

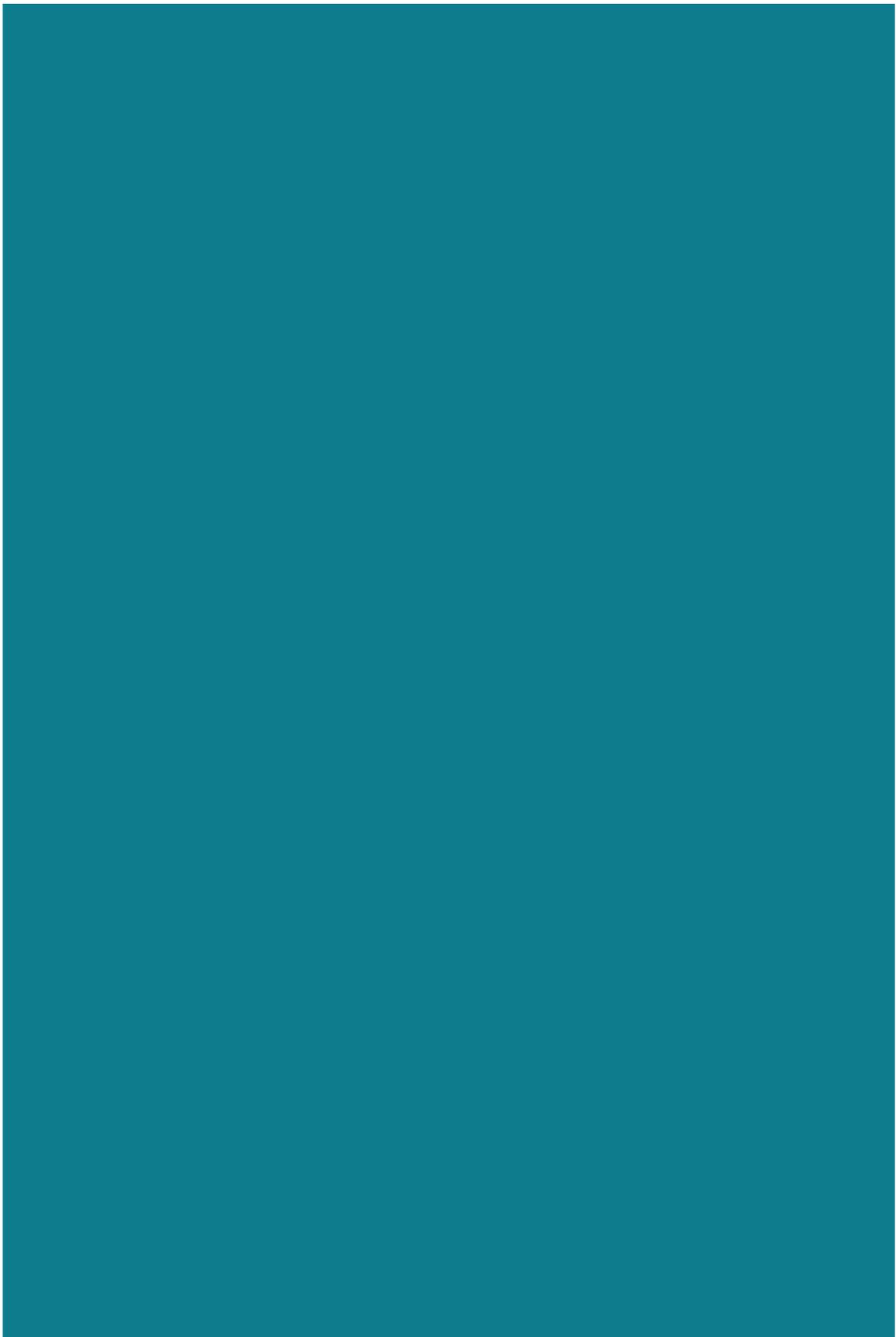
# RENEWABLE ENERGY IN AFRICA

## MALI COUNTRY PROFILE



AFRICAN DEVELOPMENT BANK GROUP





Renewable energy in Africa

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# MALI COUNTRY PROFILE

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 2015 

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Printed, designed and published in Côte d'Ivoire –  
2015

## **Renewable Energy in Africa: MALI Country Profile**

**T**his document is extracted from the Mali Investment Plan produced by the Government of Mali with support from the African Development Bank (AfDB) and the World Bank Group under the Scaling Up Renewable Energy Program in Low Income Countries (SREP), a program of the Climate Investment Funds (CIF).

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## ACRONYMS AND ABBREVIATIONS

<b>AfDB</b>	African Development Bank
<b>AMADER</b>	Mali Agency for Domestic Energy and Rural Electrification
<b>AMARAP</b>	Mali Radiation Protection Agency
<b>ANADEB</b>	National Agency for Bio-fuel Development
<b>ANICT</b>	Local Authorities Investment Agency
<b>API</b>	Investment Promotion Agency
<b>CDM</b>	Clean Development Mechanism
<b>CIF</b>	Climate Investment Funds
<b>CNESOLER</b>	National Solar Energy and Renewable Energies Centre
<b>CO<sub>2</sub></b>	Carbon dioxide
<b>CREE</b>	Electricity and Water Regulatory Commission
<b>DNE</b>	National Energy Directorate
<b>ECOWAS</b>	Economic Community Of West African States
<b>EDM</b>	Energie du Mali SA
<b>FER</b>	Rural Electrification Fund
<b>GDP</b>	Gross Domestic Product
<b>GHG</b>	Greenhouse Gas
<b>GIZ</b>	German Technical Cooperation Agency
<b>GoM</b>	Government of Mali
<b>GWh</b>	Giga watt per hour
<b>HV</b>	High voltage
<b>IAEA</b>	International Atomic Energy Agency
<b>IEA</b>	International Energy Agency
<b>IFC</b>	International Finance Corporation
<b>IP</b>	Investment plan
<b>KMS</b>	Knowledge management and sharing
<b>KWh</b>	Kilo watt per hour
<b>LV</b>	Low voltage
<b>MDBs</b>	Multilateral development banks
<b>MV</b>	Medium voltage
<b>MWh</b>	Mega watt hour
<b>NGO</b>	Non-governmental organization
<b>PANA</b>	National Program of Action for Adaptation to Climate Change

<b>PEN</b>	National Energy Policy
<b>PNPE</b>	National Environmental Protection Policy
<b>PRSP</b>	Poverty reduction strategy paper
<b>PV</b>	Photovoltaic
<b>RE</b>	Renewable energy
<b>RGPH</b>	General Population and Housing Census
<b>RI</b>	Interconnected grids
<b>SDA</b>	Electrification Master Plan
<b>SIE</b>	Energy information system
<b>SOGEM</b>	Société de Gestion de Manantali
<b>SREP</b>	Scaling Up Renewable Energy Program
<b>SSD</b>	Decentralized service company
<b>UNDP</b>	United Nations Development Program
<b>UNFCCC</b>	United Nations Framework Convention on Climate Change
<b>USD</b>	United States Dollar
<b>VAT</b>	Value-added tax
<b>WAEMU</b>	West African Economic and Monetary Union
<b>WB</b>	World Bank
<b>WDI</b>	World Development Indicators
<b>ZEM</b>	Multi-Sector Electrification Zone

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## ACKNOWLEDGMENTS

This country profile is part of the work undertaken by the African Development Bank (AfDB) in the context of its new Strategy 2013-2022, whose twin objectives are “inclusive and increasingly green growth”. The Bank mobilizes climate finance – including from the Climate Investments Funds, the Global Environmental Fund and other funding instruments - for its regional member countries and provides technical assistance for them to embark on a low carbon, climate resilient development pathway.

