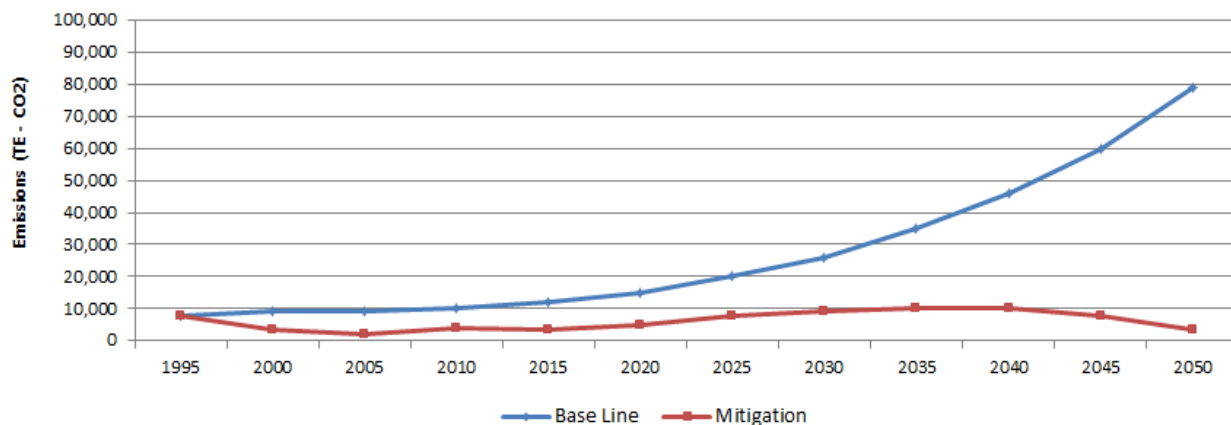
⁴⁰ Second country paper by Mali under the United Nations Framework Convention on Climate Change.

⁴¹ European Photovoltaic Industry Association, Photovoltaic Energy- Electricity from the Sun. January 2010

⁴² S.O. Traoré (2009) *Development of Renewable Energies in Mali (CNESOLER)*

⁴³ Based on the emission of 850g and 37g of CO₂. The difference between CO₂ emissions from fossil energies (850g) and CO₂ from PV solar (37g) amounts to 813g; it corresponds to CO₂ emissions avoided for 1kWh. For the generation of 0.76GWh of energy that corresponds to 0.76*813 tonnes of CO₂ (all things being equal).

Figure 5: Projections of GHG Emissions and Mitigation Scenario in the Energy Sector in Mali⁴⁴



54. **Sector vulnerability to climate variability/change.** The energy sector is identified as one of the priority sectors for taking climate change adaptation measures according to Mali's NAPA (Table 2). In terms of vulnerability, the hydroelectricity subsector is highly subjected to climate variations. In accordance to the climate scenario formulated under the NAPA, a 1% decrease in water flow will result in a 1.3 million KWh decrease in electric generation. In particular, mitigating the impacts of climate change on hydroelectric power generation and biomass production will be key to the success of the SREP implementation. Feasibility studies for the proposed projects under SREP will include site specific assessments relating to climate variability/change.

Table 2: Energy sector is at the risk of climate change⁴⁵

Sectors	Climate Risks				Exposition Indicators	Class
	Droughts	Floods	Strong Winds	Severe Temperature Variations		
Agriculture	5	3	3	3	14	1 ^o
Pastoralism/Breeding	5	1	1	1	8	6 ^o
Fisheries	5	1	3	2	11	3 ^o
Energy	5	1	2	3	11	3 ^o
Health	4	4	3	3	14	1 ^o
Water	5	1	1	2	9	5 ^o
Forests	5	1	1	1	8	6 ^o
Fauna	5	1	1	1	8	6 ^o
Transport	2	3	2	1	8	6 ^o
Education	1	1	1	1	4	12 ^o
Industries	2	1	1	1	5	11 ^o
Habitat	1	3	3	1	8	6 ^o

⁴⁴ Source: NAPA, 2007. As part of the elaboration process of the NAPA, major types of climate risks were identified (droughts, floods, etc.) and a rating scale was designed to assess the level of risk for each sector. 1 means that the identified climate risk is low in the sector, 5 means that the identified climate risk is very high in the sector. By adding the climate risks indicators, an exposition indicator was obtained that allowed the various sectors to be classified according to their level of vulnerability to climate risks.

⁴⁵ Source: Summary of the costs assessment for mitigation and adaptation needs in the area of climate change in Mali "NEED", 2009

Impact Indicator	45	21	22	20		
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Political, Institutional and Regulatory Context specific to Renewable Energies

55. **Development of key RE institutions in Mali.** Historically, the development of small scale renewable energy technologies and appliances in Mali started under the responsibility of the National Energy Directorate, with the support of the *National Centre for Solar and Renewable Energies* (CNESOLER) since the 1980s. The main mission of the CNESOLER is to collect basic data and to undertake research, update/review, produce and market appropriate technologies and equipment, train and supervise groups of artisans as well as protect small- and medium-sized enterprises. To strengthen the existing framework, the GoM in 2006 created ANADEB charged with ensuring the constant availability of bio-fuels on the market, facilitating consultation between national and international partners in respect of bio-fuel standards and monitoring their implementation. As part of its mission to promote household energy and develop access to electricity in rural and peri-urban areas under a technology neutral approach, AMADER has supported since 2003 the development of REs in all regions of Mali on a project by project basis, in partnership with CNESOLER and ANADEB. Current discussions concern the transformation of the CNESOLER in a National Renewable Energies Agency⁴⁶. This is within the context of the consultations concerning the restructuring of the energy sector that could result in a redefinition of the missions of various governmental entities. Such process could be supported as part of SREP financing.

56. **Strategies targeting renewable energy development within the energy sector framework.** Over the last 5 years, the GoM has embarked on defining its energy policy for renewable energies (REs) further, including a *National Strategy for the Development of Renewable Energy* and a *National Strategy for the Development of Bio-Fuel*. In relation to these policy documents, strategies related to Climate Change evolved. This framework shows an explicit political will to promote sustainable investments in renewable energies within the energy sector framework.

57. The *National Strategy for the Development of Renewable Energy* adopted in 2006 aims at: (i) promoting the widespread use of renewable energy technologies and equipment to increase the share of renewable energies in national electricity generation up to 10% by 2015; (ii) developing the bio-fuel subsector for various uses (electricity generation, transportation, agricultural motorization, etc.); (iii) creating better conditions to sustain RE services; and (iv) searching for sustainable and suitable financing mechanisms for renewable energies⁴⁷. So far, the implementation of this national strategy has not been very successful. The strategy is expected to be revised soon, in line with the revision of the National Energy Policy. To accelerate the implementation of the national strategy, actions may be regrouped into four main components: (i) comprehensive inventory of the RE potential; (ii) development of REs and promotion of their technologies; (iii) capacity building and development of cooperative actions; and (iv) impact assessment. Some key measures have been identified to which the SREP Program will contribute:

⁴⁶ In the form of a Public Scientific and Technological Establishment.

⁴⁷ It should be noted that PEN and the *National Strategy for Development of Renewable Energies* are expected to be revised soon.

- The promotion of RE potentials and technologies in Mali has to be supported by sufficient funding;
- The adoption of adequate financial products needs to be developed, as well as economic and productive energy uses strategies.
- An exhaustive inventory of the entire renewable energy potential is to be completed for the establishment of a RE map;
- Capacity building is needed to redefine the priorities and strategies for the search and mobilization of appropriate financing. Shortage of skilled workforce need to be overcome for promoting RE.
- The creation of RE centres would formalize a capacity building framework;
- Environmental assessments should be strengthened and used to support the long term sustainability of various RE technologies.

58. *The National Strategy for the Development of Bio-Fuel* adopted in June 2008 aims, firstly, at enhancing affordable local energy production through the development of bio-fuels to meet the country's socio-economic needs and, secondly, reducing the country's dependency on oil imports.

59. In addition to RE strategies mentioned above, the *National Action Program for Adaptation to Climate Change (NAPA)*, submitted and disseminated in 2007, comprises RE projects, some of which have been partially implemented. Furthermore, in 2011, the GoM elaborated a *National Climate Change Policy* and a *National Climate Change Strategy* (the two documents integrate REs in their action axes).

60. **Strategies and measures to attract private sector finance.** To develop the energy sector, in particular the renewable energy sub-sector, the GoM recognizes the value added of public-private partnership for the development and scaling up of RE, based on the principles of competition and performance based targets. The GoM equally recognizes the need for continuing reforms for the promotion of RE and the strengthening of the overall investment climate. A set of regulatory measures were introduced to foster RE development. PPPs take the form of operating arrangements based on authorization and concessions. Furthermore, a framework for public/private partnership exists in the form of BOOT concession contracts. A decree on "*suspension of the value added tax, levies and duties on imported energy equipment*" is in place. It abolishes these taxes for five years starting from September 2009, thereby promoting the importation of solar panels, solar lamps and other renewable energy equipment⁴⁸. Although efforts have been made in recent years to improve the energy sector investment climate, some barriers have been stressed during SREP consultations, notably:

- Weaknesses in the Investment Code (which is currently undergoing revision), partially incoherent application of the legislative and regulatory renewable energy and private sector framework, creating risks for national and in particular international private investors; in particular the fact that energy sector investors do not have access to the free-zone regime and

⁴⁸ Decree No. 09-503/P-RM of 23 September 2009: The customs rebate resulted in an overall decrease in the prices of renewable energy equipment to various levels: 9.23% to 53.1% for modules, 16.7% to 21.5% for batteries, 23.7% for regulators, 18.4% for inverters, and 23.4% to 43.68% for lamps (these figures represent, in other words, the proportions of decrease in relation to the initial cost of the equipment).

thus cannot enjoy the related benefits. The ambivalent nature of guarantees and securities related to the acquisition of sites by foreign investors is also worth noting;

- The financial structure and capacity of national private operators do not allow them to significantly involve themselves in large-scale power generation and distribution operations. Difficulty of local energy sector companies in access to financing for high upfront capital investment costs of renewable energy technologies despite the GoM support provided by the Rural Electrification Fund; and
- Need for capacity building and technical assistance of all public and private sector stakeholders, and the general public (including end-users), to support a large scale renewable energy deployment.

Costs Estimates of Renewable Energies in Mali

61. As mentioned above, many small scale installations and appliances have been introduced in Mali by diverse government institutions, and development partners, without having an exhaustive and detailed monitoring and evaluation system in place at a national level. A few larger scale projects are being piloted for electricity generation on a project by project basis, both for off-grid and on-grid electrification (mainly solar PV, biofuel, and hybrid mini-grids). National estimates could not yet be comprehensively compiled, as a few recent studies and national databases are available for RE. Feasibility studies proposed under the identified SREP projects will provide better data quality and feed in the detailed design of selected SREP projects proposed. The national M&E system to be developed under the SREP program will especially monitor development of capital investment costs and operational expenditures related to RE.

62. Preliminary cost estimates show the need for substantial investment support for the promotion of RE in Mali. Though SREP funding, and with additional funding from MDBs and other partners, in line with regulatory measures and frameworks for RE, investment costs will be supported and RE projects will be viable and profitable on a life cycle basis, with associated co-benefits and operating costs competitive to thermal generation in on- and off-grid schemes.

Budget Allocated to the RE Sub-sector

63. The GoM is committed to scaling up renewable energy development in an equitable way. The budget allocated by the GoM to the RE subsector⁴⁹ rose from USD 3.3 million in 2008 to USD 6.7 million in 2010,⁵⁰ representing an annual average increase of 41.67%. The 2011 budget proposal is USD 8.9 million. RES's share of the 2010 national budget (amounting to USD 2.8 billion, including USD 488 million for energy) represented 0.23%. According to the 2011 budget projections, this is expected to rise to 0.30% of the total budget⁵¹.

⁴⁹ Consolidated figures allocated by CNESOLER and ANADEB.

⁵⁰ Data provided by CNESOLER.

⁵¹ In Uganda, for example, this currently represents a little over 2% of the national budget (Source: www.climateparl.net). It is worth mentioning that the global network, Climate Parliament, made up of inter-party legislators, recommends that at least 1% of national budgets be devoted to REs.

64. Apart from the national budget, bilateral and multilateral organizations constitute the most important source of financing for RE technologies through public investment projects. Development partners increased their support since the 2000s for the development of REs through investment projects or technical assistance/capacity building efforts.

65. Private sector contribution to RE is currently not accounted for in national statistics. However it is estimated that there are more than 20 local private operators active in the RE sector including decentralized energy service companies operating a few pilot RE rural electrification schemes, and retailers and distributors involved in the sale of electrical (mainly SHS), lighting and energy efficiency equipment.

Ongoing and Planned Investments by other Development Partners

66. Mali's development partners play a major role in promoting and disseminating renewable energy technologies. They fall under three groups:

- The first group concerns *multilateral cooperation institutions* that participate in financing projects and Programs through public and private institutions: the World Bank Group, the African Development Bank, United Nations Development Program, and the European Union Delegation.
- The second group is made up of *development partners* under bilateral cooperation arrangements, for financing projects and Programs through public or private institutions. In this regard, it would be worth mentioning GTZ (now GIZ) and KfW (Germany), the United States Agency for International Development (USAID), Danish Cooperation (DANIDA), French Development Agency (AFD), Belgian Cooperation, the Netherlands, and India.
- The third group concerns *organizations that search for financing* among development partners for RE projects and Programs. These organizations work directly with the beneficiary communities. These are Mali Folkcenter, SNV (Netherlands) and the Technical Research and Applications Group.

67. Development partners operate in the country's energy sector by supporting the GoM in focusing on sector reforms, improving access to energy services (including rural electrification), and improving reliability of power generation and distribution systems. In terms of REs, the multilateral and bilateral partners invest in both infrastructures covering all renewable energy technologies, capacity building and technical assistance for the key actors (see Annex 5 for details). Development partners are currently not targeting larger scale RE electrification schemes (such as mini-grids) with a systematic and standardized approach at the national level, that will however be crucial to provide adequate quality and quantity of electricity to promote productive uses and job creation for transformative RE impacts in Mali (one priority of the GoM's vision to expand the rural energy agenda and meet national RE targets). Aspects supported by these programs with links to RE are summarized in Table 3 below.

Table 3: On-going Renewable Energy Initiatives supported by Development Partners

Hybrid mini grid systems for rural electrification	WB pilots hybrid mini-grid systems for rural electrification on a project by project basis
Solar	<ul style="list-style-type: none"> • WBG is introducing market development of solar lighting • Netherlands/GIZ support selected communities for small scale PV electricity generation • The Indian Cooperation Agency is funding a village lighting project based on SHS • DANIDA is establishing a solar resource atlas
Small Hydro Power	No on-going initiatives
Wind	DANIDA is establishing a wind resource atlas
Biomass	<ul style="list-style-type: none"> • AfDB supports large scale transformation of sugar cane residuals for electricity creation and co-generation • AFD supports biofuels on a case by case basis • UNDP, Gates Foundation and FAFPA are introducing bioenergy for Mali's multifunctional platforms
Capacity building and technical assistance	<ul style="list-style-type: none"> • UNDP providing targeted support to woman associations • WB, IFC, Netherlands and USAID projects are jointly providing support in preparing an investment promotion strategy • WB is providing support to energy sector reforms including tariff

Barriers/Constraints and Mitigation Measures

68. Although the RE sector in Mali builds on considerable experience of projects and programs, and a number of development partners are active in the sector, the promotion of RE at a larger scale in view of reaching transformative impacts at a national level is also still facing many constraints of institutional, economic and financial, technical, social and environmental nature. Barriers, as explained in this section, are summarized in the table below, and linked to mitigation measures identified during SREP preparation phase.

69. Removing these barriers, supported by SREP, will help the country meet its growing demand for electricity, enhance energy security, improve access to electricity, and reduce the cost of supply. As most of the renewable energy resources target under the SREP program are located in underdeveloped areas of the country, substantial economic, social, and environmental co-benefits are expected to target vulnerable groups in Mali.

Table 4: Main barriers/constraints and mitigation measures

Main barriers and constraints hampering the development of REs in Mali	Mitigation measures to which SREP activities will contribute
Institutional, regulatory and legal constraints	
Agencies and institutions operating in the energy sector are numerous and do not always operate in synergistic manner	Define and put in place efficient and transparent coordination mechanisms; support the revision/updating of the mandates of agencies and institutions actively involved in REs

Regulatory (including tariffs) and legal frameworks do not favor RE investment by the private sector at a large scale	Harmonize and simplify procedures and regulations concerning the involvement of the private sector in the energy sector; creation and/or strengthening of a favorable tariff and fiscal system
Current political, strategic, institutional and regulatory frameworks of the energy sector do not take into account recent sector reforms	Update and harmonize political, strategic, institutional and regulatory frameworks of the energy sector in order to take into account recent changes
Technical capacities and human capacities	
Technical, institutional and financial capacities are still relatively low. Low awareness of local populations for large scale RE applications.	Initiate a systematic program aimed at building the capacities of all the stakeholders on issues related to Res (information, sensitization, and specialized training programs)
Planning capacity, M&E, and RE-related knowledge management systems are still weak	Strengthen existing planning, M&E, and RE-related knowledge management systems, while developing SREP approach and modalities
The lack of adequate economic and technical studies and of impact assessments on REs do not create adequate conditions for a robust, standardized and programmatic approach to REs	Formulate a set of knowledge assets and products, analyses, diagnostic studies, feasibility studies and impact assessment and methodological tools favoring future REs investments.
Economic and financial context	
Heavy dependence on imports of oil (impacting on the balance of trade, under the effects of the volatility of oil prices)	Define and implement alternative energy sector development and low carbon growth models
The poverty of Malian rural households leads to difficult affordability, access and use of modern Res without subsidy schemes	Design interventions and financial/subsidy mechanism aimed at reducing the costs of kWh et improve the access to and use of modern REs by households and communities
Upfront investment costs of REs are relatively high	Define and put in place measures and regulations aimed at making RE-related investments more attractive (SREP and MDBs funding mobilizing additional financial resources). Carry out life cycle analyses to proof long-term financial viability of RE against thermal
Difficult return on investments, because of high investment costs and the need for an affordable price of kWh for poor households	Mobilization of additional funding (grants) from TFPs (to subsidize initial investment costs)
Lack of adequate and affordable financial instruments does not sufficiently attract large scale REs-related investments	Development of targeted financial products in cooperation with commercial banks and concessional financing of MDBs
International private investors consider the energy sector as a risky sector	Define and put in place a range of sweeping measures aimed at favoring private investments Provide greater guarantees and security to private investors and define conditions to improve public-private partnerships for utility scale projects, such as grid connected IPPs

Section III:

Program Description

70. **Introduction.** The preceding sections provided a synthesis, among others, of the efforts by the GoM to identify the main constraints and potential of the energy sector particularly, the RE subsector. Based on these results, and based on the priorities set by the National Strategy for the Development of REs, the GoM represented by the Ministry of Energy and Water, identified the architecture of an investment plan to be submitted to SREP co-financing. This process was made possible through a participatory and inclusive approach including consultations with various stakeholders (see Annex 4). This section presents the general architecture of SREP-Mali, with its priority areas and investment projects highlighting the role and contribution of each stakeholder as well as institutional arrangements for its implementation.

In July 2010, Mali was chosen as one of the six pilot countries to benefit from funds to formulate and implement an investment for scaling up renewable energy Program. This choice is justified partly by the nature of the climatic, environmental, demographic and energy problems facing the country, and partly by concrete efforts already made by the GoM to meet these challenges.

Objectives

71. **Objective.** The main objective of SREP-Mali is *to develop renewable energies on a large scale, to effectively contribute to poverty reduction and sustainable development in Mali for the benefit of its population*. Achieving this objective should help to support low carbon emitting socioeconomic development that would generate new economic opportunities and widen access to energy services.

72. In relation to the objective to be achieved, all the stakeholders agreed on the need to direct SREP-Mali towards sustainable socioeconomic development which, while highlighting the development and use of new renewable energy technologies, is essentially geared towards poverty reduction and sustainable economic growth.

73. **Approach of the Program.** In accordance with SREP modalities, this objective will be achieved through an integrated approach that includes investments in renewable energies (particularly infrastructure needed for their production and distribution), capacity building of all the national stakeholders, integration with dynamic public-private partnership, and provision of adequate technical assistance services. Furthermore, SREP-Mali will support any action deemed appropriate in consolidating or upgrading policy, strategic and regulatory frameworks of the energy sector and which will encourage the dissemination and use of renewable energies in the country.

74. The entire SREP-Mali approach is based, among others, on a fundamental assumption, namely: with regard to energy, any transformational change will only occur through the improvement of energy market conditions and financing of the energy sector, as well the creation of specific conditions for gaining investors' confidence (public and private, small-/medium-/large-scale enterprises, national or

international investors). These conditions are indispensable for any replication and scaling-up of public and private investments in renewable energies.

75. The focus of the SREP-Mali investment plan will relate to the transformational results it will generate in the medium and long term. Thus, more than specific investments or activities, SREP aims to promote the large-scale development of renewable energies through a *programmatic approach*.

Expected Results and Replication Effects

76. **Expected Results.** The main results expected of the Program are as follows (see section on monitoring and evaluation for more information):

- The conditions of access to and use of electricity by Malian populations are improved.
- Increase in the supply of GWh from renewable energies.
- Economical and generation costs of renewable energy are reduced.
- The share of renewable energy (%) in comparison with the country's energy mix is increased.
- The proportion of rural and urban population with access to renewable energy is increased.
- The enabling environment is improved through the optimization of the legal and regulatory framework and the increased capacity of relevant government authorities in carrying negotiations with the Private Sector. The replication effect of the program will ultimately be reinforced.
- Jobs related to the adoption of renewable energy are created in targeted areas (for men and women).
- A system of management and information sharing regarding lessons learned, duplication and transformational changes is put in place at national and international levels.
- Additional financial resources for renewable energy projects are mobilized.

77. In line with SREP principles, the Program will have an overall impact on the livelihoods of Malian households, particularly those living in poor rural areas, to improve their living conditions and enhance their productive activities.

78. **Expected Outcomes.** The main long-term multiplying outcomes will concern: (i) *poverty reduction* of Malian households; (ii) *increased investments* in the RE sector; (iii) *enabling environment* conducive to the production and use of renewable energy sources; (iv) *increased economic viability of the RE sector*; (v) *increased in energy supply*; and (vi) *reduction of the incidence of respiratory diseases* affecting Malian communities (through the benefits of a cleaner green energy).

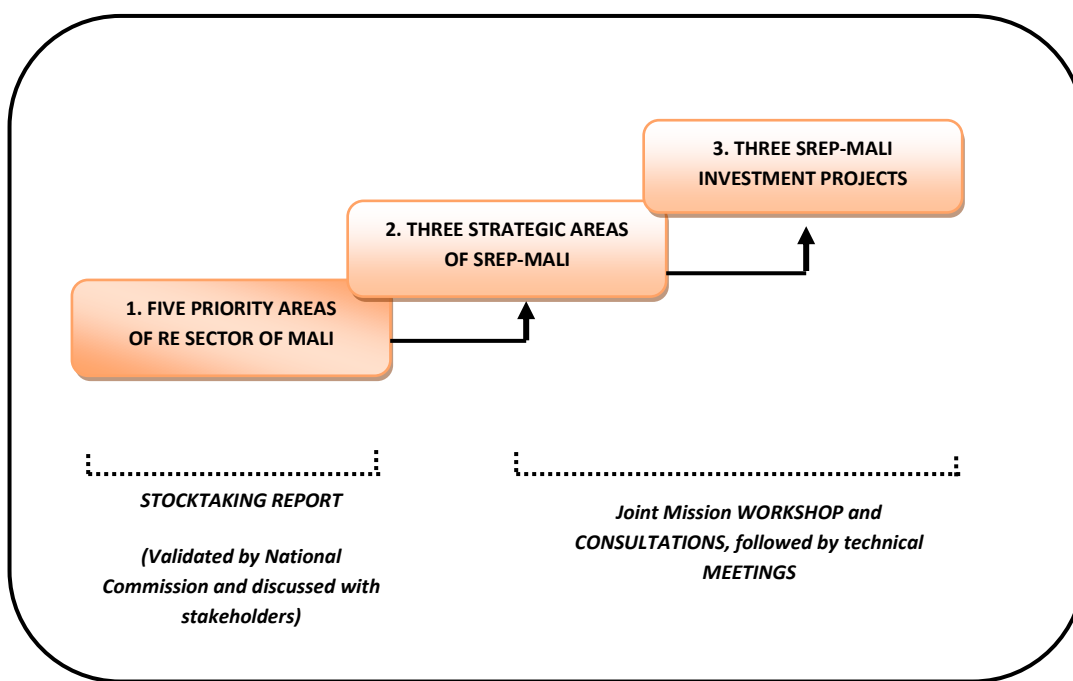
Priority and Strategic Investment Areas

79. **Participative Process for Preparing the SREP IP.** A participatory, comprehensive process involving a large number of institutional actors under the leadership of the GoM, represented by the Ministry of Energy and Water, with the support of the MDBs helped to formulate the SREP investment plan. The process took into account the outcomes of an in-depth diagnostic study, whose main recommendations

were validated by the National SREP Commission⁵², the conclusions of several consultative workshops, technical consultations and various meetings with key stakeholders.

80. The main stages of the consultative process are outlined in Figure 6, which distinguishes the *priority intervention areas* of the Malian energy sector (specifically, renewable energies), the *SREP strategic axes* in accordance with the Climate Investment Funds (CIF) principles, and *investment projects* (which translate the strategic axes into a set of specific projects submitted to SREP co-financing, with their own objectives, areas of intervention, beneficiaries, institutional arrangements, financial mechanisms and principal contractors).

Figure 6: Participatory Process in Preparing the Investment Plan



81. **Priority Intervention Areas and Strategic Axes.** The *five priority intervention areas* underpinning the national energy policy are the following:

- Institutional, legislative, regulatory and strategic frameworks;
- Diagnoses, impact studies, inventories, and research on RE technologies;
- Sensitization and information on REs & capacity building for all stakeholders;
- Priority investments in RE infrastructures;
- Information management and knowledge sharing, and monitoring/evaluation system of all Program activities.

82. The five priority intervention areas of the Malian RE sector should be considered as the pillars of the overall, long term vision. This vision is translated, within the specific context and modalities of the

⁵² See 'Etude d'état des lieux initial' ("Initial Status Report") prepared on behalf of the Energy Directorate under SREP (February 2011) and its Executive Summary (April 2011).

SREP-Mali, into three key strategic axes and two cross-cutting support measures (see Figure 7 below). Table 6 represents the nature and main characteristics of the actual strategic areas, with their main activities and crosscutting support measures.

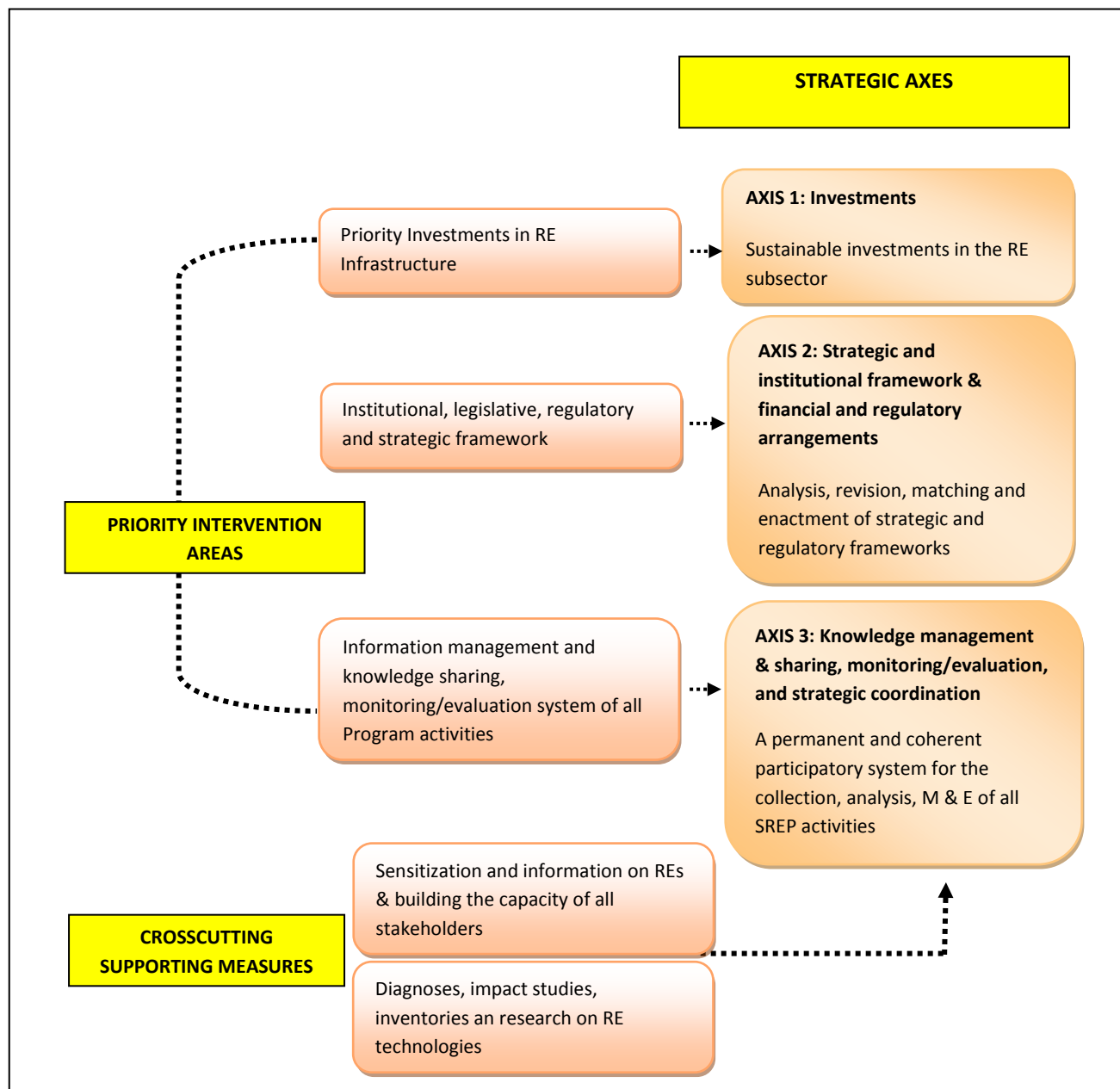
83. These strategic axes are aligned with the third pillar of the *Poverty Reduction Strategy Framework*, namely ‘Infrastructure Development and Support to Productive Sectors’. They also fall under the *National Energy Policy*, which considers the provision of energy services accessible to the majority of people a key element of the country’s sustainable development. These axes also reflect the strategic orientations of the *National Strategy for Renewable Energy Development*. The activities of the SREP investment plan should hence enable the accelerated implementation of this *National Strategy*.

Table 5: SREP Strategic Investment Areas and Priority Activities in Mali ⁵³

Strategic Areas	Priority Investment Activities	Support Measures
<u>Axis 1</u> <i>Investments in renewable energies</i>	<ul style="list-style-type: none"> Sustainable investments in the renewable energy subsector Investments in proven and innovative technologies 	<ul style="list-style-type: none"> Capacity building Feasibility and impact studies
<u>Axis 2</u> <i>Legislative and institutional framework & financial and regulatory arrangements</i>	<ul style="list-style-type: none"> Harmonization of the legislative framework Strengthening the institutional framework Definition of financial arrangements Enhancement and dissemination of regulatory frameworks 	<ul style="list-style-type: none"> Comprehensive energy communication and information strategy Conducting of analysis and supporting thematic assessment
<u>Axis 3</u> <i>Monitoring and evaluation, knowledge management and sharing, strategic coordination of the Program</i>	<ul style="list-style-type: none"> Setting up of an effective monitoring/evaluation system Definition and implementation of a knowledge management and sharing system Strategic coordination mechanism of the Program 	<ul style="list-style-type: none"> Building the capacity of all actors in M&E

⁵³ Also, see Figure 7.

Figure 7: Linkages between Priority Areas of RE Sector and SREP Strategic Axes



Axis 1: Investments

84. The activities of this first strategic axis occupy a central place in the proposed Investment Plan. Indeed, they aim at specific investments of a different but complimentary nature in the area of renewable energies. In linking socioeconomic development to energy and climatic challenges, these investments fall within the scope of Mali's social, economic and cultural development objectives.

85. This axis will primarily aim at scaling-up best practices and proven energy technologies, and their wider application. Furthermore, it will enable the implementation of a whole range of innovative investments aimed at promoting various technologies based on renewable energies and their operational management. In particular, this will entail ***sustainable investments in the renewable energy subsector*** in various energy applications relating to diverse installation methods, including connection to the national grid, off-grid connection and autonomous systems or decentralized/isolated generation systems.

86. The proposed investments will be supported and made possible through two distinct and complementary types of activities, to be integrated in the actual design of the investment in a flexible and adjustable manner as dictated by the realities of the country namely:

- ***Capacity building*** of stakeholders, i.e. public and private operators, small-, medium- or large-scale enterprises, including the improvement of planning procedures and energy investments and their technical monitoring.
- ***Conducting of feasibility and impact/assessment studies*** for the efficient preparation, control and technical monitoring of investments.
 - *Overall*, this will concern an assessment of technical resources that could be used to develop various renewable energy sources and the adjustment of investments to reflect local social realities.
 - *More specifically*, it will entail the following aspects: formulation of feasibility studies to enable the preparation of investments; establishment of a database of renewable energy equipment; conducting of complementary inventories of the renewable energy potential; setting up of test, quality control for renewable energy equipment; definition of methodologies and putting in place of a technical and scientific system of monitoring the equipment installed; testing and adaptation of renewable energy technologies to the national context, solar platforms, jatropha oil platform; and conducting feasibility studies for mini/micro hydroelectric power plants that have been already identified.
 - *From a social perspective*, appropriate diagnostic studies will focus on the “energy-poverty” situation of some vulnerable population groups, the impact of proposed investments on the condition of women and gender equity, under a gender approach and local perception (including degree of satisfaction) in relation to the provision of energy services by public and private operators.

87. Provision of *selected specialized advisory services* will help to support the definition and implementation of a set of coherent capacity-building activities and studies.

Axis 2: Strategic and Institutional Framework, Financial and Regulatory Arrangements

88. As the elements provided in the preceding sections indicate, Mali's energy sector has a fairly elaborate strategic and regulatory framework and institutional architecture. However, these mechanisms are not fully harmonized, or in a position to create sufficient incentives for private operators. Lastly, they are not well integrated with the poverty reduction and employment creation policies (especially in rural areas). Thus, the activities of this second theme mainly aim at *putting in place and/or enhancing modalities or tools for addressing energy challenges* under political, regulatory and strategic development frameworks, and in planning at the local and national level.

89. This axis will essentially entail support to be provided by SREP for the formulation, consolidation, harmonization and application of strategic frameworks, legislative instruments, as well as regulatory and financial arrangements governing the energy sector and, more specifically, the renewable energy subsector. Support will be provided for a review of the *National Energy Policy and National Strategy for the Development of Renewable Energies*, as well as the integration of renewable energies into the country's general policy and strategic frameworks. The strengthening of institutional arrangement will translate into a redefinition of the mandates of the main national directorates and agencies operating in the renewable energy sector.

90. This axis will also concern the provision of adequate support for strengthening the institutional and regulatory system to foster private investments in the RE sector.

91. The initiatives proposed will be implemented with the support of *two distinct and complementary types of activities* namely:

- ***Definition and implementation of a comprehensive strategy for RE communication information*** targeting all stakeholders involved in the sector. This strategy will include the following:
 - Conducting general consumer awareness initiatives on the major regulatory and financial mechanisms of the energy sector;
 - Putting in place a system of knowledge management and sharing, and provision of information specifically for both renewable energy producers and consumers on the standards, quality and costs of existing RE products,
 - Organizing specialized training for RE producers on the consistency of their practices to existing regulations;
 - Putting in place a simple and efficient system to ensure better planning of energy needs in the future;
 - Building the capacity of national sectoral structures, more particularly, to provide support services for the formulation of renewable energy projects that would benefit from carbon credits, and train project analysts of banks and micro- finance institutions on RE projects.

- **Conducting of supporting thematic analyses and evaluations**, including addressing energy challenges in the poverty reduction strategy, as well as decentralization and anti-concentration policies (particularly in relation to the transfer of specific functions and adequate human and financial resources to territorial communities) and the main sector policies (including agricultural, transport, etc.).

92. Provision of *ad hoc* specialized *advisory services* will allow for the definition and implementation of a set of activities in this area in a coherent and integrated manner.

Axis 3: Knowledge Management and Sharing, Monitoring and Evaluation of Activities and Strategic Coordination of the Program

93. The activities of this axis are somewhat crosscutting compared with those of the other axes. They aim at knowledge management and sharing related to renewable energies and new technologies (including new practices and experience feedback), as part of an overall information sharing strategy involving all the relevant national parties, as well as all the projects in the renewable energy sector. The activities of this axis will help to optimize the consolidation and scale-up the outcomes of the investment plan.

94. This axis will, above all, help to define and implement:

- **A participatory, coherent and permanent system for the collection, analysis, monitoring and evaluation of SREP-Mali**, based on a logical framework and a range of performance and results indicators agreed to in advance by all stakeholders and an annual work plan. The Program logical framework will include key indicators of the investment projects intended to provide feedback and enhance the information collected at the project level.
- **A simple and effective system of managing and sharing knowledge acquired through the SREP pilot Program experience in Mali** (including methodologies of studies, training modules, approaches and procedures, and implementation of investments.) The aim is to put together the practices and methodologies used to achieve the expected results available to many national and international partners (particularly the other SREP pilot countries), with a view to multiplying the experiences in Mali's other geographic areas and mobilizing additional financial resources.

95. At the operational level, it is within the framework of activities under this component that all activities related to **a general strategic coordination** of the SREP-Mali Program and all its investment projects to support and consolidate the institutional synergies, and collaboration with all technical and financial partners as well as operators involved in implementing the SREP Program approach, will be defined and put in place. As part of this strategic coordination, special attention will be given to the continuous mobilization of additional funds to ensure the sustainability of Program activities.

Co-Benefits⁵⁴

96. The direct impact of the SREP-Mali investment plan will be to engage the country in a large-scale renewable energy development. SREP will have a direct positive impact on both the living conditions of the Malian population and the productivity of their economic activities, also ensuring an increase in carbon sequestration and reduction of greenhouse gas emissions that will contribute to improving the resilience and adaptation of productive agricultural, agro-sylvo-pastoral areas.

97. In a development paradigm in which social and environmental benefits are intimately related, SREP will help, among other things, to:

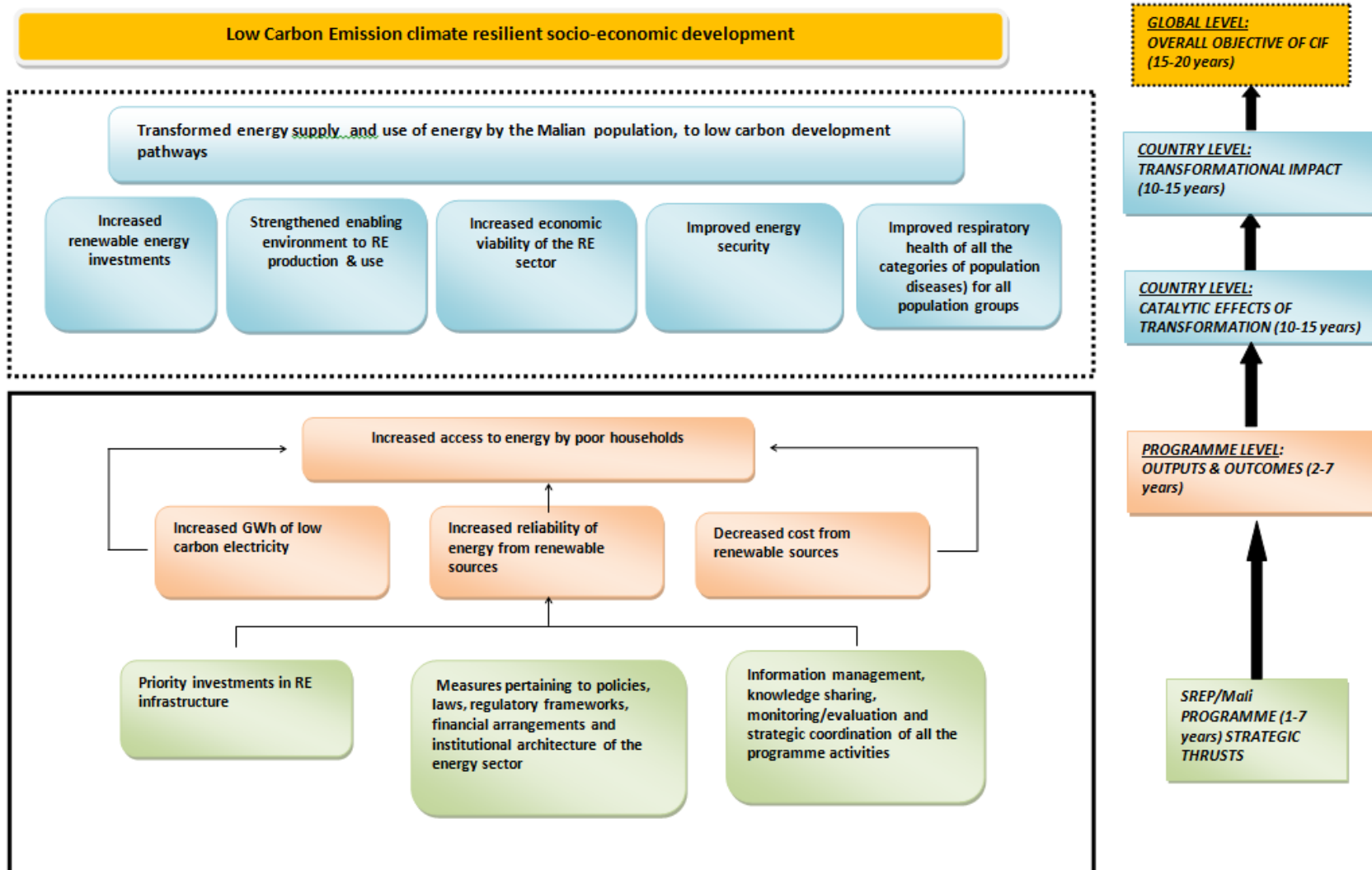
- Reduce the exploitation of non- or less renewable energy sources (forestry resources);
- Reduce GHG emissions due partly to deforestation (and thereby conserve carbon capture or sequestration wells) and partly to the use of fossil fuels;
- Maximize economic development opportunities: creation of new economic activities and new jobs related to new technologies, involvement of the private sector etc.