The CIF-AfDB team coordinated by Mafalda Duarte, Chief Climate Change Specialist, has prepared this knowledge piece. Florence Richard, Senior Climate Change Specialist, led the work with support from Giorgio Gualberti, Renewable Energy Specialist; Leandro Azevedo and Richard Claudet, Private Sector Specialists; Ndoundo Nigambye, Power Engineer; Angelo Bonfiglioli, Institutional Development and Knowledge Management Specialist; and Arona Coulibaly, Energy Specialist. The AfDB Mali field office provided support during the preparation of the Scaling Up Renewable Energy Program (SREP) Investment Plan.

The CIF-AfDB team is grateful to the Government of Mali, national counterparts, and NGO and private sector representatives who contributed to this brief. More specifically, we would like to acknowledge the intensive work done by the SREP national commission in 2011/12 for the preparation of the SREP Investment Plan from which this brief is extracted. Under the leadership of Sinalou Diawara, National Energy Directorate (DNE), the commission was composed of: Cheick A. Sanogo (DNE); Birama Diourte (DNE); Ismael O. Toure, Mali Agency for Domestic Energy and Rural Electrification (AMADER); Alassane Agalassou (AMADER); Hamata Ag Hantafaye (ANADEB); Aminata Thera Fofana (ANADEB); Sékou O. Traore, National Solar Energy and Renewable Energies Centre (CNESOLER); Alhousseini I. Maiga (CNESOLER); Sékou Kone, Agency for Environment and Sustainable Development (AEDD); Béchir Simpara, National Directorate for Pollution and Environmental Nuisances (DNACPN); and Tidiani Coulibaly, National Directorate for Environment and Forests (DNEF).

We would also like to acknowledge the critical contribution provided by the World Bank (WB) Group in preparing the SREP Investment Plan, especially Peggy Mischke, Renewable Energy Specialist (WB); Fabrice Bertholet, Senior Energy Specialist (WB); Stephanie Nsom, Energy Specialist (WB); Alain Ouedraogo, Senior Energy Specialist (WB); Paterne Koffi and Koffi Klousseh, Investment Officers (International Finance Corporation).

Julian Blohmke, Renewable Energy Consultant with the AfDB, peer reviewed this country profile along with the WB team mentioned above.

Amel Abed and Samar Yahyaoui provided administrative support to the team. Pénélope Pontet, Sala Patterson and Tharouet Elamri provided support for editing, laying out and disseminating this country profile.

We hope that the information provided in this document will contribute to mobilizing additional investors and partners in financing low-carbon development in Mali.



## EXECUTIVE SUMMARY

Mali has been selected as one of the six countries to benefit from the Scaling-Up Renewable Energy Program in Low Income Countries (SREP). The rationale behind this choice is, on the one hand, the nature and scope of the climatic, environmental, demographic and energetic problems Mali faces, and, on the other hand, the significant efforts government has already made to meet key energy challenges. The SREP Expert Group's report highlights in particular: (i) 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.

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

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This renewable energy country profile is a knowledge product derived from the SREP IP, with the objective of showcasing to a wider public the renewable energy status of the country, development options, and opportunities and constraints.

## Key constraints and challenges of the energy sector

At present, the energy sector in Mali is facing a number of challenges:

- The sector is characterized by a high dependence on oil. Importations are constantly increasing due to the demands of a fast growing population and economic growth. This is exposing the economy as a whole to the volatility of oil prices and puts the economy under foreign reserves pressure. Local energy service providers in rural areas that operate isolated fossil-fuelled mini-grids are particularly affected by rising and volatile fuel prices as well as by considerable fuel transport costs inside Mali.
- About 78% of household energy needs are satisfied by biomass resources (wood and charcoal), which cause health problems among rural populations from indoor air pollution. Biomass use also aggravates environmental degradation such as deforestation and land degradation.
- Electrification rates are still very low, especially in rural areas (15% of rural towns and villages as compared to 55% in urban centres). 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 Energie du Mali SA (EDM), the national utility, and local energy service providers operating in public-private partnerships (PPPs) with national agencies in isolated rural areas. The projected expansion of the national electricity grid is unlikely to connect a significant number of isolated low-income populations in the next decade, thus creating a considerable market for isolated off-grid rural electrification schemes.
- The current regulatory framework does not adequately promote private investment in renewable energy, though the local private sector has been increasingly involved in rural electrification since 2007.
- The impacts of climate variability are making the country's electricity supply – which depends on hydroelectric power for about 45% of its on-grid supply – increasingly vulnerable. Climate change is expected to exacerbate this situation further and to impact biomass production as well.
- The financial status of the electricity utility EDM SA is extremely weak. Government already transferred large amounts of capital to the utility in 2013 and will have to continue to support it for the coming years, despite planned annual rises in tariffs.

Inadequate access to affordable energy is also limiting social opportunities for the poor, women and youth, in particular; gender disparities in accessing energy are blocking the social development of communities, particularly in rural areas.

Renewable energy (RE) has great potential to address many of these sector challenges as well as to contribute to socio-economic development and poverty reduction. Its development, however, remains slow in spite of considerable solar, hydro and biomass potential throughout the country. Grid-connected RE (excluding hydro generation) was negligible as of 2014 but it is expected to grow to around 4% by 2019/20.

In this context, the GoM has set objectives to achieve better electrification rates nationwide. It is currently updating the energy policy, including a new target for rural electrification of 61% by 2033. The

GoM also aims to increase the share of RE in the national electricity mix to 25% over the same period. Nonetheless, there are a number of major constraints to overcome in order to achieve these goals.

- **Institutional:** Coordination among proliferating agencies concerned with RE development; weak planning processes; incomplete framework for PPPs, in particular for utility scale independent power producers (IPPs).
- **Economic and financial:** Weak domestic financial institutions; high up-front cost of RE 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; impact assessments on RE for electricity generation do not yet create adequate conditions for a robust, standardized and programmatic approach.
- **Social:** Inadequate provision of information and awareness of consumers on RE opportunities and challenges; poverty of Malian rural households impedes affordability, access and use of modern RE without subsidy schemes.

## Key achievements

Over the last fifteen years in Mali, a number of key achievements were made.

- **Technological achievements.** A number of technologies have been tested with successful results (hydroelectric dams, solar photovoltaic pumping systems, public lighting, refrigeration, telecommunication systems, water heaters, etc.). Additional promising technologies have been identified and are ready to be developed (household biogas systems, industrial biogas systems, biofuel production, etc.). Solar PV energy systems have been successfully introduced in the last decade, either through solar home systems or mini grids.
- **Policy achievements.** The GoM's vision and targets have been formulated in key policy papers, namely: National Energy Policy (2006); National Strategy for the Development of Renewable Energies (2006); National Strategy for the Development of Biofuels (2006); and the National Energy Sector Policy Letter (2009-2012). Government is currently updating the policy papers. New versions are expected by mid-2015.
- **Institutional achievements.** Mali has created and strengthened a number of institutions that play key roles in the development of the RE sub-sector. The Prime Minister Cabinet is directly involved through the supervision of the Commission for Electricity and Water Regulations and 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 SA and by local private energy companies supported by the Mali Agency for Domestic Energy and Rural Electrification (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 are measured following standard national review procedures by the Ministry of Environment. Safeguard frameworks acceptable to multilateral development banks' (MDB) requirements are in place for rural energy projects. A National Climate Change Strategy was finalized in September 2011. The World Bank financed a gender assessment that identified considerable potential for gender-specific activities in rural electrification that are inherently linked to productive energy uses

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and those that strengthen PPPs between local energy service providers and national agencies. Such activities will be further strengthened during IP implementation.