98. Implementation of these investments will also have significant related benefits:

- Reduction of the dependence on fossil fuel (and energy bill) through an increase in installed capacity;
- Support to decentralization in so far as SREP will contribute to boosting technical, institutional and financial mechanisms to facilitate the transfer of responsibilities to local governments;
- Better availability of political, administrative and regulatory information capable of attracting foreign investors;
- Improvement of the efficiency and sustainability of biomass-energy subsectors and support to alternative livelihoods based on a low carbon intensity economy;
- Protection of groundwater resources, conservation of bio-diversity and protection of forest resources used by local communities;
- Significant contribution to poverty reduction.

⁵⁴ See Annex II for more information on related benefits

Figure 8: SREP Mali General Logic Model



99. Through initiatives to build the technical and organizational capacity of private operators involved in the energy sector, improvement of legal and regulatory arrangements and implementation of adequate financial incentives for the private sector, SREP will directly contribute to involving **associations and private sector structures** in a paradigm of renewable energy production (definite spin-offs in terms of greater involvement of women's associations and women business owners).

100. Lastly, with regard to **gender equity**, SREP will contribute to significantly improving the social and economic status of women in so far as its initiatives will contribute to reducing the time and chores involved in collecting firewood (thereby freeing them for other tasks, including children's education), improving their access to energy for income generating activities. Availability of modern energy services in rural communities will allow children to do their homework at night, women to be able to deliver babies in better conditions and to have a security of movement at night, etc. A whole range of income generating activities is emerging from local communities once electricity is provided, including the creation of jobs through businesses for ice making, food processing, small retail shops, restaurants. A 2011 gender assessment targeted to rural electrification initiatives identified a considerable potential for gender specific activities to be scaled up under the SREP program⁵⁵.

Investment Projects

101. **Defining the Three Investment Projects.** The identification of SREP-Mali strategic axes and activities is the result of an inclusive and participatory process with a number of stakeholders. Many considerations were taken into account for designing the proposed projects:

- Regarding the choice of RE technologies (RET): As stated in section 2, there is a geographically evenly distributed solar potential and an untapped hydroelectric potential in Mali. For both technologies, there are already small-scale pilot projects that have been implemented and the potential for replication is high in Mali and the rest of West Africa. The GoM decided that at least 50% of the SREP allocation should finance solar photovoltaic technologies in view to develop further market potentials and business portfolios of local private sector companies. The RET currently financed by a number of development partners were also a selection criterion, in order to avoid duplication and strengthen complementarity. In this sense, it is worth mentioning that there is no mini/micro hydroelectricity project financed by development partners at this time, while there are a lot of initiatives focusing on biomass uses, although few are existing for a larger scale RE electrification schemes (such as mini-grids) that are able to provide adequate quality and quantity of electricity to scale up productive uses and job creation. Other RET (such as geothermal and wind) having a reduced or inexistent potential in Mali have not been included in the SREP Program.
- Regarding the repartition between On-grid and Off-grid: The electricity access rate is 55.27% in urban areas while it is still below 15% in rural areas. In order to achieve the target set in the PEN (55% in rural areas), the GoM decided to allocate at least 50% of the SREP allocation on rural electrification through RE. The proposed projects will increase the installed RE capacity in

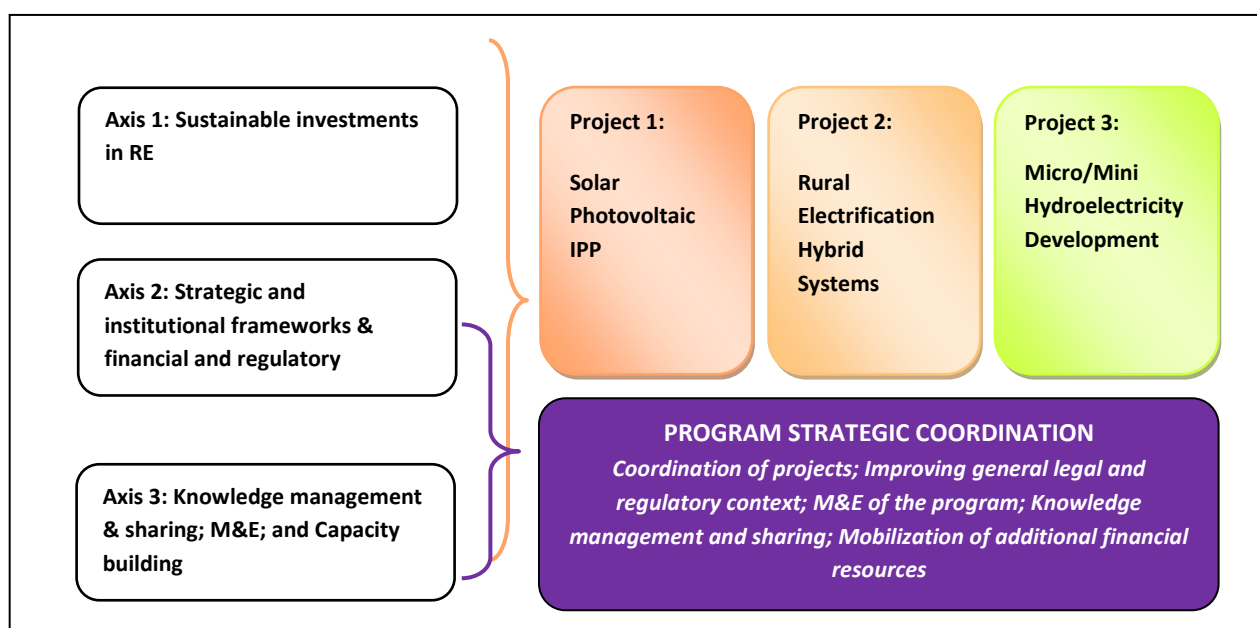
⁵⁵ World Bank / AMADER, 2011

rural areas by about 8 MW (compared to 10MW currently installed in rural areas as a whole), a significant impact that will benefit rural households and businesses. The proposed projects will also add 30MW to the utility network (isolated centers), which represents about 10% of the total installed capacity in the country (see table 1 page 17).

- Regarding the repartition between public and private sectors: Promoting private sector investments has been clearly identified by the GoM as a way to achieve the objectives set by the PEN. Therefore, an important part of the available SREP resources will highly contribute in installing in the country the first Solar PV IPP (Project 1) under a BOOT scheme and implemented by the private sector. Private Sector participation will also be materialized through the strong involvement of the private sector in projects executed by public agencies (projects 2 and 3), and through the provision of specific capacity building and enabling environment activities that will support the private sector.
- Regarding the selection of “soft” activities: The consultation process and analytical work undertaken during the preparation phase of the IP highlighted a number of major barriers/constraints for the scaling-up of RE in Mali. From there, the SREP strategic axes and key activities/measures were identified to overcome these bottlenecks. “Soft” activities, targeting improved human and technical capacities, improved enabling environment, strengthened knowledge management and M&E were therefore chosen to overcome the identified constraints and increase the catalytic and transformational impacts of the “hard” investments.

102. This lead to the appraisal of three investment projects, which, in a distinct but combined manner, will contribute to the implementation of different program activities (Figure 9 presents the functional links existing between strategic axes and investment projects).

Figure 9: Identification of Investment Projects on the basis of the Strategic Axes



103. An in-depth analysis of the activities and the comparative advantages of MDBs and development partners in Mali also led to a consensus on agencies more directly involved in the implementation of each of these projects. The main characteristics of these investment projects are presented below (Annex 1 gives a more detailed presentation of the three projects). With their specific objectives and activities, each project will contribute to the implementation of the SREP-Mali development objective.

104. **Approach for designing the projects.** The three projects were designed to be complementary, while keeping their own specific features. Their structure is quite similar, in order to harmonize processes, maximize interactions and ensure a homogenous M&E system. Each of the projects will have distinct components:

- First component will systematically deal with investments on infrastructures and technologies.
- Other components will address institutional, legal and administrative frameworks (including regulations and tariffs), information management, and capacity building.

105. More particularly, in compliance with national policies on poverty reduction and decentralization, the projects will establish a strategic partnership with participating local governments, so that their annual investment plans integrate income generating activities that, among others, will enable rural households to pay their energy consumption. In this regard, the joint role of AMADER and the National Agency for the Investments of Local Governments (ANICT) will be crucial.

Project 1: Solar Photovoltaic IPP Implementing Agency: Private Sector Co-financing: AfDB Private Sector and IFC	Budget: USD 60 million (including USD 12 million SREP) Additional Installed Capacity: 20MW
<p>To meet a growing demand for electricity, the project will increase the contribution of renewable energy sources to the national sector. It will pave the way for the development of future public-private partnerships in the country. Overall, this project aims to demonstrate the technical, social, economic and environmental feasibility of an integrated and self-sufficient energy model in Mali. The project will be structured around two components:</p> <p>Investment: Capital expenditures to implement an overall additional generation capacity of around 20MW (utility-scale) structured as an IPP in the field of renewable energy, with a cost recovery tariff – maximization of capacity through solar PV technology.</p> <p>Capacity building and Project Management: Provision of technical assistance, mainly in the areas of bidding process, resource assessment, stakeholder consultations, legal corporate arrangements, access to carbon revenues, fiscal regime, and cooperation between EDM and API, and sovereign guarantees. Ensuring the coordination of all the activities of the project, including activities to manage the Monitoring & Evaluation system and to manage/share information on Solar PV energy (its strengths and constraints in the Malian context) for the replication of commercially viable PV installations.</p>	

Project 2: Rural Electrification Hybrid Systems Implementing Agency: AMADER (with CNESOLER and ANADEB) Co-financing: WB	Budget: USD 57.9 million (including USD 15.5 million SREP) Additional Installed Capacity: 4MW
<p>The objective of this project is to support the GoM's efforts to increase access of isolated low income populations to basic energy services to help achieve economic growth and poverty reduction targets. In particular, this project aims to accelerate renewable energy development and increase the proportion of renewable energy in off-grid areas by an additional 4 MW. The project will contribute to increase the number and capacity of large scale RE systems for electricity services (Solar PV and bio-fuel) in existing thermal and new minigrid systems in rural areas. It will also contribute to: (i) replace diesel fuel usage in rural areas with RE thereby reduce GHG, (ii) increase the number of jobs and productive energy uses in rural areas, with a focus on vulnerable groups (women, youth), (iii) leverage additional resources to complement GoM's rural electrification agenda, and (vi) standardize business models for hybrid minigrids in Mali. The project will be structured around two components:</p> <p>Investment: Capital expenditures will, on one hand, increase renewable energy capacity in the existing isolated grids and, on the other hand, gradually build new isolated RE hybrid systems (about 35 localities and the corresponding energy service companies will be targeted). In addition, combinations of hybrid mini grid systems with small scale SHS, energy efficiency and demand side management measures, and modern PV lighting solutions will be promoted in selected larger concession areas of private local energy service providers to expand the energy service portfolio according to rural customer's needs.</p> <p>Capacity building and Project Management: The following initiatives will be included: (a) Training for supervisory and technical staff of the executing agencies, its partners and private energy service providers (for use of safe, quality and sustainable renewable energy equipment and system performance); (b) Training of rural population, particularly women, on the need for efficient use of energy to conserve renewable energy and allow for more productive energy uses; and (c) Awareness creation on the importance of utilizing the installed systems and avoid the usual kerosene and wood fuel use.</p>	

Project 3: Micro/Mini Hydroelectricity Development Implementing Agency: DNE (with AMADER and EDM)	Co-financing: AfDB Budget: USD 136.5 million (including USD 10 million SREP) Additional Installed Capacity: 14.6MW
<p>The project will increase the share of renewable energy in the national system of electricity production and distribution with a focus on rural electrification through mini/micro hydroelectricity. Thus, it will contribute to meeting a growing demand for electricity in rural areas both for household consumption and for local productive activities (commerce, agriculture, etc.). By supporting the construction and operation of four micro and two mini-hydropower plants and their respective transmission lines, the project will benefit thousands of rural households, create new activities, decrease the cost of electricity and reduce GHG emissions. The project will be structured around two components:</p> <p>Investment: This includes the construction of four micro-hydropower plants and two mini-hydropower plants and their associated transmission lines. This component will also include different feasibility studies for the construction of these facilities.</p> <p>Capacity building and Project Management: Strengthening an enabling environment conducive to the development of micro/mini-hydropower plants in Mali. Building institutional, regulatory, technical and operational capacities of all participating stakeholders. Ensuring the coordination of all the activities of the project, including Monitoring & Evaluation activities.</p>	

3.1 Table 7 below summarizes the architecture of the program with the three proposed projects and the strategic coordination mechanism, highlighting their objectives and expected transformational impact.

Table 6: List of the three SREP Investment Projects and the Strategic Coordination Unit

PROJECT	OBJECTIVES	TRANSFORMATIONAL IMPACT	SREP ALLOCATION	TOTAL COST
Project 1 : Solar Photovoltaic IPP	Demonstrate the technical, social, economic and environmental feasibility of an integrated and self-sufficient energy model in Mali	<ul style="list-style-type: none"> Strengthening national capacities and the regulatory framework for a greater involvement of the private sector in RE Paving the way for the development of future IPPs in the country Promoting enabling environment for the development of solar PV 	USD 12 million	USD 60 million
Project 2 : Rural Electrification Hybrid Systems	Increase access of isolated low income populations to basic energy services to help achieve economic growth and poverty reduction targets	<ul style="list-style-type: none"> Reduced costs of electricity generated in rural areas through a standardized approach to scale up hybrid RE systems Expansion of the energy service portfolio of local private sector businesses, including energy efficiency, off grid solar lighting, O&M services, etc. Fuel savings will improve the financial viability of energy businesses in rural areas Establish a programmatic approach for carbon funding for the Rural Energy Fund Reduced health risks (women and children) Improved livelihoods Creation of jobs (by private operators) General socio-economic development in targeted localities with a focus on energy and gender aspects 	USD 15,5 million	USD 57,9 million
Project 3 : Micro/Mini Hydroelectricity Development	Increase the share of renewable energy in the national system of electricity production and distribution with a focus on rural electrification	<ul style="list-style-type: none"> Improving the access of rural populations to modern and affordable energy services Impacting on the economy of rural household and communities Preventing a substantial amount of GHG emissions Reduced health risks (women and children) Improved livelihoods Creation of jobs (by private operators) General socio-economic development in targeted localities with a focus on energy and gender aspects 	USD 10 million	USD 136,5 million
Strategic Coordination	Ensure the strategic coordination of the SREP-Mali (in a way that is consistent with SREP guidelines)	<ul style="list-style-type: none"> Promoting an enabling environment for scaling-up REs Contribute to strengthen the political commitment of GoM to REs Promote efficient knowledge management and exchange of best practices 	Total : USD 2,5 million	USD 4 million

Section IV:

Financing Plan and Instruments

Sources of Finance for Investment Projects

106. The tentative budget for implementing the activities of the SREP investment plan is about **USD 258.4 million**. In addition to the financing requested from SREP (USD 40 million for Phase 1), the Program will receive contributions from the MDBs and from several other partners, as expressed in Table 8 below.

107. In accordance to its request, the GoM wishes to benefit from the totality of SREP contribution in the form of a grant. By lowering the capital investment costs, this will make the projects more attractive for private and public sector partners to co-finance.

Table 7: Tentative Budget for the First Phase of the SREP-Mali Program (in USD million)

Project		GoM	SREP	MDB	Other partners	TOTAL
Solar PV IPP	IFC / AfDB PS	-	12	30	18	60
Hybrid Rural Electrification Project	WB	3.1	15.5	16.2	23.1	57.9
Mini/Micro Hydro Project	AfDB	10	10	25	91.5	136.5
Strategic Coordination Unit	AfDB	1	2.5	0	0.5	4
TOTAL		14.1	40	71.2	133.1	258.4

108. Reserve funds in Mali would be used to complement SREP projects under implementation by providing additional technical assistance, capacity building, and financial resources based on the results achieved during SREP preparation and implementation and focusing on mitigating remaining barriers identified. During the Joint Missions and stakeholder consultations there was a wide consensus that investment needs for the implementation of large scale RE development in Mali are still considerable, namely the cost of financing provided by local financial institutions. As a consequence, capacity building and the strengthening in terms of the role of the local financial institutions should be envisaged as a continuous process in scaling-up market development for RE expansion in Mali. On this basis, the GoM is currently discussing the allocation of SREP resources to (i) develop in cooperation with local commercial banks adequate banking mechanisms and credit lines to increase the participation of Financial Institutions in the development of RE technologies (for both utility scale IPP projects and local private investors involved in rural electrification), that would complement the implementation of the utility scale solar IPP project and the hybrid rural electrification project; and (ii) to expand the financial envelope for critical infrastructure investments. The GoM envisages tapping into SREP reserve funds in an estimated amount of USD 20 million as they will become available and are approved to the SREP pilot countries. Detailed proposals for reserve funds allocations will be transmitted for consideration by the SREP Sub-committee in due time.

Beneficiaries

109. Overall, the final beneficiaries of the IP activities will be the *Malian populations*, especially the poor and rural households whose livelihoods are vulnerable to socioeconomic and environmental crises. The financing will aim at creating conditions that would enable *consumers* to have access to affordable energy and *producers* to enjoy adequate returns on their investments. Other beneficiaries of the Program will be *national institutions* and *local governments*, to the extent that they have an adequate legislative and regulatory system enabling them to stimulate some type of large-scale renewable energies development throughout the country. Lastly, a significant portion of the financing will benefit the *private sector*, which will be mobilized for instance through energy production sub-contracting for infrastructure construction, operation, etc.

General institutional arrangements

110. The institutional arrangement to be put in place under SREP will enable both the general coordination of the Program and implementation of its investment projects. To this end, many actors will be empowered in accordance with their respective mandates, since this is a guarantee of the sustainability of the activities envisaged.

111. The design and implementation of the Program follow a number of guiding principles, the most significant of which being: promoting the programmatic approach to ensure consistency and efficiency across projects, upholding of the principle of ‘subsidiarity’ in carrying out activities (with the empowerment of grassroots actors), optimization of management costs, and consolidation of lessons learnt from past experiences.

Program Steering and Coordination

Program Steering Mechanism

112. The steering and general supervision of the Program will be the responsibility of an ***SREP Steering Committee***. The committee, whose composition, nature and functions will be defined in a decree by the Minister of MEE, will comprise representatives from various governmental agencies involved in the energy sector. Observers will include representatives of MDBs and of relevant UN agencies.

113. Overall, the mandate of the Steering Committee will be to ensure that the principles of SREP are observed in light of national energy policy and in the context of the National Renewable Energies Development Strategy. Another of its roles will also be to provide guidance, support and advice for all activities conducted under the Program and projects. In particular, the Committee will be responsible for examining and approving annual work plans of the Program and projects (prepared and/or validated by the Strategic Coordination Unit), verify and approve the technical and financial assessments, as well as the Program performance reports.

114. For its decisions, the Steering Committee will take into account comments, suggestions and remarks formulated by the different program stakeholders (including national agencies/departments, development partners, NGOs, private sector, etc.), within the context of the annual meetings of the ***SREP Consultative Committee***. This committee will allow the stakeholders to be better informed about program progress and to express their opinions/concerns about the program implementation modalities.