- **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 with support from AMADER (communities, women associations) 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 2013. About 10% of rural energy services are provided using RE, including mainly small-scale applications such as Solar Home Systems (SHS).

The further development of RE in Mali is promising and will support the country's sustainable development and poverty reduction efforts. It will also help reduce the country's vulnerability to external price shocks and fossil imports, and increase energy access. Despite the large potential, a series of technical and non-technical barriers has limited the adoption of RE technologies. The GoM, with the support of its development partners, and with the participation of the private sector, has established a series of policies and projects whose implementation could open the market for RE providers, and help the country satisfy its growing and unmet energy needs.



## KEY ENERGY FIGURES

Topic	Indicator	Unit	2000	2012	Source
Socio-Economic	Population	units/growth	10.26 mln/ 2.8%	14.85 mln/ 3.4%	WDI
	Urban/Rural Population Shares	%	72% rural 28% urban	64% rural 36% urban	WDI
	GDP/per capita	USD- constant/ PPP <sup>1</sup>	380 (USD 2005) 835 (USD 2005 PPP)	476 (USD 2005) 1047 (USD 2005 PPP)	WDI
	GDP growth	%	5.1% average per year		WDI
	Poverty headcount 1.25USD	%	61.18%	50.43% (2010)	WDI/ National
	Poverty Gap 1.25 USD	%	25.8%	16.4%	WDI
Access and Consumption	Electricity Access (urban/rural)	%	1% rural	55% urban 15% rural (2010)	IP
	Electricity Access (national)	%	17%	27% (2010)	WB-GTF, IP
	Electricity Consumption per capita	kWh/p.c.			WDI or calculated
	Electricity Demand and growth	%	6.6% per year (2008-2012) (Interconnected System Only)		EDM SA - calculated
Production	Installed Base	MW/GW		425 MW (only EDM)	EDM SA
	Share of Hydro	%		44.4% (2014- only IC system)	EDM SA
	Share of Other RE	%		0.1% (2014-only IC system)	EDM SA
	Share of gas/coal/fuel (as relevant)	%			IP
	Imports of fuels	(% of imports)	23.6%	26.0% (2010)	WDI
	Net Imports of electricity	(% of production)			IP, calculated
External Financing	Aid for the energy sector from 2000	USD	478.5 USD millions (2011 prices)		OECD CRS
	FDI for the energy sector from 2000	USD			World Bank PPI

1 Purchasing Power Parity



I.

# COUNTRY CONTEXT



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## I. COUNTRY CONTEXT

*Mali is a large country with diverse ecosystems and climatic zones, spanning from the arid desert in the north, to the tropical areas of the south. In the future, temperatures are projected to rise and rainfall to decrease, increasing climate vulnerability. The population of Mali is 14.85 million but growing fast (3.4% year). Mali has experienced sustained economic growth in the last decades, but in 2012 it was hit by security, institutional and economic problems that have hindered the country's development. The situation almost normalized in 2013 and the country is projected to grow economically. Poverty indicators improved in the last decade, although 44% of the population still lives below the national poverty line.*

### Geography and climate

Mali is a landlocked country in the Sahelian belt of West Africa. It covers an area of 1,241,248 km<sup>2</sup>, of which 51% is desert and 4% arable lands<sup>2</sup>.

The climate, highly variable, is characterized by a long dry season and a rainy season averaging one month in the north and up to five months in the south. Rainfall ranging from 1,200 mm/year to 200 mm/year has resulted in the climatic stratification of the country into 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)<sup>3</sup>.

Mali is highly vulnerable to climate change, climate variability and desertification. These factors may create risks for the RE sector, affecting biomass production and hydroelectric resources.

### Institutional framework

Mali has been independent since 1960 and a multi-party democracy since 1991. From 1991 to 2012, it was a stable country that experienced a democratic and peaceful transfer of power between parties. At the beginning of 2012, Mali was hit by a multi-faceted crisis: a conflict in the north of the country that threatened its territorial integrity; political and institutional instability in the south that resulted in the coup of March 22; and severe food insecurity as a consequence of the previous year's droughts.

Following these events, Government re-gained control of key areas in the north. A first peace deal was signed in June 2013, although it lasted only few months. Troops from the European Union and the African Union supported the Malian Government to stabilize the situation. After a short transition period, democracy was restored and parliamentary and presidential elections were held in 2013 with success.

Mali is part of the Economic Community of West African States (ECOWAS) and the West African Economic and Monetary Union (WAEMU) with whom it shares the same currency.

### Socio economic demographic context

As of 2012, Mali had a population of 14.85 million people with an average annual growth rate of 3.4%<sup>4</sup>. The majority of the population (about 64%) lives in rural areas, but the urban population grows steadily at 5% per annum. Population growth is a major concern for the country's future since it implies a strong increase in basic needs, including energy<sup>5</sup>.

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2 [www.fao.org](http://www.fao.org)

3 See: [http://country-profiles.geog.ox.ac.uk/UNDP\\_reports/Mali/Mali.lowres.report.pdf](http://country-profiles.geog.ox.ac.uk/UNDP_reports/Mali/Mali.lowres.report.pdf)

4 Data from the World Bank World Development Indicators, accessed in April 2014.

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

Mali's economy is dominated by the primary sector, which accounts for 36.5% of GDP and employs nearly 85% of the working population. The electricity and water sub-sector accounts for 1.91% of GDP<sup>6</sup>. Mali imports all the fossil fuel it needs, making it highly vulnerable to price volatility.

The mining sector also has a prominent role. Gold is Mali's main export and the country is the third largest gold exporter in Africa. There are seven active gold mines and 285 prospecting permits have been issued. The mining sector is a major driving force in the growth of internal energy demand.