Program Coordination Mechanism

115. A Program Coordination Unit located at the National Directorate of Energy will cater for the general Program coordination. The main tasks of the Unit will be as follows:

a) Strategic Coordination

- Carry out the general coordination of SREP-Mali, by enhancing collaboration between all stakeholders;
- Prepare the annual Program work plans, and support the preparation of the work plans of the three projects;
- Harmonize the Program approach with the national energy policy and the growth and poverty reduction strategy;
- Ensure synergy between the three investment projects;
- Initiate and organize crosscutting analytical work in support of various investment projects.

b) Knowledge Management and Sharing (KMS) (see Inset 1)

- Disseminate and communicate the results of SREP at local, regional, national and international level;
- Support the management of all the knowledge acquired by the SREP Program (approaches, methodologies and lessons);
- Ensure linkage with the CIF Administrative Unit and prepare regular reports on Program implementation for the SREP sub-committee;
- Conduct targeted studies, organize consultative workshops and support dialogue spaces;
- Participate in various fora organized by the CIF or other partners to share experience with other pilot countries.

c) Monitoring and Evaluation (M&E)

- Operate the SREP monitoring/evaluation system and inform the various indicators of the log-frame;
- Ensure the implementation of the Environmental and Social Management Master Plan and continuously assess the social, economic and environmental impacts of all Program activities (including those relating to KMS);
- Harmonize the logical framework of the Malian SREP Program with the general logical framework of SREP/CIF to provide feedback to the CIF and facilitate information consolidation.

d) Capacity Building (in coordination with projects capacity building activities)

- At institutional level: (i) support to the revision of the institutional framework of the RE sector and the mandate of national institutions (to ensure its consistency), and building their capacity (including carbon financing); (ii) support to the revision of arrangements (legal, legislative, regulatory, tariff, tax, etc.) governing the subsector; (iv) adaptation of RE technologies to the Malian context and deepening of studies in resource mapping; (v) support to the development of a strong planning system for the energy sector.
- At the level of private operators: (i) support to technical managerial training (human and financial resources, administration, business plan development, marketing, environmental impact of investments, awareness on social issues, etc.); (ii) understanding of regulatory frameworks governing the subsector (legal, legislative, regulatory, tariff, tax, etc.);
- At the level of banking institutions: (i) needs assessment, (ii) development of specific lending products to renewable energy sources; (iii) sensitization and training of executives; etc.

e) Mobilization of additional financial resources

- a. Define and conduct specific activities (advocacy, information, etc.) aimed at mobilizing additional financial resources from development partners and private sector.
- b. Mobilize sufficient additional financing to undertake a series of technical/feasibility studies to prepare a strong pipeline of projects, and ensure that new RE projects are being prepared on the basis of this pipeline.

116. The team of the Coordination Unit will comprise the following experts:

- a. An institutional expert responsible for the planning and overall coordination of the Program, in charge of consultations between stakeholders and conducting activities related to reforms at institutional, regulatory levels.
- b. A monitoring/evaluation expert in charge of implementing Program M&E system in coordination with the monitoring/evaluation experts of the projects.
- c. A knowledge sharing /management expert responsible for defining and implementing the Program's communication strategy, undertaking capacity-building activities.

117. Other experts (for instance: finance management/procurement, environment, etc.) will eventually join the unit, together with some additional supporting staff (exact needs will be clarified in the coming months).

Inset 1: SREP Mali KMS System

The SREP-Mali KMS system aims to define and implement a key element of CIF Programs, in general, and SREP, in particular, namely: *a system of filtering, presenting, critically analysing and disseminating main Program achievements* (with regard to information concerning the approaches, methodologies, lessons learned, synergies and partnerships).

This is a fundamental element of the development process put in place by SREP, as it aims to build on the achievements of the Program's *learning by doing* and monitoring/evaluation systems. Through the KMS, all operators involved in implementing the Program will be able to gain access to the necessary technical data in a *timely manner* and in *real time*, and all the stakeholders of the energy sector will become aware of and draw on lessons from on-going operations. This will make it possible to have a parallel reading of the challenges and outcomes of the general Program and its individual investment projects, depending on their objectives.

To this end, the coordination of all the KMS activities will constitute a key element of SREP implementation. The methodology will consist in addressing issues concerning the following aspects: Program priorities and objectives as well as those of its investment projects, modalities envisaged for achieving these objectives, the results achieved (through the two components of the three projects namely 'Investments' and 'capacity building').

The key themes that will be pursued by the SREP-Mali KMS are as follows:

Configurations of Program Approach

- The current and potential involvement of the GoM in energy matters (inventory of new and general legal measures, including those SREP may have contributed to defining, and administrative and technical decisions concerning the REs).
- The active participation of UN agencies, development partners, private sector, local governments, NGOs and civil society associations in the main issue areas of the Climate Fund (particularly to address impact of deforestation and effects of CO² emissions).
- The consultative spaces existing between decision-makers and civil society to assess the approaches and most relevant methodologies to address Mali's energy challenges.

Program Implementation Modalities

- Constraints and impediments encountered by the three investment projects (technical, financial, institutional aspects, etc.), especially in relation to their capacity to change the market and create catalytic effects.
- The results of the Program with regard to additional financial resource mobilization.
- Reforms (legal/administrative) that can guarantee greater sustainability of the Program.
- Weaknesses and strengths of the financial instruments used in the various investment projects.
- Operating links existing between the RE objectives pursued by SREP and those of the forestry sector and the GoM's fight against climate change.
- Comparison between the outcomes of the SREP capacity building initiatives and those used by other Programs, and the possibility of using the 'cross-fertilization process'.

At the Coordination Unit level and under the supervision of the Program Coordinator, a communication/knowledge management expert will be responsible for the cross-sectoral capacity building activities, and will support the implementation of the 'Capacity Building' component of the three projects. Close partnership will be established with the relevant sector ministries in charge of M&E and capacity building. Possible activities will include conducting of targeted studies, organization of consultative workshops, support to dialogue spaces, participation in for organized by CIF/SREP, etc.

118. As a member of the Strategic Coordination Unit based at the DNE, each expert will be integrated into the MEE staff. Each one will be linked to the Program through a *performance contract*, which will be subjected to annual evaluation. Administrative modalities concerning the recruitment and wages of experts will be in line with Mali's current regulations.

119. The Strategic Coordination Unit will also benefit from specific services of an external expertise, as and when needed (staff of the Unit will be in charge of the preparation of TOR of all external consultants and monitoring of their activities).

Implementation

120. Depending on their characteristics, the three investment projects will be implemented by various public and private stakeholders or as part of a public-private partnership.

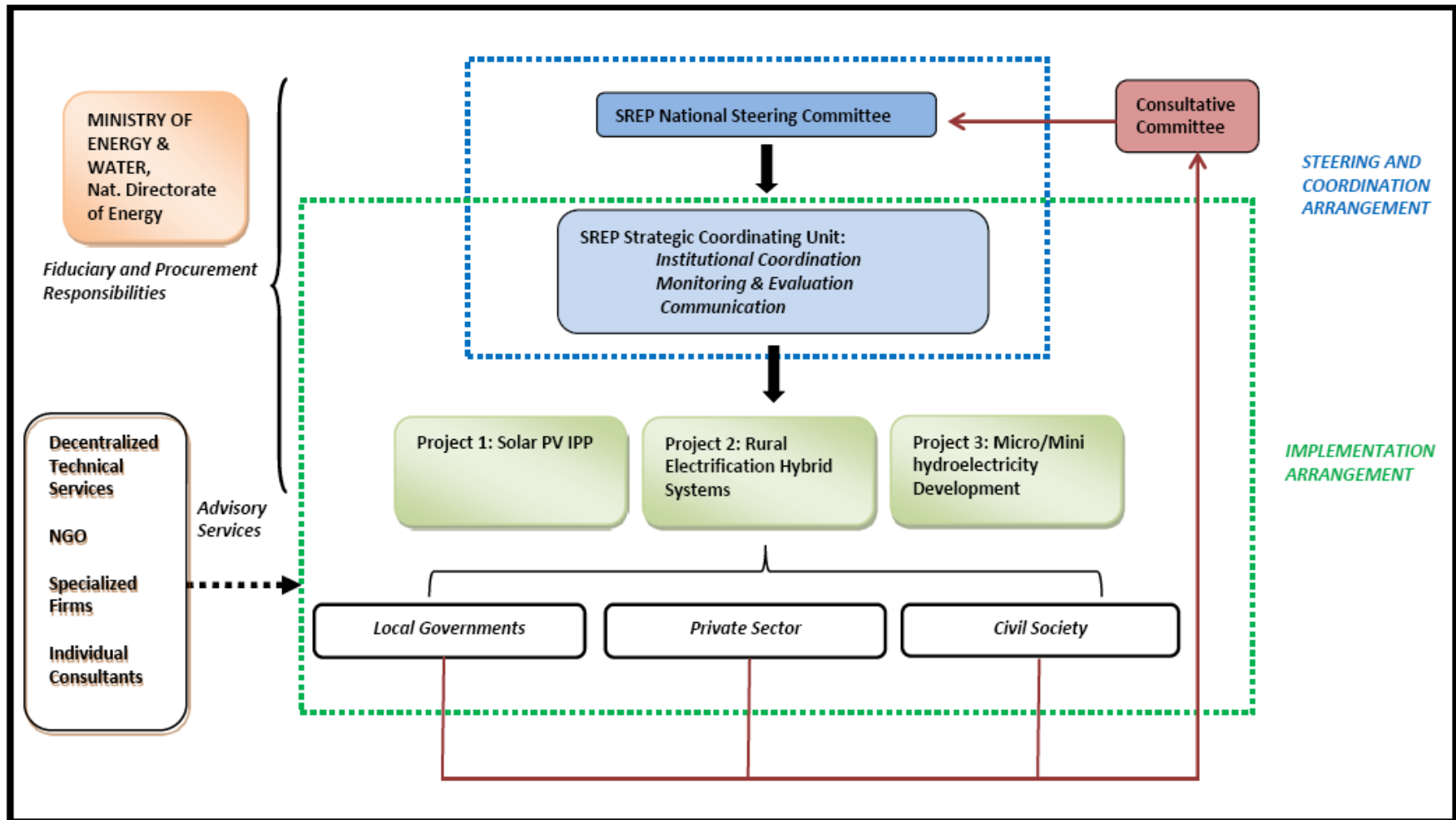
121. Local governments, local communities, NGOs, and private sector operators will also be involved in diverse ways (depending on project) in the planning and implementation of activities. Technical

services, specialized consulting firms and individual consultants/resource persons will provide advisory/support services according to the needs identified. Figure 10 below shows the architecture of the steering and implementation arrangements of the Program.

122. The MEE will oversee the ***fiduciary and procurement arrangements*** (through the institutions implementing the projects). An assessment of the capacity of the national institutions that will implement the projects has been partially conducted by the MDBs as part of on-going projects. Complementary assessments needed and capacity building actions may be carried out based on the assessments. As soon as possible, preference will be given to the use of the national procedures and systems in line with the Paris Declaration.

123. ***Partnership agreements*** will be established between MEE and all the stakeholders involved in diverse ways in Program implementation. These agreements will help verify the performance of the intervening parties and their compliance to their respective obligations. To this end, each party will be bound to the investment projects through a *performance contract*, which will be subjected to annual evaluation. The agreements will also help to establish an annual planning of activities to be conducted, depending on the structures, budgets and procurement plans. Following approval by the SREP Steering Committee, the annual work plan and budget of each party will be integrated into the annual work Program of each project. The annual auditing of each project will also cover aspects related to the management of these structures.

Figure 10: SREP Mali Institutional Structure



Section V:

Contribution to the National Energy Sector Roadmap and Potential for Replication of Investments

124. SREP will contribute to implementing the main institutional, technical and financial aspects of the energy sector roadmap stemming from national policy and strategic frameworks.⁵⁶ In particular, it will foster the comprehensive and rapid implementation of the major elements of the *National Strategy for the Development of RE*, notably in relation to the increase in the share of REs in national power generation, bio-fuel industry development, sustainability of RE services and search/acquisition of sustainable financing mechanisms.

125. The investments will have a direct and indirect impact on all aspects of the country's socioeconomic development. Indeed:

- The use of renewable energy sources and dissemination of new technologies will help to reduce man-made pressures on the wood products of the country's forests, while at the same time leading to a low carbon intensity growth.
- Targeted RE investments will enable private energy companies to improve their business models (for instance limiting impacts of volatile fuel costs) and households and vulnerable groups to benefit from increased access to electricity, thereby creating opportunities for jobs and productive energy uses.
- Training programs modulated to suit various actors will help to build the capacity of all the actors involved directly or indirectly in the energy sector, particularly officials of national agencies, local authorities, civil society and private sector operators.

126. SREP investments made in private sector-led projects⁵⁷ are expected to provide a catalytic effect for the development of large, privately sponsored, renewable energy projects. By enabling the first such project to take place, the SREP will allow all actors (private and public sector) to learn how to implement a successful project in a Malian context, therefore reducing the costs associated with these activities for future projects. SREP investments will also lower the risks and uncertainty perceived by the investor community related to the feasibility of these types of projects in Mali. Consequently, with a lower implementation cost and a greater confidence that these projects can be implemented in a Malian context, we should see investors asking for a lower rate of return on their investments in the future, and more projects passing the minimum required rate of return threshold. This should help boost large scale renewable energy projects in the future.

127. Public sector-led SREP investments will target rural electrification through renewable energies, enabling displacement of part of generation provided through fossil fuels. They will (i) ensure that

⁵⁶ For other benefits see Annex 2

⁵⁷ SREP private sector investments are expected to be made jointly with private sector sources of financing, notably private sponsors, and other private sector focus investors such as the International Finance Corporation (IFC) and the African Development Bank (AfDB) Private Sector. Efforts will also be made to seek commercial financing from local or foreign institutions if the current economics of the project allow it.

efficient coordination mechanisms will be in place among the Government agencies, (ii) create an environment conducive to attract an increasing number of local and international private investors by strengthening regulatory frameworks, (iii) pilot a number of different business models to make sure grid and off-grid electrification will be implemented in a sustainable manner in rural areas, (iv) and contribute to the introduction of clean and low cost technologies in different regions in Mali, thereby promoting productive energy uses, stimulating the creation of jobs for isolated low income populations, contributing to the MDGs and reducing GHG. Increased connectivity will further eliminate health risks to women and children arising from use of kerosene and wood fuel. The activities will also transform and positively impact livelihoods in rural areas. SREP investments that are managed in partnership with local private sector initiatives will contribute to establish a benchmark for a sustainable renewable energy service portfolio in isolated rural areas. A successful scale up of Mali's rural electrification initiatives combined with the greening of Mali's rural energy mix and the introduction of carbon funds will provide lessons learned and best practices for the sub-region.

128. Furthermore, the Strategic Coordination Mechanism of the Program will ensure improved knowledge management and cross-cutting capacity building, and support institutional/regulatory reforms, thus creating an enabling environment and providing lessons learnt that will increase the catalytic and replication effect of the investment projects.

Section VI:

Coordination with Development Partners and Supplementary Development Activities

129. In Mali, the development partners have actively embarked on the implementation of the Paris Declaration, in partnership with the GoM. A Joint Country Assistance Strategy (SCAP 2008-2011) binds 14 partners, including the African Development Bank and the WB Group for improvement in aid effectiveness and alignment with national priorities. Under the leadership of the African Development Bank (AfDB is the lead of the development partners in Mali in 2011), a new SCAP is undergoing formulation for alignment with the new *Growth and Poverty Reduction Strategy* (2012-2017). Beyond these national frameworks, the development partners are also organized into sector Thematic Groups, including the “Energy Group” chaired by the African Development Bank. The partners coordinate their sector dialogue with the Ministry of Energy and Water under the thematic group. The Energy Thematic Group has been involved in the formulation of the SREP-Mali Investment Plan since its inception.

130. During the preparatory phase of the Investment Plan, several development partners expressed interest in actively participating in Program implementation. This partnership could take several forms, depending on the specificity of the partners, their expertise and value added as well as the status of some their current or future programs/projects (at national and/or sub-regional level). Some development partners confirmed their interest in co-financing SREP projects; others will facilitate synergies with on-going projects to ensure better consistency of interventions funded by the development partners.

131. Beyond the co-financing secured for SEP-Mali projects, the growing interest of the development partners in renewable energy sources in Mali, boosted by the financing mobilization role to be played by the SREP Program Coordination Unit, augurs well for both fruitful synergies with on-going development projects and the formulation of projects that will help to scale up SREP investments in the coming years. Annex 6 gives an indication of on-going activities/projects with which SREP projects will develop in synergy. There is a growing trend among United Nations Agencies (notably UNDP) and the European Union towards greater involvement in the sector. Through its White Paper on Energy, France (AFD) has also expressed the desire to enter the country’s renewable energy sector in the medium term.

132. At the same time, contacts with specialized financial institutions will help to define a framework on “clean investments” in the private sector. This is critical since a major constraint for the development of the sector is the expensive nature of loans provided by local commercial banks to the Malian private sector. Hence, this will allow overcome one of the identified barriers in the RE sub-sector.

133. Coordination with the development partners is also envisaged within a wider framework that includes issues related to SREP. Among them: (i) energy efficiency; (ii) reduced man-made pressures on forest resources through improved cooking methods; and (iii) forest management plans. Indeed, as in many African countries, energy issues are closely related to that of biomass management. Consequently, if a choice had to be made in terms of investment priorities for the SREP program activities, these

investments must be made in conjunction with other activities/projects that deal with the aforementioned related issues⁵⁸, thereby achieving the overall objective of sustainable energy development in Mali. In this sense, discussions have been on-going with development partners for the past few weeks on synergies to be created with projects that include activities related to biomass/forestry management, energy efficiency, etc. The Strategic Coordination Unit of the Program will be responsible for monitoring that such synergies are truly efficient and support the implementation of the *National Strategy for the Development of Renewable Energies*.

⁵⁸ See sustainable natural/forest resources management projects, WB's *Lighting Africa*, etc.

Section VII:

Implementation Potential and Risk Assessment

134. Mali's general environment is conducive for setting up SREP, as the GoM has already defined the appropriate strategic frameworks and institutional architecture that meet the conditions for the development and replication of new technologies based on renewable energy sources. This augurs well for a relatively satisfactory implementation of the Program.

135. However, the implementation of SREP-Mali is expected to entail some risks. The overall implementation risk is assessed as **moderate**. Table 9 below shows the main identified risks and the mitigation measures that will be developed to ensure efficient implementation of the Program. ***Appropriate corrective and support measures*** will be put in place during the formulation and implementation of the investment plan in light of lessons drawn from the activities and regular supervision and monitoring/evaluation missions. The monitoring/evaluation system in relation with the "Knowledge Management Component" will help to correct any dysfunction (surveys will be conducted among beneficiaries of the Program and project activities, especially with regard to their perception and 'degree of satisfaction')

136. ***Environmental and social assessment.*** The GoM is conducting an Environmental and Social Assessment of the SREP-Mali investment plan. This notably aimed at: (i) identifying the environmental, socioeconomic and institutional challenges and impact (both positive and negative) associated with the Program; (ii) incorporate environmental, socioeconomic and institutional issues in the design and implementation of SREP in Mali and, where necessary, recommend specific institutional strengthening measures for the stakeholders concerned; (iii) ensuring that the IP activities comply with the Malian environmental law and the safeguards policies of the MDB; (iv) propose an Environmental and Social Management Framework for implementing the SREP Investment Program.

137. The analysis conducted so far shows that SREP-Mali will have a global positive impact on the country's sustainable development by reducing GES emissions, creating new jobs and income generating activities thus contributing to poverty reduction, to improved health in rural areas, etc. Thanks to the integration of participatory approaches and knowledge management, SREP should have a positive impact that could extend to the sub-region, thereby enabling Mali to play its role as a pilot country in West Africa.

138. However, the evaluation also highlighted the fact that the proposed investments could potentially generate negative impacts (especially related to the construction of infrastructure) that need to be mitigated through appropriate measures. An Environmental and Social Management Framework (ESMF) is being designed for the Strategic Coordination Unit to implement in the coming months/years.

139. Main recommendations include:

- All SREP projects and sub-projects would be subject to environmental and social impact evaluations, according to Malian regulations, through the DNACPN;
- All liability thresholds should be strictly respected, and subject to verification through SREP monitoring.
- The terms of reference for the impact studies that will be required through the project life of the SREP should include an analysis of proposed activities with regard to environmental and social policies of development partners and national institutions.
- A list of reference norms has been prepared for SREP projects, taking into account the different policies of development partners, and each project will be analyzed according to these norms.
- Capacity building should be done to ensure the efficient implementation of the ESMF activities.