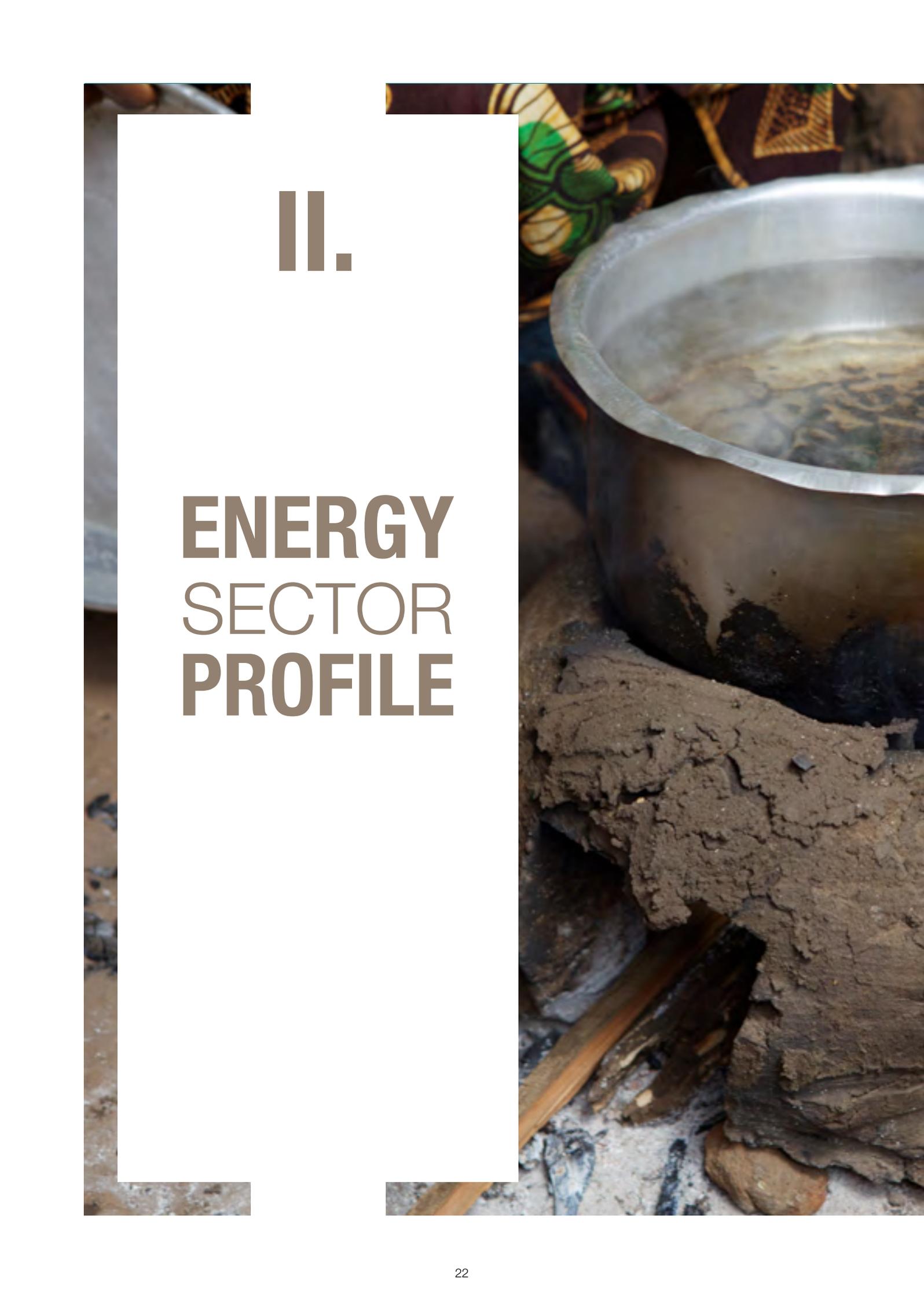
On average, between 2000 and 2012, Mali experienced strong economic growth, averaging 5% yearly accompanied by a modest increase in GDP per capita (from 380 USD to 476 USD at constant 2005 prices, or from USD 835 to USD 1046 in Purchasing Power Parity terms). In 2011, economic growth reduced to 2%; the following year it was -1.18%; and in 2013 and 2014, it started to be positive again (around 5%). Poverty indicators improved and the headcount ratio at the national poverty line passed from 56% to 44% between 2000 and 2010, while the respective poverty-gap measure passed from 25.8% to 16.4%<sup>7</sup>.

Despite economic growth, Mali remains a country with severe poverty and low human development indicators. Most of the Millennium Development Goals are not expected to be achieved by 2015. Mali has made a lot of progress in recent years but major inadequacies in access to basic services and infrastructures have to be addressed. The current Growth and Poverty Reduction Strategy (CSCR 2012-2017) considers energy a key area for economic development, gender equality and the environment. It also envisages a series of policies and projects to support its development. The long-term vision for the energy sector, mentioned in the CSCR, is to make RE the main source of energy for the country. The strategy consists of developing new RE, reducing the share of thermal generation and developing energy access for all.

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

7 World Bank, World Development Indicators, accessed April 2014.



# II.

# ENERGY SECTOR PROFILE

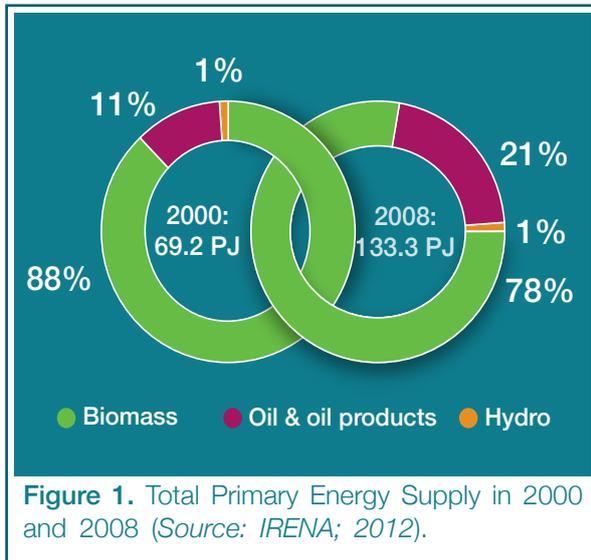


## II. ENERGY SECTOR PROFILE

*The primary energy supply in Mali is biomass, supplying 78% of all energy consumed. Electricity access rates are low but improving, at 55% in urban and 15% in rural areas. Electricity demand is growing extremely fast (about 10% per year in recent years) driven by domestic consumers and the industrial and mining sectors. The national grid has a large but declining share of hydroelectricity, but both isolated centres and large captive generators rely exclusively on fossil fuels to satisfy their energy needs. International electricity trade will have a growing role in the next years. In rural areas, a decentralised approach is being pursued, allowing private energy services companies to operate. Gender issues and specific domestic energy policies are being addressed by the state and by the rural and domestic energy agency (AMADER).*

### Energy sector description

The primary energy supply in Mali is largely based on biomass (78%). It is the main energy source for the majority of the population, while fossil fuels contribute to 21% of the energy supply and hydro contributes 1% (excluding electricity trade)<sup>8</sup>.



**Figure 1.** Total Primary Energy Supply in 2000 and 2008 (Source: IRENA; 2012).

Access to electricity in 2010 was about 55% in urban areas and 15% in rural areas, where it was almost inexistent a decade earlier. The latest data for urban areas shows further improvement: in 2012 the access rate was 62%<sup>9</sup>.

Mali's oil and gas subsector is characterized by total dependence on petroleum imports, which represented 26% of total imports in 2010. This is exposing the economy as a whole to the volatility of fossil fuel prices. It also puts the economy under foreign reserves pressure, including the development of the energy sector.

### Current status of electricity sector

EDM SA is the utility that generates, transmits and distributes electricity in Mali. It has been owned and managed by the state from its beginning in 1960, until 1994 when it delegated its management to an external consortium. In 1997, the management contract was ended and the state committed to privatization. In 2000, the utility was partially privatized to a consortium composed by Saur, a Bouygues group subsidiary (47%), and Industrial Promotion Services, a subsidiary of the Aga Khan Fund for Economic Development (13%). The hydroelectric plants were kept under state ownership. The privatization lasted until 2005, when SAUR withdrew from the company selling its shares to the other parties, and the state regained 66% control<sup>10</sup>.

8 Source: IRENA, 2014. Mali Country Profile, data refer to 2008.

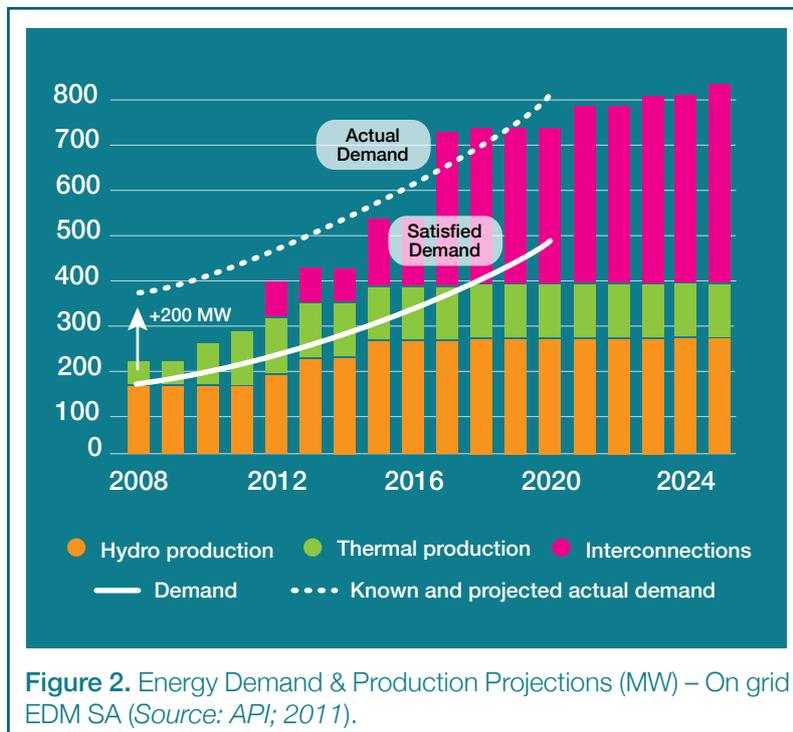
9 Source EDM-SA - <http://www.edm-sa.com.ml/edmsa/chiffres.asp>

10 Gualberti, G., Alves, L., Micangeli, A., & da Graça Carvalho, M. (2009). Electricity privatizations in Sahel: A U-turn? Energy Policy, 37(11), 4189–4207. doi:10.1016/j.enpol.2009.05.018

The financial state of EDM SA at the end of 2013 was critical due to the high level of indebtedness with banks and creditors, a deficit in installed capacity, a shift towards thermal generation and low tariffs unable to recover costs. The GoM has planned to act both through budget compensation of more than USD 126 million (in addition to an ECOWAS grant of USD 31 million) and by preparing a recovery plan for the energy sector with contributions from the World Bank and IMF<sup>11</sup>. Although the sector is vertically integrated, the unbundling of the sector has been discussed extensively. However, no decision had been taken at the time of writing (mid-2014).

## Electricity demand

Electricity sales from EDM SA increased consistently in recent years, surpassing 1,000 GWh in 2012 from 785 GWh in 2008 and averaging 6.6% growth per year. The number of clients also increased from 202,000 to 290,000 during the same period.



There is an unexpressed and largely unsatisfied demand for electricity in Mali, both for domestic users and for large industrial complexes, in particular in the mining sector. In 2012, the installed base reached 357 MW for the central grid (but peak capacity is lower, 212 MW) and 68 MW for isolated centres<sup>12</sup>. Industries and mines, on the other hand, have an estimated installed base of 200 MW to satisfy their own demand. The mining sector alone experienced significant growth passing from 47 MW to 136 MW between 2008 and 2011, exclusively from thermal power plants. The lack of reliable, lower-cost grid electricity is considered a barrier for further development of the sector<sup>13</sup>.

In 2013, the capacity gap to meet demand was estimated at 111 MW, which represents 45% of needs. In 2014, the estimated capacity gap was 32 MW, which represents 13.2% of needs.

Keeping up with the increase in demand presents 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 energy sources to face growing national electricity demand. Going forward, increased regional integration could help Mali meet its energy needs through electricity imports (Fig.2).

## Electricity supply

The Malian electricity sector can be divided into four segments: the interconnected system, isolated centres, captive generation by large consumers and the rural sector.

11 Respectively, CFCA 50 billion and CFCA 20 billion - Source: Task-Force - Rapport Provisoire - Perspectives énergétiques à court terme du réseau interconnecté - Recommandations pour le redressement de la situation financière et opérationnelle du secteur de l'électricité pour la période 2014-2020.

12 Source EDM-SA - <http://www.edm-sa.com.ml/edmsa/chiffres.asp>

13 Promotion de l'investissement privé au Mali. Opportunités pour les investisseurs dans la filière Energie. Mise à jour : Décembre 2011. API-MALI - [http://www.apimali.gov.ml/uploads/news/d112/Présentation\\_investisseurs\\_Energie%20\\_français.pdf](http://www.apimali.gov.ml/uploads/news/d112/Présentation_investisseurs_Energie%20_français.pdf)

The interconnected system, owned and managed by EDM SA, is dominated by hydroelectricity, mainly generated by the Manantali Dam (of which Mali owns 104 MW out of the total 200 MW) and Sélingué (46 MW). Hydroelectricity represented 60% of all electricity produced in 2012, while the rest was generated by diesel or heavy fuel power stations. Notably, in recent years, the Manantali Dam encountered production problems and other important hydro plants (Sélingué and Sotuba) are experiencing delays in their 10-year maintenance schedules. Therefore, the share of hydroelectricity in the interconnected system decreased to 44% in 2014 (Table 1).

In 2013, the generation profile of EDM was as follows: 21% of energy delivered was thermal, generated by EDM; 26% was purchased thermal energy; 16% was hydroelectricity, generated by EDM; and, 37% was purchased hydroelectricity.<sup>14</sup> The share of thermal energy in the energy mix is expected to increase, between 2014 and 2017, to reach 62% (Table 1).

**Table 1. Mali Electricity Mix, interconnected system, including imports.**

	2012	2013	2014	2015	2016	2017	2018	2019	2020
	Real	Real	Plan	Forecast	Forecast	Forecast	Forecast	Forecast	Forecast
<b>Thermal</b>	39.9%	47.0%	55.7%	59.9%	60.6%	61.9%	50.7%	51.2%	55.2%
<b>Hydro</b>	60%	53.0%	44.2%	39.9%	36.3%	35.3%	46.9%	44.5%	40.9%
<b>Solar</b>	0%	0.0%	0.1%	0.2%	3.1%	2.8%	2.4%	4.3%	3.9%
<b>GWH</b>	1275	1402	1629	1789	1966	2197	2516	2741	2985

Source: Mali - 2014 Provisional Electricity Recovery Plan

To keep up with demand, EDM invested in two medium-sized thermal generation projects (heavy fuel oil plants) inaugurated in 2010 for a total of 90 MW. The Malian grid is already regionally interconnected to Mauritania, Senegal and Cote d'Ivoire. Further reinforcement of the connection is planned to lower the cost of power in the medium term and to allow Mali to purchase more power from its neighbours.

There are few experiences with RE on the EDM SA grid, namely hybrid power plants (diesel/photovoltaic solar). The first was inaugurated in February 2011 (216 KWp) and two others in early 2014. Solar production is expected to ramp up and account for around 4% of total energy generated by 2020.

The EDM SA also serves 22 isolated centres exclusively with diesel power plants, for a total of 68 MW as of 2012 (Table 2).

**Table 2. EDM SA Installed Base, 2008-2012.**

EDM	Unit	2008	2009	2010	2011	2012
<b>Interconnected Grid</b>	MW	243.3	253.3	273.3	327.3	357.3
<b>Isolated Centres</b>	MW	49.7	57.2	60.1	67.4	67.9
<b>Total</b>	MW	293.0	310.5	333.4	394.7	425.2

Source: EDM-SA

Large consumers in the mining and industrial sector also exclusively use thermal generation to satisfy their needs (200 MW). Rural electrification uses a mix of diesel and PV.