Table 8: Main risks and proposed mitigation measures

RISK	DESCRIPTION/MITIGATION	RESIDUAL RISK
Institutional Risks (risks related to policy and regulatory environment and/or institutional capacity)	Institutional risks of the energy sector include: (i) institutional, policy, and regulatory changes ongoing/planned in the energy sector that might lead to changes in the design of proposed project and delays in the implementation of SREP, (ii) weaknesses and incoherencies that persist in terms of regulations, frameworks, and systematic approaches, in particular those linked to the promotion of utility scale IPPs, and (iii) guarantees and financial support mechanisms explicitly targeting RE promotion are not fully studied (such as feed-in tariffs), tested, or implemented for the scale-up of RE (i.e. the rural energy fund). The GoM is fully committed to the program's success and sustainability. Several national energy sector policies and strategies indicate the GoM's visions and objectives for the sustainable development of the energy sector. Multiple institutions, including DNE, several specialized public agencies and the EDM have been showing leadership during SREP preparation and are committed to drive the GoM's RE agenda forward. Reporting/supervision mechanisms are in place, although not fully reflecting recent sector reforms. A sector regulator is in place with adequate technical capacity. The GoM recognizes the value of PPPs and is proceeding with reforms to open the energy sector to private investors. High level and joint policy dialogue with MDBs already active in the energy sector in Mali will be aligned to support the Governments efforts and establish confidence needed to attract private sector investors and development partners. A systematic capacity building program envisaged under the SREP will provide the Governmental relevant institutions with the tools, knowledge, and capacity to carry out required reforms. Expert consultant support will be provided to support the assessment and formulations of policy reforms related to RE. Institutional capacity of the implementing agencies will be assessed before project appraisal, and where necessary capacity building will be provided.	Moderate
Technology risks (risks related to technological complexity)	Technologies to be adopted for solar PV, mini-hydro, and hybrid-mini-grids are proven and assessed as adequately to be handled by the implementing agencies, in combination with the planned technical assistance and capacity building activities under SREP. Detailed feasibility studies and a few pilot projects currently underway will provide further site specific information and valuable lessons learned to fine-tune technology investments as needed. Track record in off-grid electricity access expansion over the last years and appetite of local private energy sector companies to invest in energy technologies have created momentum and is expected to continue under the SREP program.	Low

Financial risks (risks related to the financial viability of the sector/entities)	The RE sector in Mali, although showing increasing budget allocations, has limited financial resources and its viability will depend on the leverage prospect of external funding to implement the ambitious RE program. Effective implementation of the restructuring of EDM, supported by MDB policy dialogue and investment operations (including the WB's Energy Sector Development Project) will be key to improve the sector viability. Relative high upfront capital costs of RE technologies might prevent the sourcing of investments at a significant scale. The SREP will play a catalytic role in decreasing the financing costs of RE projects and required financial support mechanisms will be designed and assessed during preparation, in line with the on-going MDB and development partner interventions in the energy sector. At project appraisal, the financial viability of each executing agency will be assessed and corrective measures will be agreed on as needed.	Moderate
Social risks (related to social issues)	Intensive stakeholder consultations have been carried out during SREP preparation and will continue when project activities are fine-tuned. Consultation mechanisms, involving a wide range of stakeholders from the private sector and civil society organizations, have been put in place under the SREP. By providing affordable electricity to more people, the program will promote greater economic growth and equity, including targeted investment activities in rural areas. A focus on productive energy uses and employment creation is incorporated in the program design and will target vulnerable groups (women and youth). Design of financial mechanisms under SREP will take affordability and willingness to pay into account, supported by information, education, and communication campaigns.	Low
Environmental Risks (Risks related to environmental concerns)	In view of implementing SREP investment program in a sustainable and environmentally friendly manner, the GoM is preparing a programmatic environmental impact assessment. The potential impacts of the program's activities are being assessed and mitigation measures will be proposed as part of the ESMF. ESMF activities will be implemented and monitored through the Strategic Coordination Mechanism, with support from the MEA.	Low

Section VIII: Monitoring and Evaluation

140. The SREP will define and implement a complete Monitoring & Evaluation system aimed at collecting, analysing, processing and communicating key information related to the activities of the Program, as well as its results, impacts, and lessons learnt. It will be a key tool to plan and monitor Program's activities.

141. The SREP M&E system will be perfectly integrated into the national M&E system of the energy sector, while solving some of its main constraints and bottlenecks. It will also be in harmony with the M&E systems of the three investment projects. Appendix 4 provides a more in-depth presentation of the M&E system of the SREP-Mali Program.

LOGICAL FRAMEWORK RESULTS	CORE INDICATORS	RELATED INDICATORS	BASELINE	TARGETS	MEANS OF VERIFICATION	DATA COLLECTION RESPONSIBILITY	SOURCE OF DATA
PROJECT LEVEL							
1. Increased access to RE energy by Malian rural households	Number of targeted households with access to energy services from RE (women/men)		Baseline to be determined during the preparation of the investment projects	[TBD]	Projects' M&E systems	M&E experts (projects and CPS Energy)	Statistic data on energy (CPS Energy) Progress reports of the investment projects
		PEN's INDICATORS Number of RE systems installed (breakdown by type of RE equipment).	2010: 469 (solar water-heater, stoves, dryers, refrigerators, solar kits, solar pumps, battery chargers, solar power system for computers)	[TBD] by CPS and/or CNESOLER	National M&E (Min. Energy)	CPS Energy	Statistic data on energy (CPS Energy)
		ENERGY INDICATORS Rates of access to electricity (national, urban, and rural levels) Number of new localities benefitting from public lighting Number of new subscribers to electricity in rural areas per year	Estimations 2010 Nat : 27,08% Urb : 55,27% Rur : 14,89% Estimations 2010 21 (AMADER) 35 (EDM-SA) 11.829	[TBD] by CPS and/or CNESOLER	National M&E (Min. Energy)	CPS Energy	Statistic data on energy (CPS Energy)
2. Increased GWh of RE energy services	a) Percentage change (%) of GWh generated from REs & per household			+ 10% /per year from 2014 onwards	Projects' M&E systems	M&E experts (projects and CPS Energy)	Statistic data on energy (CPS Energy)
	b) Evolution in percentage (%) of reduced tons (millions) CO ₂ equivalent emissions and cost/ton		Baseline : 0	[TBD] with 'Carbon Fond' experts		M&E experts (projects and CPS Energy)	Progress reports of the investment projects Statistic data on energy (CPS Energy) and CPS Environment
	c) Increased RES capacity (MW)		Baseline : 0	+ 10MW by 2014	Projects'	M&E experts (projects and CPS)	Statistic data on energy (CPS Energy) and CPS

LOGICAL FRAMEWORK RESULTS	CORE INDICATORS	RELATED INDICATORS	BASELINE	TARGETS	MEANS OF VERIFICATION	DATA COLLECTION RESPONSIBILITY	SOURCE OF DATA
				+ 40MW by 2016	M&E systems	Energy)	Environment Progress reports of the investment projects
	d) Number of jobs (women/men) created in RE sector		Baseline : 0	Total estimation 3.000 direct and indirect jobs	Projects' M&E systems	M&E experts (projects and CPS Ministry of Employment)	Progress reports of the investment projects Statistic data on energy (CPS Energy) and on employment
		Quantity of Biofuel produced (liters)	At national level (2010): 74.829 lit jatropha oil 100.000 lit biofuel	By 2013: 39.2 million liters of jatropha oil and 25 million liters of ethanol.	National S&E Ministry of Energy	CPS Energy	Statistic data on energy and M&E (CPS Energy)
3. Decreased cost of electricity from RE	Percentage (%) change in cost/GWh (\$) of REs for project beneficiaries grid-connected		Baseline to be determined during the preparation of the investment projects	[TBD]	Projects' M&E systems	M&E experts (projects and CPS Energy)	Statistic data on energy and M&E (CPS Energy) Statistic data on energy (CPS Energy))
4. Knowledge management and sharing	a) Number and type of knowledge assets (ex. publications, studies, knowledge sharing platforms, learning briefs, communities of practice, etc.)		Baseline : 0	+ 15 products by 2014 + 35 products by 2016	Program M&E systems	SREP Programme Coordination Unit	Progress reports of the investment projects Program Annual Reports
	b) Number of non-SREP countries that replicate project approach (ex. investment documents citing Malian project experience)		Baseline: 0	At least 2 countries in the sub-region	Program M&E system	SREP Programme Coordination Unit	Supervision mission reports MTR report (based on policy and strategy documents of different countries)
	c) Evidence of use of knowledge assets (by energy programs/projects/micro projects)		Baseline : 0	At least 3 new projects for the development of REs by 2016	Program M&E system	SREP Programme Coordination Unit	Supervision mission reports MTR report (based on policy and strategy documents of different

LOGICAL FRAMEWORK RESULTS	CORE INDICATORS	RELATED INDICATORS	BASELINE	TARGETS	MEANS OF VERIFICATION	DATA COLLECTION RESPONSIBILITY	SOURCE OF DATA
							countries
		<u>PEN' INDICATORS</u> - Number of participants in international energy meetings on energy-related issues - Number of projects and activities included in internal cooperation agreements - Number of RE repairers trained - Number of RE trainers trained - Number of communication and consultative initiatives carried out	2010 : - 38 participations to international meetings - 2239 newly trained agents (overall energy sector) (AMADER: 11, DNE: 15, CNESOLER: 10, EDM: 2185, PASE: 3, ANADEB: 10, AMARAP: 05)	[TBD] by CPS and/or CNESOLER	National M&E (Ministry of Energy)	CPS Energy	Energy statistics M&E (CPS Energy)
		<u>ENERGY INDICATORS</u> Number TV & radio programs produced Number of workshops and seminars organized	<u>Estimations 2010</u> About 120 programs 5 Workshops (ANADEB) 8 Workshop (EDM-SA) 188 Training sessions (EDM)	[TBD] by CPS and/or CNESOLER	National M&E (Ministry of Energy)	CPS Energy	Energy statistics M&E (CPS Energy)
5. New and additional resources for renewable energy projects	Leverage factor of SREP funding (amount of financing from other sources (contributions broken down by MDBs, GoM, multilaterals and bilateral, CSOs, private sector))		[]TBD	2012 : \$10,000,000 2014 : \$30,000,000 2016 : \$60,000,000 (cumulative)	Program and projects M&E system	SREP projects financial officers SREP Coordination Unit	SREP financial reports Partnership agreements

(*) Chauffe-eau solaire; Séchoirs solaires ; Cuiseurs ; Frigo ; Kits solaires ; Pompes solaires ; Charge de batteries ; Système alimentation solaire d'ordinateur)

RESULTS	CORE INDICATORS	RELATED INDICATORS	BASELINE	TARGETS	MEANS OF VERIFICATION	DATA COLLECTION RESPONSIBILITY	SOURCE OF DATA
REPLICATION CATALYTIC							
1. Increased RE investments	a) Percentage (%) of RE investment of total energy sector investment		[TBD] by CPS and/or CNESOLER	At least 55% by 2022	National M&E Ministry of Energy	CPS Energy Ministry of Finance / Central Bank	National statistics on energy
	b) Percentage (%) of RE investments made private sector (compared to the total investments of energy sector)		[TBD]	At least 30% by 2022	National M&E Ministry of Energy (with support from investment project M&E systems)	CPS Energy Ministry of Finance	National statistics on energy M&E (CPS Energy)
2.Strengthened Enabling environment for renewable energy production and use	a)Adoption of and implementation of low carbon energy development plans		1 National Energy Policy	2012/2013 : PEN updated By 2022 : 2 additional national plans for low carbon development	National M&E Ministry of Energy MDBs, Global RE report (RE 21)	National Directorate of Energy /CPS Energy	National statistics on energy M&E (CPS Energy) MDBs reports
	b)Enactment of policies, laws and regulations for renewable energy		2 National Strategies (RE/Biofuels)	2012/2013 : RE strategy updated, Orientation Law adopted 2015 : Biofuel strategy updated By 2022 :At least 2 additional bills and regulatory documents aimed at promoting REs are completed	National M&E Ministry of Energy MDBs,Global RE report (RE 21)	CPS Energy	National statistics on energy M&E (CPS Energy)
		PEN's INDICATORS - Number of texts approved and published by the official Gazette - Number of agencies created - Number of operators involved in the energy sector	2010 : 1 regulatory text available 2 normative documents available	[TBD] by CPS and/or CNESOLER	National M&E Ministry of Energy	CPS Energy	National statistics on energy M&E (CPS Energy)

3. Increased economic viability of RE sector	a) Change in percentage (%) of total investment in RE sector from private sector		Baseline to be determined during the preparation of the investment projects	[TBD]	National M&E Ministry of Energy	CPS Energie	Statistiques énergétiques S&E (CPS Energie)
	b) Change in percentage (%) of total energy sector employment working in RE (women/men)		Baseline to be determined during the preparation of the investment projects	[TBD]	National M&E Ministry of Energy	National M&E system (Ministries of Energy and Employment)	National statistics on energy M&E (CPS Energy) Statistic of Ministry of Employment
	c) Cost of renewable energy \$/kWh compared to cost of fossil fuels \$/kWh over time		Baseline to be determined during the preparation of the investment projects	[TBD]	National M&E Ministry of Energy	CPS Energy	National statistics on energy M&E (CPS Energy))
4. Increased energy security	Increase in percentage (%) of total energy supply from renewable sources in the power industry and in the energy sector		3% of total energy supply from REs (for electricity sector) 10% of total energy supply from REs (for the energy sector)	10% by 2022 15% by 2022	National M&E Ministry of Energy	CPS Energy	National statistics on energy M&E (CPS Energy)
5.Improved respiratory health of women, men, girls, and boys	Prevalence of Acute Respiratory Infections (ARI) (in children under 5 years) (rural/urban)		Baseline to be determined during the preparation of the investment projects	[TBD]	National M&E system (reported by World Development Indicators (WDI))	(Ministries of Health and CPS Energy)	National statistics on energy

TRANSFORMATIONAL IMPACTS							
Transformed energy supply and use by poor households in Mali, to low carbon development pathways	a) Level of household 'energetic poverty'		Baseline [TBD] during preparatory phase	[TBD]	Household surveys	DNE	National statistics on energy M&E (CPS Energy)
	b) Percentage (%) of population (rural/urban hhds) consuming energy services from RE sources (country level)		Baseline [TBD] during preparatory phase	[TBD]	National M&E of Ministry if Energy	DNE	National statistics on energy M&E (CPS Energy)
	c) Percentage (%) of energy services from modern, and low carbon REs		Baseline [TBD] during preparatory phase	[TBD]	National M&E of Ministry if Energy	DNE	National statistics on energy M&E (CPS Energy)
	d) Change in the Energy Development Index		[TBD] by DNE and AMADER	[TBD]	Annual updates by IEA	DNE	National statistics on energy M&E (CPS Energy)
		ENERGY INDICATORS Share of timber fuels in the total national energy system	2008 : 77%	[TBD] by CPS and/or CNESOLER for national targets	National M&E of Ministry if Energy	DNE/AMADER	National statistics on energy M&E (CPS Energy)

Annexes

- Annex I: Investment Projects
- Annex II: Evaluation of Mali Absorption Capacities
- Annex III: Stakeholder Consultations
- Annex IV: SREP Co-Benefits
- Annex V: Current/Planned Short Term Activities in the Area of Renewable Energies

Annex I: Investment Projects

Project 1: Solar Photovoltaic IPP

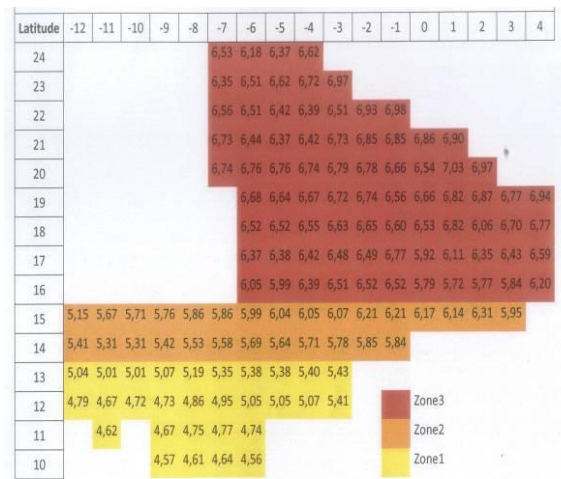
Executant: Private Sector

MDB Support and Co-financing: AfDB Private Sector and IFC

Problem Statement

1. The GoM adopted in 2006 the National Energy Policy, the overall objective of which is to contribute to the sustainable development of the country through the provision of energy services more accessible at lower cost and conducive to promoting socio-economic activities. The specific objectives of the National Energy Policy are: (i) meeting the energy needs in quality, quantity and cost; (ii) ensuring the protection of persons, property and environment against the risks of inappropriate energy services; (iii) strengthening the capacities of policy, management, monitoring and control of the energy sector; and (iv) strengthening the benefits of international cooperation in the field of energy. In terms of guiding principles, these are based on decentralization, liberalization, a programmatic and participatory approach, competitiveness and on the implementation of public-private partnerships.
2. The demand for electricity is growing at an annual rate of 10%, despite the households' consumption component growing only at 2%. The electrification rate is around 55% in urban areas and 15% in rural areas. The latter is low even compared to the African average of 22.7%. A disparity in the cost of electricity services is evident between urban consumers, who are supplied by EDM, and rural consumers supplied by AMADER. In urban areas, the average price per kWh including VAT and fees, is estimated at USD 0.20, whereas in rural areas the price is very volatile but is estimated to be on average at least double the price in urban areas (USD 0.47).
3. Renewable Energies, including Solar Photovoltaic, have never been properly accounted for in any analysis, but could represent around 3% of conventional electricity generated, or about 9 MW. There is only limited renewable energy resource information available from existing studies, such as the solar radiation map included in the stocktaking report of February 2011. This information is valuable and should be supplemented to ensure the most effective location of future PV systems.

Figure 1: Solar Radiation in Mali



4. In order to meet the growing demand and provide adequate, reliable, safe and environmental friendly electricity, the GoM intends to diversify its sources of generation and build on its huge solar potential, well distributed over the national territory with an estimated 5-7 kWh/m²/day⁵⁹. The global typical average is around 4-5 kWh/m²/day.

Objective and Proposed Transformation

5. A wider policy challenge for electricity investment in Mali relates to the fact that the sector is highly subsidized where the regulated tariff is set well below a cost recovery level. SREP co-financing is proposed to implement in Mali an overall additional generation capacity of around 20MW (utility-scale) structured as Independent Power Producers (IPP) in the field of renewable energy, with a cost recovery tariff. The project will increase the contribution of renewable energy sources to the sector and will pave the way for the development of future IPPs in the country. Overall, this project aims to demonstrate the technical, social, economic and environmental feasibility of an integrated and self-sufficient energy model in Mali. The capacity added, through the use of solar PV technology, will be maximized but will depend to a large extent on the level of SREP resources available. On one side, a SREP concessional loan/grant will be used to lower the costs of financing of the project to allow a more competitive tariff for EDM, and subsequently for end users, but on the other it should still make the project bankable and commercially viable in terms of attractive longer-term returns to the project shareholders.

6. PV solar energy carries most value when meeting the demand for a distributed energy source (that is energy produced at, or close to, the point of use). The power output from a distributed power source typically ranges from 1 kW to 5 MW in capacity. This contrasts with central generation, which is associated with large MW generating plants that are usually located at a distance from where the energy is consumed. The electricity is then transported through the transmission and distribution infrastructure to the consumer. Distributed generation is well-suited to the use of some renewable energy technologies because such technologies can be located close to the user and can be installed in

⁵⁹ February 2011, SREP Mali, Stocktaking Report

small increments to match the load requirement of the customer. Solar Photovoltaic energy reduces the cost of investment in grid transmission extension, which carries both an economic cost and a time delay associated with capital investment and planning approvals. Solar energy can also be introduced in small increments to closely match the load requirements and can provide a good fit with daily load peaks. The strengths of distributed Photovoltaic generation are: (i) generation close to the demand itself thereby eliminating or significantly reducing transmission loss; (ii) reduced need for the construction of new transmission lines, which is one of the main challenges for large-scale centralized developments; (iii) distributed PV generation capacity has the potential to supply power during peak demand; (iv) more efficient systems (due to less power loss in transmission); (v) no GHG emissions from power generation; and (vi) high initial capital costs but significantly lower operational and maintenance costs when directly compared with grid connected power suppliers; vii) the ability to supply customers on an individual basis and therefore match type of system to individual needs. Nonetheless, a Technical Feasibility Study draft in close cooperation with DNE and EDM will be required to determine the most realistic and economical proposal for the development of a Solar Photovoltaic project.