The volume of EDM SA's fuel consumption tripled from 2005 to 2010<sup>15</sup>. In 2010, the electricity sector of Mali was around 50% dependant on fossil fuels<sup>16</sup>; this share is believed to have further increased since then. If private captive generation is included, the Mali energy system has a clear prevalence of fossil fuel generation. The economic growth experienced by the country in the first decade of the century required a rapid increase of energy generation achieved through new thermal power plants<sup>17</sup>. With a view to enhancing 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.

Electricity generation is vulnerable to climate variability since a significant portion of the on-grid supply managed by EDM SA comes from hydro power plants. It is worth noting, however, that the water system is made up of two large rivers, namely the Niger and Senegal, forming immense watersheds (300,000 km<sup>2</sup> for the Niger, and 155,000 km<sup>2</sup> for the Senegal). The total flow potential of these two river systems is estimated at 56,000,000,000 m<sup>3</sup> per year, and the country's estimated hydro potential is, as of 2014, nearly 1 GW.

## Electricity distribution

Energy access in Mali is low but growing. In 2010, the national rate was 27%<sup>18</sup>; in urban areas, it was 55%<sup>19</sup>, and in rural areas, it was only 15%<sup>20</sup>. The latter is low even compared to the African average rural access rate of 22.7% but represents a strong increase from the 1% access rate of 2000. Mali has a very low population density of 12 persons per km<sup>2</sup>, its villages are often widely dispersed and the main grid is not yet expanding to all major cities. As a result, a parallel on-grid and off-grid energy access expansion approach is preferred, allowing both local private energy service companies and the national utility to sell electricity to customers in their respective concession areas.

In fact, EDM SA serves 22 isolated urban centres via independent grids using diesel generators, while in rural areas, the Malian Rural and Domestic Energy Agency (AMADER) is pursuing a decentralised approach by allowing generation by private local energy companies and local initiatives (communities, women associations, NGOs).

When the World Bank-financed "Household Energy and Universal Access Project" (HEURA) closed, it was estimated that 74,787 off-grid connections for households and public lighting had been made, providing electricity access to more than 1,200,000 beneficiaries. In addition, 1,295 public and community institutions and centres had also been provided with off-grid electricity access, including 218 schools and 168 health centres. Generation technologies introduced so far essentially include diesel generators and associated transmission and distribution systems, but there are also many SHSs and a few pilot hybrid solar/biofuel mini-grids. The total installed capacity of mini-grids is around 15 MW, with less than 10% accounting for RE uses.

15 EDM - Plan de Redressement de la Situation Financiere et Operationelle du Secteur de l'Electricité, March 2014.

16 API-MALI 2011, cit.

17 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, and the BID and SOPAM plants in 2010. A portion of the thermal energy has also been imported from Nouakchott (AGGREKO) since 2007..

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

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

20 In rural areas, the access rate rose from 1% to 14.9% in 2010, indicating a special effort by the Ministry of Energy through AMADER.

Local energy service providers in rural areas that are operating isolated fossil fuel generators and mini-grids are especially affected by rising and volatile fuel prices, considerable fuel transport costs inside Mali and, in rural villages, environmental pollution (GHG emissions, noise pollution). Fuel charges currently amount to up to 75-80% of operational expenditures for local energy service providers in rural areas.

## Traditional/Domestic energy

Energy consumption is dominated by traditional biomass sources. Fuel wood – the most important source of household energy<sup>21</sup> - is derived from the country's forests, whose capacity is estimated at nearly 33 million hectares, with 520 million m<sup>3</sup> of standing trees. The consumption of fuelwood and charcoal increased steadily, reaching a yearly growth rate of 2.62% and 7% between 2000 and 2006, respectively<sup>22</sup>. In a country vulnerable to climate change and where the degradation of land and natural resources constitutes a major problem, fuelwood cannot provide an adequate response to growing energy needs. Uncontrolled logging has resulted in the implementation of a Domestic Energy Framework as well as the Forestry Code and Electrification Master Plan, a set of reforms aimed at preserving the forest resource. AMADER has the mandate to handle domestic energy projects, in addition to rural electrification.

The implementation of a fuelwood 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 continue to be high if no alternative, sustainable and affordable energy sources are introduced. This is particularly true for rural areas where energy sources are needed that are in synergy with potentials for productive energy uses and employment creation.

Additionally, the World Bank has been assisting AMADER in mainstreaming gender issues into its projects and creating a "gender energy action plan" that focuses on: 1) strengthening the gender desk within AMADER; 2) mainstreaming gender into monitoring and evaluating AMADER projects; 3) community-level training; 4) identification of new technologies, best practices and sustainable focal points; 5) solutions to the removal of barriers; 6) communication and information sharing; and 7) capacity building and training of relevant organizations.

Other relevant projects on gender and domestic energy include the installation of Multifunctional Platforms, with UNDP support, and more than 400,000 improved cookstoves, under the framework of the World Bank Household Energy and Universal Access program.

## SWOT box

Strengths	Weaknesses
Large hydro resources Regional interconnections Large investments planned Small Power Producers for rural generation	Overall dependence on fossil fuels Difficulty coping with electricity demand Financial situation of EDM SA very critical Rural access, domestic energies and gender issues
Opportunities	Threats
Sustained economic growth Further regional integration	Climate change Fossil fuels costs

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

22 Seconde Communication Nationale du Mali sur les Changements Climatiques, Juin 2011.



III.

# RENEWABLE ENERGY POTENTIAL

AND  
IMPLEMENTATION





### III. RENEWABLE ENERGY POTENTIAL AND IMPLEMENTATION

*Mali has a large renewable energy potential, which is only partially harnessed. Solar energy technology is particularly advantageous due to exceptional radiation levels, especially in the north. Biomass is abundant in the southern regions and the GoM plans to dramatically scale up biofuel production. Hydroelectricity is partially exploited, especially by large dams, with new facilities being planned. However, the potential for mini- or micro-hydro is also present. Wind power is at the very early stage and wind mapping is being produced.*

#### Renewable energy potential

Mali has a high and largely unexploited potential for RE sources and vast unexpressed and unsatisfied energy needs from a widely dispersed population. Biomass is the primary energy source used in Mali, although the modalities in which it is collected and used are often informal and traditional. Hydro is the only large-scale RE deployed; solar technology is very promising but still has low uptake.

#### Solar

Mali is in one of the regions in the world with higher solar potential. Average solar radiation in the country is well distributed over the national territory with an estimated 5-7 kWh/m<sup>2</sup>/day<sup>23</sup> and a daily sun lighting duration of 7-10 hours. The country's solar radiation is stronger in the desert areas of the north (Fig. 3).

Solar technology is particularly suited for granting energy access to remote and isolated populations. Despite the potential, the penetration of solar technology is still low and almost all installed capacity is from independent solar installations. No data is available on solar thermal deployments.