Implementation Readiness

7. Mali has a significant need for additional generation supply to the grid. EDM suggests that an additional 200MW would be needed in the medium term and is in line with an April 2011 study, prepared by Castalia Strategic Advisers on behalf of the WB Group's Investment Climate Business Line. The study states that Mali has a significant need for additional power supply to the national grid, creating opportunities to increase centralized power generation (and considering the projects constraints, investments will have to come from the private sector by the way of IPPs). Discussions with investors highlighted a number of weaknesses and barriers to entry. For instance, bureaucratic hurdles as a challenge to the development of a project—in particular the lengthy but unnecessary step of reaching a MOU with the Ministry of Energy, before starting negotiations for the concession contract and PPA. The GoM is aware of the existing limitations and it is working with a view to address these weaknesses and gauge investor interest. The SOPAM IPP provides a good example and clearly identifies an area that needs to be improved. It relates to the fact that the concession contract and the PPA were not drafted in consistency with international good practice and did not encompass efficient risk sharing mechanisms between the public and the private sector. As a consequence, the PPA is expected to be re-negotiated to enable the sponsors to fully recover their investment and lenders repaid.

8. The following activities will be undertaken by the GoM for the implementation of the project:

- a. The GoM will liaise with IFC and AfDB Private Sector to decide the best procurement modality that will lead to the choice of an appropriate Project Developer, including Direct and Competitive Procurement, whichever is the most appropriate, taking account of each MDB's rules and guidelines.
- b. Under the SREP, the GoM shall benefit from a capacity building and technical assistance component to pave the way for the successful implementation of IPPs. In this regard it is

expected to implement capacity-building activities that address, but are not limited to, the following: (i) Bidding Process; (ii) Resource Assessment; (iii) Stakeholders Consultations; (iv) Legal Corporate Arrangements; (v) Access to Carbon Revenues; (vi) Fiscal Regime; (vii) Establishment of a cooperation between EDM and API; and (viii) Sovereign Guarantees.

9. After discussion and agreement on the procurement process that will later on lead to the selection of the Project Developer, IFC/AfDB Private Sector Department will start their due diligence process with a view to approve SREP resources and co-financing. It is important to mention that blending SREP resources with other co-financing has the potential to make investment capital in infrastructure available (which may otherwise not be the case) or to facilitate the speed of adoption and scaling-up of solar power capacity. However, original review, MDB's co-financing, and further debt arranging through other DFIs, will occur under the leadership and responsibility of IFC/AfDB Private Sector Department. The low cost financing would be instrumental in strengthening the commercial viability of the project. However, it is worth mentioning that a careful balance will be required to stimulate the market without creating long-term dependence on public subsidies. The MDB in charge of implementing the SREP resources, apart from its co-financing share, will seek to provide the minimum concessionality needed to catalyze this particular investment. In accordance with this principle, the SREP instrument will be chosen on a case-by-case basis to address the specific barriers identified in the project and risks associated with the technology, market, project implementation, and the financial structure. The amount and terms of SREP funding offered to an individual client will be determined between the MDB and the client on the basis of efficient and proper due diligence and in the effective use of SREP and MDB resources

Rationale for SREP Financing

10. The project will increase the installed electricity capacity from renewable energy sources, and result in the replication of commercially viable PV installations that will reduce the gap between the demand for electricity and available supply. At the same time, it will improve the generation mix of the country.

11. Without SREP financing, this infrastructure development could be delayed by a number of years and any tendering program at this later time would be far less attractive to the bidders, without the same level of public sector support. Under current financial conditions the Photovoltaic option is unlikely to be able to compete with traditional forms of power generation. While operation and maintenance costs would be lower over time, the higher capital costs constitute a serious financial barrier for non-recursive financing or even for public sector investment. In order to make the projects economics interesting to a private sponsor, and to bring the electricity tariff under the PPA down to competitive levels, the average cost of financing (including lenders and SREP resources) shall be small enough.

Results Indicators

12. Some of the indicators identified are associated with SREP while others are project specific. All indicators shall feed into the overall M&E framework. Main proposed indicators are:

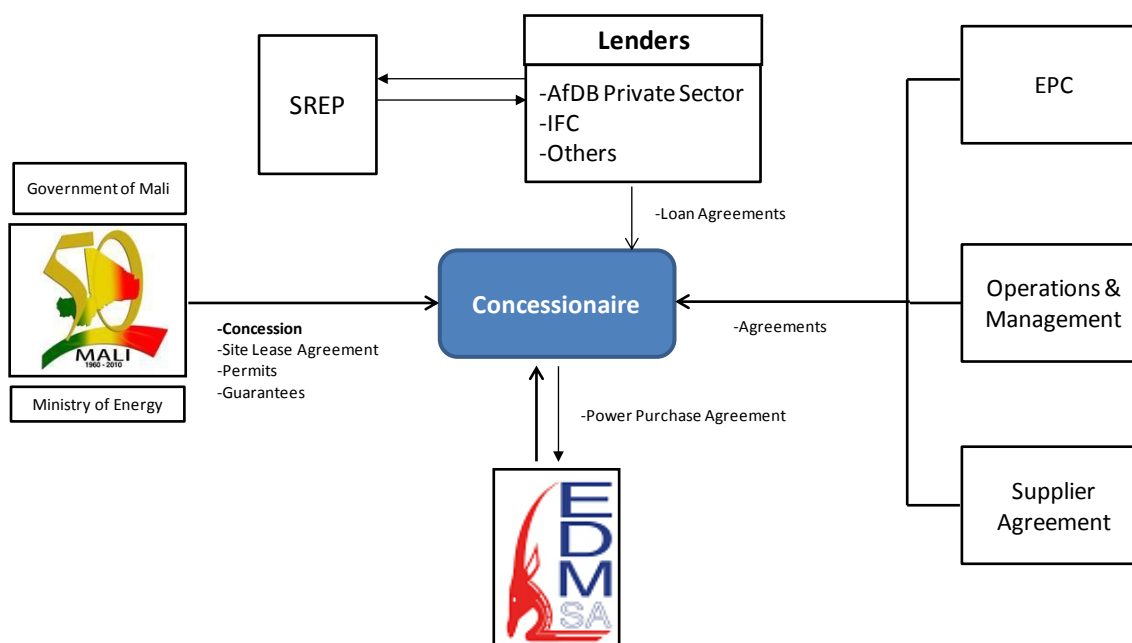
- Number of Solar Panels installed on [...] site(s)
- [...] years PPA signed and in force between the project developer and EDM

- Increase in % of total renewable energy supply in the energy sector
- Total electricity sold
- Renewable energy power as % of total power sold by EDM
- Increase in Tax collections by the GoM
- Number of jobs created during (i) construction and (ii) operations (men/women)
- USD [...] accrued due [...] t/CO2 savings in GHG emissions.
- Promulgation of policies, laws and regulations promoting the production and use of renewable energy
- SREP project allocation/Other Sources of Funds

Project Structure and Financing Table

13. Figure 2 presented below, provides an example of what the final Project Structure may look like. The Project Company (Special Purpose Vehicle created under Malian law) shall be responsible for all Cash Flows exchanges and for the implementation of the project. It will engage in discussions with IFC and AfDB Private Sector, other potential lenders and the GoM to improve the risk profile of the project. At the moment the structure presented in Figure 2 is an example and should not be assumed as final.

Figure 2: Example Project Structure



14. The proposed SREP allocation is approximately USD12 million and would be provided in the form of a concessional loan or grant (to be determined by the MDBs in due time and in accordance with SREP – Financing Modalities). The SREP envelope is proposed to compensate sponsors for the risks associated with the initial high capital costs. It is expected that the risk/return profile for future projects will eventually be sufficient to stimulate private investment without future subsidies (i.e. risks will come

down because of the track record established from an early project and where costs go down and returns go up). The financing table is presented below.

Table 1: Financing Table⁶⁰

USES			SOURCES		
Solar PV	60	100%	EQUITY	12	20%
Others	[...]	[...]	-Sponsor	8	13%
			-Local Partners/Others	4	7%
			-GoM	[...]	[...]
			SREP	12	20%
			-Concessional Loan/Grant	12	20%
			DEBT	36	60%
			-AfDB	15	25%
			-IFC	15	25%
			-Others	6	10%
Total	60	100%	Total	60	100%

15. In accordance with SREP guidelines, the SREP National Team and the MDBs have agreed to request a Project Preparation Grant (PPG) to ensure that enabling environment is in place and will allow the construction of the first Solar PV IPP in Mali, under a Build Own Operate and Transfer scheme. The PPG will also seek to provide support and make sure the relevant governmental entities have the capacities to undergo negotiations with the Project Developer.

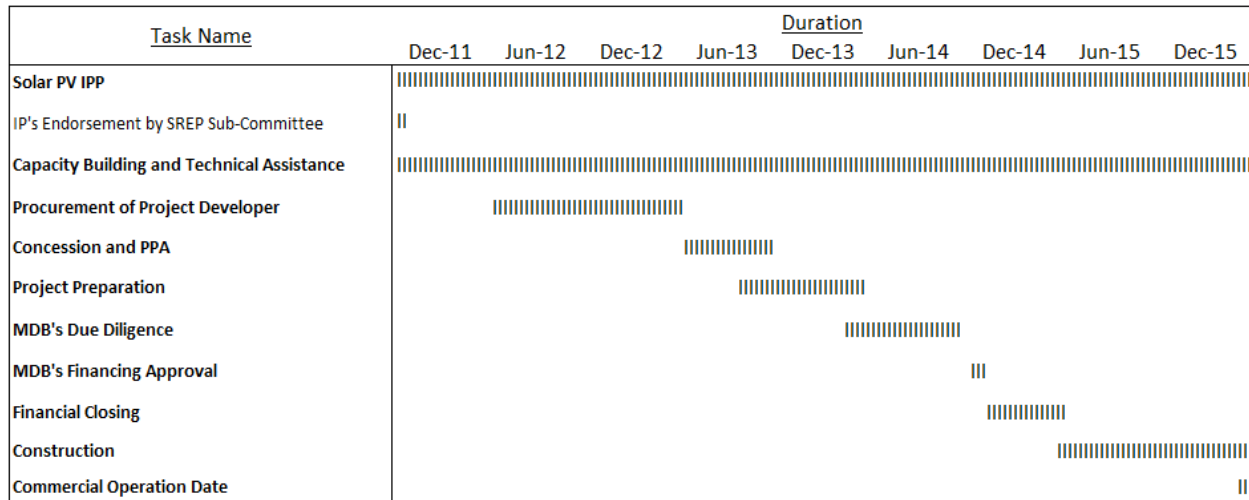
16. The objective of the capacity building component is to ensure a replication effect for similar projects in the years to come. The priority activities / detailed capacity building components outlined in the PPG might be changed in due time, provided that the MDBs involved and the executing agency are in agreement. Those that could be financed, include for example, a review of the adequacy and optimization of a competitive bidding process, in case such a process is deemed as necessary, preparation of standard concession agreements and of Power Purchase Agreements, or the capacity to coordinate and oversee the implementation of a project of this kind. The activities shall be consistent with those implemented by the Strategic Coordination Unit. The current SREP allocation assigned to this project (USD 12 million) shall be primarily used for capital expenditures. Nonetheless, a cap of USD 1 million is proposed to finance the preparatory activities. Furthermore, the costs associated are to be covered by this grant but only the components that are seen as vital, and in case the needs in terms of minimum concessional finance have been fully satisfied. If necessary, and complementing the project, the funds made available to the Strategic Coordination Unit can be mobilized. Among others, the reasons for this are the following: (i) ensure the scalability of the project and ensure it is able to bear the transaction costs of a non-recursive financing transaction; (ii) having more than one entity executing SREP resources; (iii) avoid cumbersomeness in the MDBs approval process. That being said, MDBs will endeavor to arrange extra funding to support the implementation of SREP in Mali.

⁶⁰ The values are estimates and will likely change. Furthermore, it is important to mention that the SREP contribution to the Project's Capital Expenditures might be smaller in case the capacity building components are to be borne by SREP. MDB's will use their best efforts to tap into other resources to pay for such costs.

Project Preparation Timetable

17. Figure 3 provides an estimative of the implementation timetable.

Figure 3: Estimated Implementation Timetable



Problem Statement

1. Electricity access in the 12,000 rural towns and villages in Mali (15 %) is significantly low compared to electricity access in urban areas (58 %), limiting the social and economic opportunities particularly for the residents in rural areas. Biomass use through wood and charcoal still represents about 80 % of national energy consumption, putting natural resources such as forests under pressure. Most of the countries households in rural areas satisfy their needs for modern energy services (mainly lighting, radio, refrigeration and TV) by using kerosene and batteries, which are unreliable. Hence, there is a need to increase rural electricity access to isolated low income populations.

2. GoM endeavors to address these energy access challenges by scaling-up its rural electrification program, as stipulated in its energy sector policy documents (see the main text). The GoM's has set target to increase rural electricity access to at least 55% by the year 2015⁶¹. To achieve the rural electrification goals, the GoM established the rural energy services agency, AMADER in 2003 and a rural electrification fund, *Fonds d' Electrification Rurale* (REF)⁶², which is managed by AMADER since 2005. In 2008 a partnership between CNESOLER, the national research center for solar technologies, and AMADER has been established to promote solar PV systems in rural areas. A partnership between AMADER and ANADEB, the national agency for the development of biofuels, has been launched in 2009 to develop rural electrification via sustainable biofuel schemes. As a consequence of these initiatives, Mali's rural energy access rate increased correspondingly from 1 % in 2000 to 15 % in 2010. About 10 % of rural energy services are currently provided from renewable energies.

However, to achieve the GoM's targets, accelerating further deployment of renewable energy for rural electrification will be crucial. The funds available in the Rural Energy Fund can only enable roll out to a limited number of areas, leaving out other equally needy towns and villages. In order to increase rural energy access, new mini grids are being piloted to be supplied by thermal/renewable energy sources. To reduce the cost of running thermal power plants in isolated areas and mitigate local environmental degradation, making existing diesel power plants hybrid through a standardized approach and increasing the share of renewable energy in mini-grids will be critical.

Objective and Proposed Transformation

3. The **objective** of this project is to use SREP funds to support the GoM's efforts to increase access of isolated low income populations to basic energy services to help achieve economic growth and poverty reduction targets. In particular this projects aims to accelerate renewable energy development and increase the proportion of renewable energy in off-grid areas.

⁶¹ Politique Énergétique Nationale

4. The program will transform and positively impact livelihoods in rural areas. The GoM's initiative of scaling up hybrid mini grids in rural areas will be expanded to reach out to more rural towns and villages. SREP contribution will be critical to proof that the average cost of connection and electricity supply per customer in rural areas of Mali can be reduced by scaling up RE (Studies included under the program will analyze and evaluate life cycle costs between hybrid mini-grids and thermal mini-grids in several isolated areas of Mali). It will lead to higher access to energy, replace fossil fuel consumption in rural areas, and lower GHG emissions and less indoor air pollution in homes that previously used kerosene for lighting. Increased connectivity would further eliminate health risks to women and children arising from use of kerosene and wood fuel uses. The program will furthermore enable a systematic approach to rural electrification, rather than an ad-hoc and piecemeal approach hitherto adopted, by evaluating and standardizing the business models adopted in mini-grid extensions. This would provide momentum to attract private energy service companies and diversify their portfolio of various energy and electricity services targeted to the needs of rural customers (including mini-grids, off grid lighting, energy efficiency appliances, SHS, operation and maintenance services for electrical appliances) will be crucial for transforming the sub-sector. Experience has shown that once thermal mini grids are established, access to rural energy services attracted development of other related infrastructure that include clean water, quality health care, job creation, information and communication technology, among others. These have impacted positively on the rural women and youth who can easily access relevant information.

5. A successful scale up of Mali's rural electrification program combined with the greening of Mali's rural energy mix and the possible introduction of carbon funds will provide lessons to be learned and best practices for rural energy agencies in the sub-region in the framework of the African club of rural energy agencies⁶³.

Implementation Readiness

6. The GoM's rural energy access program managed by AMADER has shown track record of making progress, promoting mainly isolated solar home systems (SHS) and conventional diesel fueled micro-grids in rural areas of the country. A generation capacity of about 10 MW has been installed by in public private partnership with local private operators (ESCOs), NGOs, communities, and woman associations, with financial supported from the REF and technical assistance provided by AMADER. Local private operators have provided an average matching co-financing of 25 % of the mainly thermal rural electrification projects. Recently a few solar PV and biofuel mini grid pilot projects have been tendered to test the introduction of renewable energy in existing thermal mini grids on a project by project basis. A growing pipeline of more than 100 business plans is under development with technical assistance provided by AMADER, awaiting financing from the Rural Electrification Fund.

7. **Hybrid solar PV and biofuel mini grid systems:** The SREP proposal is to increase renewable energy capacity in the existing off-grid power stations and gradually expand the construction of renewable energy fueled mini grids by 2015. This would involve increasing the solar PV and biofuel system capacity

⁶³ Politique Énergétique Nationale

⁶³ <http://www.club-er.org>

by about 4 MW in the next 5 years. The country's Rural Electrification Master Plan and AMADER's rural electrification planning and progress reports will serve as a basis to identify about 35 small rural towns and villages and the corresponding energy service companies that are targeted for mini-grids and grid extension. In addition, combinations of hybrid mini grid system with small scale SHS and modern PV lighting products will be tested in selected larger concession areas of rural energy service providers. A well designed maintenance schedule shall be prepared to ensure that the systems are sustainable. The local operators will incorporate the solar/biofuel systems in their daily and monthly reports for the stations to AMADER so as to keep track of any new developments including performance of the equipment.

8. Capacity building, Technical Assistance, and Awareness Raising. SREP funds will be used in conducting feasibility studies to identify suitable sites for mini grids and to prepare a request for carbon funds. Based on the overall development of the rural electrification agenda, technical studies during implementation will be financed as required, which would evaluate and standardize mini grid extension business models. Climate change mitigation and environmental impacts for biofuels will be evaluated, in cooperation with ANADEB and development partners. This program will also include training for supervisory and technical personnel of staff of the executing agencies, its partners and private energy service providers to ensure that only safe, quality and sustainable renewable energy equipment are installed for use in the hybrid systems and to ensure system performance will meet expected standards. Rural population, particularly women, will be trained on the need for efficient use of energy to and allow for more productive energy uses. Awareness creation will also be done on the importance of utilizing the installed systems and avoid the usual kerosene and wood fuel. This measure is aimed at ensuring the hybrid systems are utilized to their installed capacities.

Rationale for SREP Financing

9. SREP funds would complement the ongoing GoM-funded thermal and hybrid mini grid projects in the country, and evaluate and standardize the business models adopted for mini grid extensions. The private sector and bilateral donors would be encouraged to participate in the solar/biofuel projects to complement GoM's efforts in the program. Increased availability of clean energy in rural areas would provide multiple benefits, including the strengthening of Mali's decentralization policy by creating jobs and productive energy uses in rural areas; and by reducing the dependence on fossil fuels and biomass resources which provide most of the energy requirements in the rural areas. As many rural towns and villages won't be targeted for an economically viable connection to the electricity grid in the next decade, SREP funds will be crucial to continue to expand rural and renewable energies, thereby strengthening the rural electrification framework and using the momentum created by public private partnerships in rural electrification.

Results Indicators

10. The proposed key results indicators include:

- Number and capacity of RET systems installed (including hybrid mini grids, SHS, off-grid lighting, multifunctional platforms)
- Number of jobs created in rural areas (including energy service companies and productive energy uses)
- Number of project beneficiaries with access to RET, by gender
- Number of community institutions with access to RET
- Leverage effect of SREP financing (USD million)
- Number and type of awareness raising products developed
- Reduction in GHG emissions (k tones CO₂e avoided/reduced)

Financing Plan

11. This financing plan, as shown in table (1) is projected for a five year period. The GoM would contribute part of the capital for rural electrification program while other willing donors/financiers are invited to provide the funding so as to raise 75 % of the required capital. SREP funds shall be used to bridge the remaining 25 % gap. As an innovating factor, carbon finance will be included in this financing plan. Sufficient financing for capacity building, technical assistance and supervision is planned to accompany infrastructure investments under a national hybrid RE program. The tentative financing plan will be confirmed at project appraisal stage.

Table 1: Tentative Financing Plan (in USD million)

Description	Total Cost	GoM	SREP	WB	Others (Dev. Partners, Private Sector, Carbon Credits)
Studies/Design	1.2	0.5	0.5	0.2	-
Infrastructure/Equipment	48.7	-	13.5	12.0	21.2
Supervision	3.4	1.9	-	1.5	-
Capacity Building	4.6	0.7	1.5	2.5	-
Total	57.9	3.1	15.5	16.2	21.2

Project Implementation Timetable

12. Table (2) shows the proposed implementation plan for the infrastructure component, building on a phased approach (initial phase to jumpstart program and second phase as additional financing based on lessons learned and results achieved).