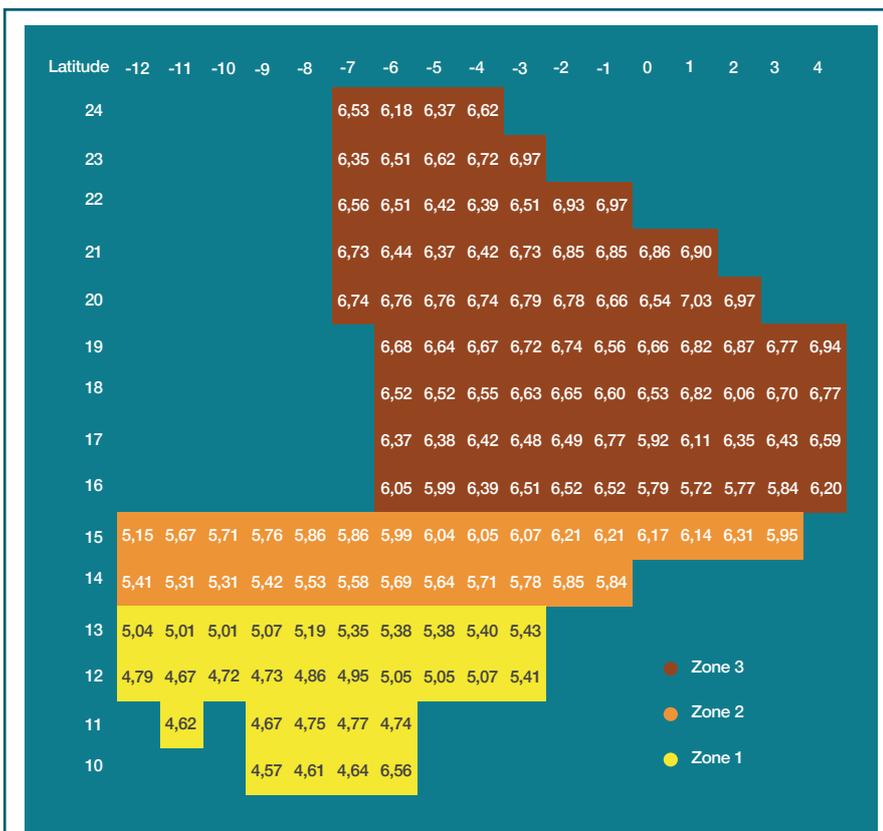


Figure 3. Solar Radiation in Mali.

Solar power grid generation was negligible in 2014 but plans are to expand it in the following years. Large solar PV IPP projects were being negotiated as of mid-2014 and are expected to generate a substantial amount of power starting in 2015/16. As for EDM isolated centres, three new hybrid plants (biodiesel/PV) were put in operation between 2010 and 2014; with the assistance of SREP, new hybrid plants should be developed to reach 4.5 MW under the supervision of AMADER.

## Hydro

Large scale hydroelectricity potential in Mali is mainly situated on the Niger and Senegal rivers, where 10 identified sites could provide 1 GW of installed base 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; and 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 has been upgraded from 0.6 MW to 60 MW with joint support from the World Bank and European Investment Bank. Further large-scale hydro power plants are under evaluation by IFC, including Kenie (42 MW). Potential exists also for mini and micro-hydro, and several sites have been identified. With the support of the SREP program, four micro- and two mini-hydro power plants are being developed together with the supporting distribution infrastructure, for an additional capacity of 14.6 MW.

## Biomass/Biofuels

Biomass is the most widely used form of energy in Mali. Despite the relatively fragile ecosystem, the resource is abundant and includes: (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 metres/ha/year; (ii) several million tonnes of agricultural residue and plant waste; (iii) an overall annual production capacity of 2,400,000 litres of alcohol since 1997; and (iv) about 2,000 hectares of *Jatropha* plantations for sustainable bio-fuel production<sup>24</sup>.

Opportunities exist to develop the capacity of sustainable biomass and biofuel uses given the strong agricultural base of the economy. In particular, opportunities to scale up biofuel projects for household electrification, to blend fossil fuels and to power productive uses for agricultural businesses in rural areas (such as grinders and de-huskers) could be explored further. The 2008 National Strategy for the Development of Biofuels identifies two biofuels with great potential: ethanol, for which commercial expansion is already ongoing; and *Jatropha* oil – derived from a widespread local plant – whose seeds can be pressed and produce quality oil that is easily compatible with diesel engines. *Jatropha* is a robust plant that can grow in semi-arid climates with little or no maintenance. Its potential in Mali is considerable and, besides its uses in rural areas, there are ambitious plans for its development and blending with fossil fuels for transport. A research paper from the World Bank finds that the development of *Jatropha* biofuels would be beneficial for both macroeconomic and distributional aims if the plants were to be developed on idle lands, i.e. not displacing other crops or forests<sup>25</sup>. The UNEP Risoe Center conducted a study to estimate the potential of other agricultural residues (rice straw, residues from sugar production and cotton stalks), finding, in some cases, substantive amounts of raw material that can be used to feed biomass power plants instead of being burned<sup>26</sup>.

24 A locally adopted, non-food crop, relatively resistant to droughts.

25 Boccanfuso, D et. al (2013) Macroeconomic and Distributional Impacts of *Jatropha*-based Biodiesel in Mali. World Bank Policy Research Paper n. 6500.

26 Nygaard, Ivan et. al. (2012). Agricultural residues for energy production in Mali, DANIDA contract 1711, Feasibility of renewable energy resources in Mali. UNEP Risoe Center - [http://www.frsemali.org/Biomass\\_resources.htm](http://www.frsemali.org/Biomass_resources.htm)

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## Wind

Wind energy potential is present in some regions of Mali. In the Sahelian and Saharan zones, the annual average wind speed is estimated at 3 m/s to 7 m/s. The UNEP Risoe Center developed a numerical wind mapping exercise. It concluded that wind resources are relatively low but that under certain conditions they may be economically feasible, i.e. at favourably exposed sites, given enhanced winds and where practical utilization is possible (given grid connection or replacement or augmentation of diesel-based electricity systems)<sup>27</sup>. For the moment, there is no penetration of wind technology beside pilot projects and small water pumping.

## Climate change risks and opportunities for RE

Mali is one of the countries with the lowest emissions in the world, reaching 0.04 metric tons of CO<sub>2</sub> per capita<sup>28</sup> in 2010. The second National Communication to the United Nations Framework Convention on Climate Change (UNFCCC) estimates that the emission of all GHGs reached 3,159 tCO<sub>2</sub> eq. in 2006, from 2,390 tCO<sub>2</sub> eq. in 2000<sup>29</sup>. The main source of emissions is traditional biomass, which accounts for 81% of all GHG emissions.

Vulnerability to climate change is severe. The most likely scenarios foresee a rise in temperatures and a diminution in rainfall for all localities in Mali with potentially severe effects on agriculture, forestry, health, energy and water, among others. According to Mali's National Adaptation Programme of Action (NAPA), the energy sector is identified as one of the priority sectors for taking on climate change adaptation measures. In terms of vulnerability, the hydroelectricity subsector is highly subject to climate variations. In accordance with the climate scenario formulated under the NAPA, a 1% decrease in water flow will result in a 1.3 million KWh decrease in electricity generation. In particular, mitigating the impacts of climate change on hydroelectric power generation and biomass production will be key for any energy development and poverty reduction strategy.