Tablet 2: Estimated Project Implementation Timetable

Description	1Q 2012	3Q 2012	1Q 2013	3Q 2013	1Q 2014	3Q 2014	1Q 2015	3Q 2015
Projects on Initial Phase								
- Project Preparation								
- Tendering								
- Construction								
- Commissioning								
Projects for Additional Financing								
- Project Preparation								
- Tendering								
- Construction								
- Commissioning								
Capacity building								

Requests for Investment Preparation Funding

13. SREP funds will be required to develop the detailed design of the proposed hybrid mini grid projects for the 35 towns and villages and prepare in parallel a request to access carbon funds. For each subproject, the outcome shall be documented in standardized bidding documents and business plans suitable for the competitive selection of a rural energy service provider, giving all the technical specifications and material requirements, implementation plan, connection targets, and total project costs among other details.

Problem Statement

1. In order to achieve the objectives defined in the PEN and the National Renewable Energy Development Strategy – a rural electrification rate of 55% by 2015 and a contribution of 10% of renewable energy generation to the total energy mix– Mali imperatively needs to increase its electricity generation capacities through a set of diversified and appropriate technological options. Given the growing demand for electricity (10% per year) and the high dependency on imported oil (100%) to meet energy demands, the Government of Mali (GoM) proactively turned to Renewable Energies (REs).
2. At present, electricity in rural areas is almost exclusively produced by isolated thermal stations, resulting in high production costs per kWh for rural dwellers and GHG-related environmental effects. Micro/mini hydroelectricity meets current challenges by providing low cost electricity to rural households and contributing to poverty reduction.
3. Due to numerous technological, regulatory and financial factors, the Malian energy sector is not using all its hydro potential (estimated at more than 1,000 MW). There are today two functional micro hydro power plants (Felou, 0.6 MW, and Sotuba, 5.7 MW), with a total of installed capacity of 6.3 MW, about 1.6% of total installed capacity in the country. The proposed SREP investment project will not only build and operate four micro hydro power plants and two mini hydro power (for a total capacity of 14.6 MW), but build national capacities in the installation and management of mini/micro-hydro power plants and strengthen the enabling institutional and legal environment conducive to the dissemination of this type of projects with the participation of the private sector.

Objective and Proposed Transformation

4. The PDM-Hydro project will contribute to the achievement of the main SREP PDO – that is *to develop REs on a large scale, to effectively contribute to poverty reduction and sustainable development in Mali for the benefit of its population*. Thus, it will increase the share of REs, namely mini/micro hydroelectricity, in the country generation and distribution systems.
5. The project will support transformational changes by improving the access of rural populations to modern and affordable energy services, with significant impact on the economy of rural household and communities. The project is expected to directly benefit about 160,000 people, create more than 3,500 income generating activities, with a kWh cost significantly lower than that proposed in the context of rural electrification based on fossil fuels. In addition, as some mini-hydro power plants will be grafted on mini dams built by the Ministry of Agriculture for irrigating crops, the electricity generated by these plants will also power the irrigation pumps, thereby reducing production costs for local farmers. From an environmental point of view, the project will prevent a substantial amount of GHG emissions (estimated at more than 12,700 tones), and reduce air pollution (the electricity provided will prevent the use of

kerosene lamps in rural houses). Through isolated grids, rural electrification is also likely to further develop other infrastructures (water, health, education, etc.), which will improve the living conditions of rural communities (particularly for women and the young people). The impact will also be even more positive, as the mini-hydroelectricity will be coupled with biofuel systems (synergies with another SREP investment project), supporting the transformation and use of jatropha-based biofuel.

6. The business model proposed by the project will be compliant with Malian rural electrification institutional and regulatory frameworks. The private sector is expected to have a key role in constructing and operating the proposed infrastructure and could eventually participate in its financing. Together with the capacity building and the improvement of the legal framework and energy tariffs, the business model will facilitate the scaling up of these projects. Furthermore, the development of a complete atlas highlighting the national potential for mini/micro hydroelectricity will facilitate future additional investments.

7. To achieve its objective and ensure its transformational changes, the project will be implemented through the following components:

- **Component 1 - Investment:** Building and operating four micro-hydropower plants and two mini-hydropower plants and their transmission lines (in order to improve access to electricity for targeted rural populations).
- **Component 2 – Institutional, regulatory and strategic Frameworks, Capacity Building, and Project coordination and management:** Strengthening the enabling environment conducive to the development of micro/mini-hydropower plants in Mali. Strengthening the institutional, regulatory, technical and operational capacities of participating stakeholders. Ensuring the coordination of all the activities of the project, including Monitoring & Evaluation activities.

Implementation Readiness

8. In 2005, UNDP carried out a study to identify mini-hydroelectricity potential in Mali. The GoM and AfDB have recently completed this study to better identify the locations for the proposed SREP project. During its first phase, the project will build and operate four micro hydro power plants in Farako, Billy, Kenieto, and Woroni (the duration of the feasibility studies is estimated to last for about 8 months). In addition, the project will also build and operate two mini hydro power plants in Talo (whose feasibility study has already been completed) and Kourouba (whose feasibility study is currently starting). All these studies will be available by September 2012 and the construction of the hydro power plants will start in 2013⁶⁴. An atlas of mini/micro hydro potential will be carried out during Phase 1, in order to facilitate the extension of the project after 2015 (Phase 2). The National Directorate of Energy will supervise the studies and the construction of the plants by the private sector. Micro hydro power plants will be operated and managed in accordance with the Malian rural electrification regulatory framework, but specific institutional arrangements will be fine-tuned when the feasibility studies are

⁶⁴ A feasibility study will also be carried out in 2012 for a mini hydro power plant that will be installed on the Djénne mini dam during the second phase of this project.

available. Regarding the mini hydro power plants, the feasibility studies will explore further forms of direct management by EDM considering their installed capacity.

Rationale for SREP Financing

9. In Mali, among all REs, the development partners provide technical assistance and smaller investments mostly to small scale Solar PV applications (such as SHS) and diverse bio-energy related initiatives. Mini/micro hydroelectricity still has limited financing available, mainly because of high capital investment costs and the substantial time needed for project preparation. With SREP financing made available in addition to AfDB's contribution, the SREP will stimulate the mobilization of other partners to co-finance this technology. If SREP contribution is provided as a grant, operation costs will be greatly reduced. This will have a direct impact on the cost per kWh paid by the beneficiary in rural areas. In line with the SREP guidelines, the project will not only finance the construction of the proposed infrastructure but will also aim at building national capacities for mini/micro hydroelectricity management and will improve the legal and regulatory frameworks that will lead to further dissemination of these projects in the medium-long terms.

Results Indicators

10. The project proposed indicators are:

- Number of hydropower plants built and operational in targeted rural areas.
- Percentage change (%) of electricity access in the area covered by the project (as well as number of localities and people benefitting from access to electricity).
- Increase in kWh of energy generated by mini/micro hydropower plants.
- Number of jobs and activities created by the project.
- Volume of additional financial resources mobilized for the project.
- Evolution (%) of reduced equivalent CO2 in tones (millions).

Financing Plan

11. The project will be made up of two phases:

- **Phase 1 (2012 – 2016):** Preparation of feasibility studies for the seven identified mini/micro hydro power plants; construction of the four micro hydro power plants in Farako 1, Billy, Kenieto and Woroni and two mini-hydro power plants in Talo and Kourouba, as well as their associated transmission lines.
- **Phase 2 (2015 – 2016):** Construction of the mini-hydro power plant in Djenne, as well as its associated transmission lines.

12. **For Phase 1**, the total amount of the project is estimated at **USD 136.5 million**, distributed among the two components:

- Component 1, focusing on “Infrastructures”: total amount of USD 124 million; and
- Component 2, focusing on “Institutional and Regulatory Frameworks, Capacity building, Knowledge management and Project management”: total amount of USD 12.5 million.

13. The contribution requested to SERP is USD 10 million that is 7.3% of the total budget of the project. Additional amounts will be eventually mobilized by the GoM (USD10 million) and the AfDB (about USD 25 million). JICA, BID and CEDEAO already expressed interest in co-financing the project.

Table 1: Financing Plan (in USD million)

Description	Total Cost	GoM	SREP	AfDB	Trust Funds	Other TFPs	Carbon Credits	PS
Component 1 Infrastructures (incl. feasibility studies, construction of hydro power plants and transmission lines)	124.0	7.5	7.0	22.0	2.0	62.5	8.0	15.0
Component 2 Inst. Framework; Capacity Building; Knowledge Sharing; Project Management	12.5	2.5	3.0	3.0	-	4	-	-
Total	136.5	10	10	25.0	2.0	66.5	8.0	15.0

14. During Phase 1, when the studies will be conducted, the assessment of technical/financial characteristics of the selected mini/micro hydro power plants and their transmission lines will be fine-tuned. Resource mobilization will be done during the next 10 months to ensure that the project financing is available in September 2012 when the studies are over and the project is ready to start.

15. SREP funds are likely to be allocated as a grant, in order to reduce operation costs, and therefore reduce the cost of kWh.

16. **For Phase 2** (construction of the Djenne mini hydro power plant and associated transmission lines), the total amount is estimated at about **USD 60 million**. In this regard, the GoM wishes that additional SREP funding be allocated by the Sub-Committee to this project (from the “Reserve”).

Project Implementation Timetable

Tablet 2: Project Implementation Timetable

Description	Jan 2012	Jun 2012	Jan 2013	Jun 2013	Jan 2014	Jun 2014	Jan 2015	Jun 2015	Jan 2016
- Feasibility Studies									
- AfDB's Board Approval									
- Tenders									
- Constructions									
- BOD									
- Updating Instit. Framew.									
- Capacity Building									
- Project Management									

Requests for Investment Preparation Funding

17. SREP funds will be required to develop the detailed design of the proposed project on the basis of sound feasibility studies (including environmental and social impact studies). Preparatory activities will also include (i) activities related to the elaboration of the project M&E system (write up of the manual, data collection for reference data, etc.); (ii) consultations with local stakeholders to inform them and ensure appropriate preparation of the project, and capacity building on mini/micro hydro for MEE staff and its regional offices; (iii) operation costs and office equipment.

Annex II: Mali Absorption Capacity

1. The absorption capacity of a country depends on several factors including economic performance, macroeconomic management, governance, public institutions and administration functioning, quality of services provided by the private sector, among others. However, it can be assessed through three dimensions: (i) sovereign debt capacity, (ii) implementation capacity of the state budget and the technical capacity of the line ministries/agencies, and (iii) efficiency and effectiveness of public spending.

Debt capacity

2. Since 2000, the sovereign debt of Mali has improved significantly due to the implementation of a public debt management strategy, that has been put in place in conjunction with development partners and relief that the country has benefited from the Heavily Indebted Poor Countries Initiative (HIPC) in 2002 and the Relief Initiative in 2006. Thus, the external public debt of Mali declined significantly from 103% of GDP in 2000 to 24.2% in late 2010, while the amount of domestic public debt remains low at 3.6% of GDP.

3. In Mali, the Analysis of the Debt Sustainability conducted as part of the fifth review of the government's reform program supported by IMF's Extended Credit Facility, indicated that the risk of Mali's debt distress is moderate. This risk is sensitive to impact on exports and economic growth. Therefore, the debt sustainability of the country will depend on the ability of the country in maintaining a prudent fiscal policy and sound macroeconomic management, which the GoM has been undertaking in cooperation with development partners. The GoM has also pledged to avoid contracting non-concessional loans for the duration of the program with the IMF.

4. In addition, the funding granted to Mali as part of the SREP, will meet the concessionality criteria and will have little impact on Mali's capacity to service its debt. However, under the structure of Project 1, the GoM might be requested to provide a Sovereign Guarantee to the Power Purchase Agreement, signed between the state-owned utility and the Project Company. While the guarantee has the ability to improve and strengthen the risk framework of the entire project, it will have a material impact on the country's sovereign debt capacity by raising the level of its contingent liabilities. This aspect needs to be monitored during project preparation.

Implementation capacity of the state budget and the public sector

5. The country's ability to control properly the state budget is satisfactory and has improved in recent years. In terms of budget allocations, the implementation rate was 79.1% in 2009. This rate was significantly improved and reached 91.1% by end 2010. In general, the mobilization of state budget compared to external funding is weak. External funding, which covers 62.9% of the National Investment Budget, the mobilization rate increased from 51.7% in 2008 to 74.3% in 2009. In 2010 about 45% of state budget was provided by external funding, as assessed in the PRSP (2012-1017) currently under development.

6. At the level of the energy sector, the implementation rate of expenditure also improved. The rate of implementation of budget allocations to the Ministry of Energy and Water has increased from 67.1% in 2009 to 93.1% in 2010, while the rate of mobilization of financing at the Ministry level was 96.4% in 2009. The high rates of execution of expenditure show that the Ministry of Energy and Water will most likely have the capacity to coordinate the implementation of activities financed under the SREP. Regarding Project 1, which will be implemented by a private counterpart under a Build-Own-Operate-Transfer (BOOT) scheme, and apart from the initial work in preparing the launch of the respective concession, the involvement of Ministry of Water and Energy during project implementation will be limited to negotiations and discussions with the private partner every time is necessary and requested by one of the parties.

7. Line ministries and agencies in the energy sector generally have a good track record of implementing projects, supported by the regulatory framework already established in the country. As indicated in Annex VI, they have been managing a number of initiatives undertaken in the renewable energy sub-sector. Through the implementation of projects funded by development partners, technical and managerial capacities of AMADER, DNE, CREE and DNCN have been strengthened, especially in the area of developing an adaptive and multi-layered approach to rural energy provision. However, apart from these institutions, not many SREP implementing agencies have the direct experience working with MDBs, which would necessitate a harmonized capacity building, among others, on management of project, fiduciary, and safeguard aspects during project implementation. For this purpose, the Strategic Coordination Mechanism of the SREP Mali will help enhance technical capacity of respective agencies to manage the projects.

8. Moreover, besides the public energy sector institutions, academia, R&D institutes, training institutions, and private sector, will continue to be consulted and integrated in the SREP Mali program as part of a concerted and purposive action to transform the energy system. Local private sector initiatives and R&D capabilities are instrumental to support the transformation towards a 'greener' society and sustain a 'green' and climate change resilient development path. The GoM is aware of the challenge to a balance between technology transfer (imports) and locally available resources to enable a swift adoption and adaptation of technologies. The SREP program will not only help establish a vision to promote local energy service initiatives in renewable energies through public private partnerships, lessen the dependence on fuel imports, and diversifying the number foreign firms in the energy sector, but also a better control of the development process and speeding up project implementation.

Effectiveness and efficiency of public spending

9. According to the latest review of PSRP, conducted in July 2011, the implementation of PSRP was satisfactory. Mali's economic performance has been remarkable even though the country was suffering from the effects of the food and financial crises that occurred between 2007 and 2008. The real GDP growth was 5% on average in the period between 2005 and 2010, higher than the West African Economic Monetary Union average. The incidence of poverty has declined in real terms from 55.6% in 2001 to 43.6% in 2010 and progress has been made in the area of education, access to drinking water

and treatment HIV / AIDS. However, the progress towards achievement of the Millennium Development Goals remains fairly mixed. Stronger growth is needed to cut poverty by half by 2015.

10. PEFA 2010 report states that the credibility of the budget has improved significantly compared to the situation in 2006. The progress made in the implementation of PSRP is partly due to the government's actions in terms of fiscal policy. The objective of the fiscal policy is to ensure the efficiency of budgetary allocations by focusing spending on social sectors (education, health and social development). In 2010, these expenditures accounted for almost one third of the state budget. Regarding recurrent costs, social sectors accounted for over half of the budget in 2010. In addition, the GoM keeps on respecting a cap on its spending in the social sector, a quantitative criteria for implementing the program with the IMF. To further strengthen the effectiveness of public spending, the GoM embarked on a process of economic decentralization in recent years. The process will allow local authorities to respond more effectively to the needs of populations, most specifically in terms of employment and access to basic social services.

11. In summary, the absorptive capacity of Mali is not saturated and might be partially affected by the funding to be provided under the SREP in case a Sovereign Guarantee is requested as mentioned in paragraph 3. Still the activities planned under SREP will have the potential of contributing to strengthening institutional capacity and efficiency in the implementation which may bring residual benefits to the management of public debt.

Annex III: Stakeholder Consultations

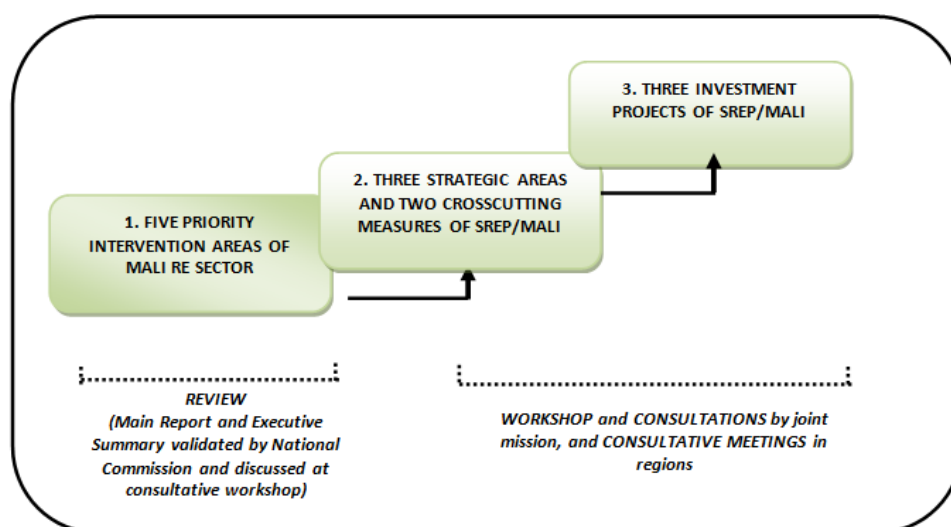
1. The SREP investment plan is the product of a comprehensive participatory process involving a large number of institutional, national and international actors, led by the GoM, represented by the Minister of Energy and Water, with the support of MDBs. The main stages of the process are as follows:

- (i) Holding of an in-depth diagnostic study (stocktaking exercise) validated by the National SREP Commission and discussed during the scoping and joint missions;
- (ii) Holding of two national consultative workshops, one during the scoping mission and the other during the first joint mission;
- (iii) Organization of technical consultations with major stakeholders during the first joint mission;
- (iv) Holding of four consultative meetings with local actors in regions earmarked for SREP investment projects (to be held in October).

2. To this may be added multiple meetings during the entire duration of the preparation of the investment plan with the development partners, NGOs, private sector, etc. Key documents were made available to the stakeholders on a website during the formulation of the investment plan.

3. Figure below indicates these stages and their main outputs, namely identification of five priority areas for Mali's renewable energy sector, definition of three strategic axes of SREP-Mali (as well as two cross-cutting measures), and design of three investment projects of SREP-Mali, as well as a strategic coordination mechanism.

Figure I: Participatory Process in Preparing the Investment Plan



NATIONAL CONSULTATIVE WORKSHOP (2 February 2011)

4. As part of the Scoping Mission, a national workshop was organized on February 2, 2011. The presentation of the draft stocktaking exercise made during the workshop was used as a basis for discussion between all stakeholders (development partners, private sector and NGOs, public institutions). Early results of diagnosis, stakeholders' expectations vis-à-vis SREP, as well as constraints for the deployment of renewable energies were discussed.

5. The major constraints and bottlenecks to renewable energy development in Mali were discussed and the three working groups provided consistent contributions. The main constraints expressed are the following:

- *Technical constraints:* technical capacity is considered lower than it could be; this is due for instance to the fact that the potential of renewable energy sources is not fully known (especially for micro-hydro⁶⁵) and that there is a lack of consumer information. Some equipment is also considered insufficiently secure (imported products more or less reliable).
- *Financial constraints:* this includes lack of funding, and more specifically the fact that there is a lack of adequate funding from commercial banks and limited human resources in such banks to assess the projects in the energy sector. Without appropriate capacity, these banks are not able to assess projects' associated risks – their capacity should be strengthened.
- *Economic constraints:* an efficient market for renewable energy is missing; investment costs for renewable energy equipment are high compared to investment costs for conventional energy equipment.

6. As part of the workshop, and knowing that there is already a *National Strategy for the Development of Renewable Energies* in Mali, the public institutions were asked to analyze the reasons why the set objectives were not achieved. They mentioned that lack of funding is the main reason for the relatively slow start of implementing the national strategy. The group suggested that public-private partnerships should be expanded to effectively implement this national strategy. SREP should capitalize on this existing national strategy and support its accelerated implementation.

NATIONAL CONSULTATIVE WORKSHOP (19-21 APRIL 2011)

7. As part of the first Joint Mission, a 3-day national workshop was organized involving a large number of stakeholders. The workshop, opened by the Minister of Energy and Water, Habib Ouane, enabled about 85 participants, representing various national institutions, the private sector, NGOs, development partners operating in the Malian energy sector to focus on the major aspects of the renewable energies subsector. By combining plenary and targeted working groups, the participants dealt with five themes, namely: (i) Institutional, Legislative and regulatory frameworks concerning renewable energies (ii) information, training and institutional, organizational and technical capacity building of the actors involved in the renewable energies sector; (iii) knowledge studies, research,

⁶⁵ However, it should be mentioned that studies have been done already and at least 10 micro-hydro centrals below 10MW have been identified.

management and sharing; (iv) investments in technologies and high potential regions for the sustainable socioeconomic development of the country (v) environmental and social assessment.

8. Group 1 discussions related to the main strengths and weakness/constraints that had been identified as part of the assessment in terms of institutional, legislative and regulatory framework. Based on the outcomes of the assessment, the group members set out to prioritize the main strengths and constraints, and activities to be pursued under SREP to address these constraints by highlighting, among others, the legal process of reviewing current instruments and establishing adequate banking mechanisms.
9. Group 2 discussions focused on information, awareness and capacity building of actors involved in Mali's renewable energy sector. This helped identify key actors in the RE sector and classify them into 7 categories, namely: (1) central and local governmental institutions (2) training institutions (3) private operators (4) NGOs, (5) microfinance banks and organizations (6) consumers, (7) public electricity utility. Since each category of actors had its own strengths, limitations and needs, specific activities were proposed by the group for each of them. SREP investment projects should build the capacity of these actors through information, awareness and training.
10. Group 3 focused on conducting a studies and research program upstream and downstream of the major investments in order to enhance their achievements as well as generate and share technological knowledge. The sessions highlighted, among others, the lack of financial and quality human resources to undertake the studies needed to formulate projects, insufficient financial resources allocated to applied research; irregularity of scientific publications and their low level of dissemination. Consequently, a number of priority activities were identified including the following: (i) creation of a SREP/RE network to support existing information systems (EIS, RE newsletter, etc.); (i) increase the popularity of RE equipment through increased dissemination and communication activities; (iii) training of relevant actors in the maintenance of RE equipment; and (iv) strengthening of quality norms and standards, etc.
11. The objective of Group 4 was to discuss and identify sustainable investment opportunities in the renewable energy sector and identify the best technologies and regions with their highest potential. The group reviewed the principles and mechanisms of SREP, particularly in relation to the manner in which SREP resources in Mali could be used to raise additional funds from the MDBs, the private sector and other potential donors. Project proposals were made and subsequently submitted to the National SREP Commission and to the MDBs for discussion.
12. Lastly, Group 5 focused on the environmental and social analysis. This initial effort helped analyze SREP objectives and strategic investment areas in view of the environmental and social concerns and prioritize investments geared towards sustainable development with a view to addressing the issue of sources of greenhouse gas emission and their impact.

13. Overall, the working groups and plenary discussions enabled workshop participants to agree on:
 - The need to strengthen the legislative, regulatory and institutional framework to establish a more favourable context to the development of REs and, notably, investments by the private sector;
 - The need to build the capacity of various types of actors, in technologies as well as other aspects related to implementing RE projects, and to support investment projects through specific analyses and research;
 - The need to develop an efficient information management and knowledge sharing system and monitoring/evaluation system of all SREP program activities.
02. The will of the actors to highlight the following technologies: solar, notably PV solar, mini/micro hydro; and bio fuels/biomass.
14. The results of the stocktaking report and the discussions held also supported the classification of the various RE technologies into 3 groups, depending on the degree of control and/or use by the various stakeholders (technical services, communities, etc.):
 03. *Proven technologies*: Hydro, photovoltaic solar pumping systems, lighting, refrigeration, telecommunications, water heater systems and thermal solar dryers, wind pumping systems and small aero-generators in the Sahelian and Saharan zones.
 04. *Technologies to be promoted*: Biogas domestic systems, biogas and fuel industrial systems using municipal or industrial wastes for electricity generation, bio-fuel production systems, rural and peri-urban bio-fuel systems for transportation.
 05. *Technologies to be introduced*: Existing systems of photovoltaic solar/transmission or distribution grid coupling (urban or rural) in residential areas.

CONSULTATIVE MEETING WITH MAJOR STAKEHOLDERS (26 APRIL 2011)

15. These consultations constituted a key element of the participatory process, to the extent that they enabled an in-depth study of some themes that were discussed during the joint mission with all the actors operating in Mali's energy sector, namely national institutions, civil society, private sector and development partners.
06. Thus, consultations with national institutions addressed the need to review institutional and legal instruments in order to define the roles and functions of the actors involved as well as instituted a mechanism that will help to coordinate their activities.
07. The meeting with the private sector helped representatives of national agencies, local private sector enterprises in the renewable energy sector and the MDBs to address a number of issues that, according to the Malian private sector, hamper their effective involvement in the renewable energy sector, namely: inadequate support mechanisms for small operators, absence of a sustainable renewable energy financing mechanism; need to develop new forms of partnership between the public and private sectors in order to stimulate fresh investments; changes in the legislation to facilitate access to land for implementing RE projects in general and solar energy projects in particular.

08. The consultative meeting with civil society focused the adequacy and relevance of current measures on the energy sector, in general, and the RE subsector in particular. According to the participants, the priority activities that SREP should promote are: (i) promotion and use of solar energy; (ii) promotion and use of renewable energies that have long term benefits in terms of employment creation and income-generating activities; (iii) creation of a business incubation centre; (iv) production of household energy sources; (v) and putting in place of suitable financing mechanism for REs to facilitate their large scale acquisition and use. Civil society actors expressed the desire to be involved in implementing SREP activities and monitoring.
09. The MDBs held a consultative meeting with the development partners. Their discussion indicates that there are a significant number of on-going or planned projects/initiatives in the sector, and that these should help to strengthen the framework within which SREP has been formulated. The development partners are interested in pursuing their involvement in SREP formulation and implementation. The parties indicated the need to move towards proven technologies (PV solar, mini hydro and bio-fuel) and resort to co-financing (private sector included) to create leverage, taking into account the limited resources earmarked for SREP investments.

CONSULTATIVE REGIONAL MEETINGS (October/November 2011)⁶⁶

16. Since the formulation of an investment plan should be done as part of a broad consultative framework to ensure the relevance of the investments proposed and their acceptance by the local communities, the GoM expressed the wish to hold regional workshops. The primary objective of these regional workshops is to: (i) inform and sensitize the various regional and local actors on SREP principles and objectives; (ii) share with them the priority investment areas; and (iii) draw their attention to and discuss the projects proposed under the investment plan. These workshops should also enable: (i) the discussion of the results to be achieved as part of the program (monitoring/evaluation); and (ii) discuss the findings of the environmental and social assessment.

17. Four sites have been chosen for these regional workshops: (i) North workshop involving about 50 participants from the Mopti, Timbuktu, Gao and Kidal regions, held in Mopti; (ii) South workshop that involved 30 participants from the Segou and Sikasso regions, held in Segou; (iii) Central workshop that involved 30 participants from the Koulikoro and Bamako district, held in Koulikoro; (iv) the East involving 15 participants from the Kayes region, held in Kita.

POSTING DOCUMENTS ON AN INTERNET WEBSITE

Since the SREP-Mali program was formulated as part of an extended participatory process, a temporary site was created (pending the successful revamping of the National Energy Directorate website) to enhance public information and make key documents available to stakeholders. The content of the temporary site was consequently transferred to that of the National Energy Directorate in August 2011.

⁶⁶ The regional consultations will be held when the preparatory grant funds will be made available to the SREP National Commission.

Annex IV: SREP Related Benefits

1. SREP will contribute to implementing the main institutional, technical and financial aspects of the energy sector road map stemming from national policy and strategic frameworks. The Program will more specifically help achieve the objectives of the *National Strategy for the Development of RE*.
2. Its investments will have related benefits with direct impact on the country's development, particularly in relation to the following aspects:
 - Firstly, contribute to gradually substituting traditional fossil fuel based-solutions and the ineffective use of biomass through investments in renewable energies and, secondly, fully integrating these energies into the national energy policies.
 - Foster the synergy of the main activities of the energy sector operators and effectively direct the interventions of the actors, especially by encouraging private investments to significantly increase the share of renewable sources in national energy generation.
 - Link economic, social and environmental benefits in a single paradigm of sustainable development and poverty reduction. This will enhance, in an integrated way, energy security, business start-ups, reduction of local pollution and improvement of the livelihoods and living conditions of the local communities (with special attention to vulnerable groups, including women and young people).
 - Contribute to strengthening the national energy planning system and the monitoring/evaluation system, thereby ensuring an accelerated implementation of the *National Energy Policy* and *National Strategy for the Development of RE*, but also, more widely, a sustainable development of the country's energy sector.
 - Contribute to reducing the growing pressure of the energy sector on the national budget by reducing the share of imported fossil fuels in the national energy mix.
 - Through synergies with other projects and programs geared towards energy efficiency, contribute to reducing pressure on sustainable natural resources, notably forest resources.
 - Lastly, in accordance with the principles of the country's democratic and decentralization reforms, contribute to highlighting the necessary ownership by local authorities of all aspects of local development, including those related to energy challenges and access by households to energy to improve their living conditions and increased productivity of their economic activities.

Annex V: Current / Planned Short Term Activities in the Area of Renewable Energies

Projects	Objectives	Amount	Components and/or Results and Achievements Enhanced in July 2011	Linkages with SREP	Development Partner Supporting GoM	Date
On-going Projects / initiatives						
Household Energy and Universal Access Project (SREP)	Support Governmental in its efforts to improve access by poor and isolated communities to basic energy services in order to achieve set objectives set in terms of poverty reduction and development – notably the MDGs.	USD 83 million	Component 1: Institutional support and technical assistance Component 2: Provision of Energy Services Component 3: Household Energy	Mobilization of partnerships, and additional funding	WB, GEF, KfW, ESMAP/AFREA, ESME, local private sector,	2004 – 2012
Energy Service Development Project	The aim of the project is to improve access to electricity and energy efficiency in Bamako and other sites of the country	USD 120 million	Component 1: upgrading and extension of transmission and distribution systems Component 2: Energy efficiency and demand management Component 3: Institutional support and capacity building of energy sector	Synergies in energy sector capacity building and institutional support	WB	2010-2014
Lighting Africa	Lighting Africa is an initiative by the WB Group aimed at fostering a development that would enable the population to gain access to modern off-grid lighting products in Sub-Saharan Africa	USD 5 million		Co-financing of activities -	WB, IFC, NDTF, GEF	2007-2014
Regional Hydroelectric Project (Felou)	Increase access to low cost energy sources in the West African Power Pool	USD 240 million		Large scale hydroelectricity	WB, EIB	2011 – 2013
Communal Electrification Project (ELCOM1)	The aim of ELCOM is to ensure primary access to electricity in Mali's rural areas, in complement to the AMADER approach, through support to communes for the procurement of solar equipment to electrify major public infrastructure (CSCOM, schools and town halls).	USD 1.78 million	<ul style="list-style-type: none"> ✓ Access to basic electrification for 95,000 citizens; ✓ 46 public buildings electrified, 53 public street lights working; ✓ Development of 7 public-private partnerships ✓ Setting up of a sola training centre at Segou 	Promotion of REs at local level and distribution of RE equipment	GIZ (Germany BMZ) DGIS (Netherlands)	Assessme nt of Phase I (2007-2009)
Communal Electrification Project (ELCOM2)		USD 2.97 million	Situation of second phase in March 2011 <ul style="list-style-type: none"> ✓ 8 public buildings electrified ✓ 5 battery charging stations ✓ 7 public street lights working; ✓ Development of 2 public-private partnerships 			Phase II (2009-2012)

Projects	Objectives	Amount	Components and/or Results and Achievements Enhanced in July 2011	Linkages with SREP	Financial Partner Supporting GoM	Date
Promotion of New and Renewable Energies for Advancement of Women (PENRAF)	The project aims to support communes and villages for access to REs; create in chosen communes attractive equipment for private stakeholders ; satisfy energy needs of selected communes ; integrate women's associations and promote women in distribution of RE equipment; increase productive incomes of beneficiaries	USD 5 million	312 villages supervised in 4 regions (Koulikoro, Segou, Sikasso, Mopti) ; Installation of 642 RE technologies Build capacity of 580 beneficiaries in RE technologies. Establish a solar village (Sirakorola: 2000 inhabitants).	Promotion of REs at local level and distribution of RE equipment in selected localities ; environmental protection ; women's integration	UNDP	Phase 1 : 2004- 2009 Phase 2 : 2010- 2012
Promotion of Jatropha production and use as sustainable agro bio-fuel in Mali	The project aims to (i) promote access to renewable energies in decentralized areas; (ii) produce supports needed for the formulation of appropriate regulatory framework for quality oil such as agro-fuel, fixing of prices in the area of jatropha products, access to land, certification of production process, (iii) promote gender equity and (iv) promote jatropha-based technologies, (v) conduct technical and economic analyses of production systems	USD 6,7 millions	Component 1: formulate a jatropha development strategy as sustainable bio-fuel based on successful national and regional experiences Component2: Address private sector investment constraints by putting in place an appropriate regulatory framework Component3: Strengthen research and development activities with a view to removing barriers to the development of jatropha as a bio-fuel. Component 4: Remove constraints to the ownership of the process by rural actors. Component 5: Undertake the promotion of jatropha oil	Promotion of REs at local level and promotion of biofuel technologies, creation of incomes for women	UNDP Other	2011 to 2015

Projects	Objectives	Amount	Components and/or Results and Achievements Enhanced in July 2011	Linkages with SREP	Financial Partner Supporting GoM	Date
National Program for Developing Multifunctional Platforms – PN/PTFM - Mali	The Project aims to: <ul style="list-style-type: none"> • Introduce new energy sources and technologies capable of alleviating the chores of women in rural areas • Develop and build the capacity to own and manage PRFM product by decentralized structures, private sector, cooperatives and women's groupings • Promote the development of Income Generating Activities (IGAs). • Initiate and promote a sustainable quality and affordable service delivery. 	USD 8 million	To date, the outputs include the following: <ul style="list-style-type: none"> - 1,000 PTFM micro-enterprises established countrywide including 30 PTFMs operating on <i>jatropha</i> oil; - 1.5 million persons in rural areas have access to modern energy services (lighting, drinking water, agro-food processing, battery recharging etc.; - 5,072 part-time jobs annually. 	<ul style="list-style-type: none"> - Cofinancing of SREP activities; - Support to private sector mobilization for REs and consequently support to some SREP activities; - integration of women and contribution to development of industry (value chain) biofuel 	UNDP Gates Foundation FAFPA Other partners	2008 – 2012 A new phase is envisaged for development of platforms using REs (bio-energy or PV solar)
Village Lighting through Solar Energy Project (PEVES)	Provide rural areas with quality and sufficient photovoltaic solar equipment	USD 7.7 million	42 solar pumps installed; 1090 kits school lighting kits installed; 04 refrigerators installed; 312 portable lamps installed	Wide distribution of photovoltaic equipment in rural areas	India	Phase 1: 2003-2009 Phase 2: 2010-2014
Development of <i>jatropha</i> oil agro-industry IMI Private Enterprise Project (pilot phase)	The aim of this pilot phase is to: (i) develop a <i>jatropha</i> oil agro-industry with farmer participation in the Kita Region. (ii) improve productivity. (iii) Market <i>jatropha</i> oil (biofuel) (iv) Reduce GHG emission and sell carbon credits	USD 0.26 million	Loan granted	Co-financing of SREP activities Development of biofuel subsector	French Development Agency	2011-2014
Provisional Mapping of Mali's Renewable Energy Sources	The objective of Phase 2 of Renewable Energy Sources Feasibility Project in Mali consists in mapping wind and solar resources; undertake an estimation of agricultural residues (rice husk) developable for energy purposes; analyze bio-ethanol potential of cassava.	USD 0.88 million	Component A: Data already collected for solar rays are used for the preparation of solar map. Component B: Analysis of data is conducted and will be ready in the end April report Component C: study of prefeasibility of installation of small to medium size bio-ethanol production plan and identification of an appropriate space for expansion of cassava cultivation for bio-ethanol production were carried out	Improvement of knowledge on RE resources– support to formulation of SREP projects and preliminary estimation of economic and environmental impact for application of REs in Mali	DANIDA	Phase 1 : 2007-2008 Phase 2 : 2009-2011

Project	Objectives	Amount	Components and/or Results and Achievements Enhanced in July 2011	Linkages with SREP	Financial Partner Supporting GoM	Date
IFC Mali Program	The program aims to support the GoM to formulate an investment promotion strategy in the key sectors including the renewable energy sector. The aim is to increase the volume of investments in these priority sectors for the country financing sealed) Financing the implementation of the strategy adopted.	USD 1 million (this a sub-component of an overall programme)	The framework document for the formulation of the strategy has been approved by the GoM.	Support to the mobilization of the private sector for Res and therefore support to some SREP activities.	WB, IFC, Netherlands Embassy, and USAID	2010-2012
African Rural Energy Entrepreneur Development (AREED)	AREED seeks to promote sustainable new businesses that use clean and efficient renewable energy technologies to meet the energy needs of communities living in under-served localities thereby reducing the ecological and health consequences of current methods of use of energy.	USD 0.5 million (sub-component of a regional programme)	Component 1: Business promotion service and financing of start-up. Component 2: financing of end-consumers. Support to development of NYETAA finance and setting up of a guarantee fund to refinance Nyetaa.	Co-financing of SREP activity. Public finance leverage. Promote access to renewable energies in rural areas. Support to development of businesses invested in the renewable energies	SIDA, UNEP	2001 - 2011
Projects/initiatives about to start						
Markala Sugar Project	The Markala Sugar Project is the first public-private operation (PPP) in Mali and the Bank in the agro-industry sector. The aim of the project is to increase the incomes of the actors of the sugar sub-sector on a sustainable basis. Beyond this primary objective, the project will help to develop sugar case residues for electricity production through cogeneration (30MW).	About USD 280 million for the cost of the agricultural component of the project	The project comprises two (2) components: (i) the agricultural component entails the development of an irrigated zone of 14,132 ha of sugar cane plantations; (ii) the industrial component entails the construction of a sugar plant for the annual production of 190,000 tonnes of sugar, 15 million litres of ethanol and co-generation of energy with 30 MW electrical power including a surplus of 3 MW to be transferred to the Société Énergie du Mali (EDM) grid.	Co-financing of activities. Generation of electricity by renewable energies	AFDB + IDB, KFAED, FSD, KEX, OFID, BOAD, BIDC, DGE, IFC	2011-2017

Project	Objectives	Amount	Components and/or Results and Achievements Enhanced in July 2011	Linkages with SREP	Financial Partner Supporting GoM	Date
Development of technical and economic repositories in <i>jatropha</i> -based biofuel industries	<ul style="list-style-type: none"> Improve renewable energy production and access to productive and domestic energy in rural areas (two pilot sustainable development operations of local agro-fuel industries using <i>jatropha</i> in Mali and Benin) Consolidate the technical, socioeconomic and methodological repositories for Mali, Benin Senegal and Burkina Faso by a network of project proposers in agro-fuel industries based on family agriculture for experience the sharing and consolidation Improve governance in West Africa and the regulatory frameworks of access to energy for the benefit of agro-fuel industries conducive for the development of the rural world. 	USD 7.4 million	<ul style="list-style-type: none"> Production of 1 200 t/year of <i>Jatropha</i> by 2350 independent or collectively organized producers for 6 extraction enterprises used by 1000 existing or recently created energy services within a structured industry and defined for the territory. Establishment of a regional network of agro-fuel industries based on peasant production (project proposers, research institutes, universities, professional agricultural organizations and specialized NGOs) for the production of agronomic, technical, economic, methodological repositories and impact studies on agro-fuel industries. Permanent and interactive access to training tools, studies and analyses on the issue of agro-fuels 	Co-financing of activities. Strengthening of legislative and regulatory framework for bio-fuels and consolidation of repositories and standards for bio-fuels and structuring of the subsector	European Union	2011-2014
Initial and continuing training of operators and rural electrification actors	The skills and capacity of private operators (POs) and Rural Electrification Agencies are enhanced sustainably in two pilot countries (Mali and Burkina Faso) by end 2013 and serve as reference to be reproduced in countries of the sub-region or even elsewhere in Africa	USD 1.3 million	<ul style="list-style-type: none"> Training needs were quantified and prioritized, available training schemes were identified and assessed The supply/demand catalogue has been created and made accessible to all the operators Trial training schemes (initial and continuing) and a process of certification are established to train 40 future trainers and 83 operators in Mali and Burkina Faso 	Private sector capacity building for rural electrification	European Union	2011-2014
Scatec Solar	Project for the construction of a 10MW solar plant in Mopti	USD 40 million. Concessional financing is sought: USD 12 million	N/A	Cofinancing activities. of Electricity generation through renewable energies	IFC	2011-2031