## SWOT box

Strengths	Weaknesses
Hydro, solar and biomass have a great potential Experience in hydro, biomass and some solar PV RE available for rural access in remote areas	Hydro maintenance needed Unsustainable collection and use of biomass not fully addressed Little experience in wind power
Opportunities	Threats
Growth opportunities for all technologies Great interest from private sector in solar PV IPPs Biofuels with widespread local plants promising	Climate change and extreme weather events could undermine RE potential, especially hydro and biomass

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27 Jake Badger et. al (2012). Estimation of Wind and Solar Resources of Mali. Unep - Risoe Center - ISBN 978-87-92706-55-3 <http://goo.gl/xecpW>

28 World Bank WDI.

29 Seconde Communication Nationale du Mali sur les Changements Climatiques, Juin 2011.



**IV.**

**POLICY  
STRATEGY  
AND  
REGULATORY  
FRAMEWORK**





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## IV. POLICY, STRATEGY AND REGULATORY FRAMEWORK

*Energy is mainstreamed into national development policies and is one of the top priorities of Government. Many policies have been formulated to reform the sector with the objective of increasing its competitiveness, promoting private sector participation and facilitating both access to energy and the contribution of renewable energy sources to the energy mix. However, many challenges remain. Tariffs are still insufficient to recover costs for power producers. In rural areas, power generation is extremely expensive, while the involvement of foreign actors and external capital in the energy sector is still at an early stage.*

### Mainstreaming of energy & RE into national development policies

Energy is both an opportunity and a constraint for the economic and social development of Mali. The country's Plan for Sustainable Recovery (PSR) for 2013 and 2014 indicates a way to exit the crisis and places a strong emphasis on the necessity of adequate infrastructures – above all energy infrastructures – to relieve the bottlenecks that are hindering economic development<sup>30</sup>. Various dimensions of the energy challenge are incorporated into the national development policy, like gender, the necessity to increase the use of RE sources, opportunities for the private sector and the challenge of universal energy access. Both the PSR and the Growth and Poverty Reduction Strategy Paper (GPRSP - 2012-2017) indicate the necessity to intervene in financial, technical and institutional aspects with the objective of making sustainable renewable energies the country's principal energy source and increasing access to modern energy services. To achieve these objectives, Mali has developed a series of energy policies and related institutions that are briefly presented below.

### Energy policies

#### National energy policy

The main policy regulating the sector is the National Energy Policy (PEN), adopted in 2006, whose overall objective is to contribute to the country's sustainable development through the provision of affordable energy services to increase access to electricity and promote socio-economic activities.

The specific objectives of the PEN are: (i) meeting energy needs in terms of 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.

The policy's guiding principles are based on decentralization, liberalization, a programmatic and participatory approach, competitiveness and the implementation of PPPs. 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, para-public and private actors of the energy sector for the rapid, balanced and sustainable development of the country; and (iv) ensuring a better balance between energy supply and demand with a view to improving access to electrification and reducing geographic imbalances between the grid and off-grid areas covered.

The PEN established a series of ambitious quantitative goals on rural electrification, community land management for the wood fuel sector, biomass use, biofuels and RE to be achieved by 2015. Progress has been made in many of these areas, although many targets will likely be unmet. The revision of the PEN has started and an updated policy document is expected by mid-2015.

In 2009, Government issued the National Energy Sector Policy Letter, further specifying energy policy objectives and targets. The letter lists the projects to be achieved between 2009 and 2020, including 133 MW of new hydro capacity and 100 MW of thermal capacity, the strengthening of the interconnections with Ivory Coast and Ghana and other investments in the internal transmission and distribution network. The letter further specifies the following main policy objectives:

- separation of the water entity within EDM SA to keep only the energy sector;
- tariff revisions to assure that prices reflect real costs in order to achieve economic sustainability in the electricity sector;
- reinforcement of production, transmission and distribution infrastructures;
- increase private sector participation in the energy sector through either PPPs or entirely private investments.

The letter also envisages the progressive retirement of the GoM from the capital of EDM SA and the institutional reform of the company. The letter will also be revised in 2015 as part of the revision of the energy sector policy and strategic framework.

## Renewable energy policy

Renewable energies are addressed in several pieces of legislation, including the PEN (2006) and the aforementioned letter (2009). The most important policy document in this area is the National Strategy for the Development of Renewable Energy, which was adopted in 2006. It is aimed at: (i) promoting the widespread use of RE technologies and equipment to increase the share of REs in national electricity generation (up to 10% by 2015); (ii) developing the biofuel sub-sector 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 RE.

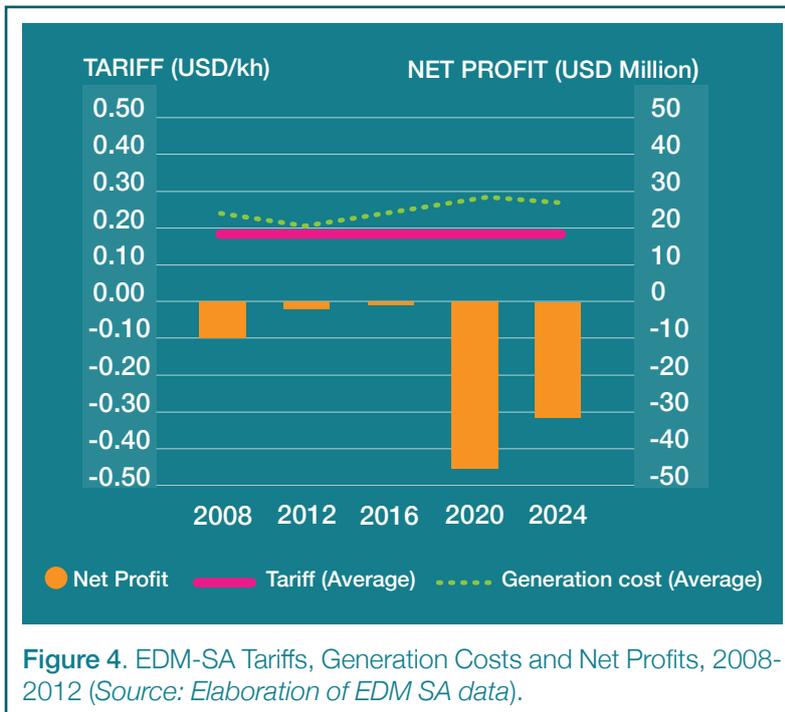
So far, the implementation of this national strategy has not been very successful. The strategy is expected to be revised in line with the next revision of the PEN. To accelerate the implementation of the national strategy, actions may be grouped into four main components: (i) comprehensive inventory of the RE potential; (ii) development of RE and promotion of their technologies; (iii) capacity building and development of cooperative actions; and (iv) impact assessment.

The National Strategy for the Development of Bio-Fuel was adopted in June 2008. It aims, firstly, at enhancing affordable local energy production through the development of biofuels to meet the country's socio-economic needs. Secondly, it aims to reduce the country's dependency on oil imports.

In addition to the RE strategies mentioned above, the National Adaptation Programme of Action (NAPA), submitted and disseminated in 2007, includes 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 (both integrate RE into their action axes).

## Electricity prices and tariffs

### Electricity pricing and tariffs (on-grid).



**Figure 4.** EDM-SA Tariffs, Generation Costs and Net Profits, 2008-2012 (Source: Elaboration of EDM SA data).

Based on 2012 figures, the average electricity tariff was at FCFA 91.5/kWh (USD 0.19/kWh), insufficient to cover generation costs of FCFA 122.1/kWh (USD 0.25/kWh). Between 2008 and 2012, the utility incurred high losses (Fig. 4)<sup>31</sup>. Average generation cost in isolated centres is even higher, at about USD 0.35/kWh<sup>32</sup>. To recover from this situation, a Provisional Electricity Recovery Plan was prepared in early 2014, presenting various options for tariff increases and state subsidies to achieve financial equilibrium by 2018. The plan suggests, as the more viable option, a tariff increase of 3% per year plus a transfer of approximately USD 40 million per year until 2017/18 when planned investments will become operative<sup>33</sup>.

### Electricity pricing and tariffs (off-grid).

Private energy service companies are establishing schemes and tariffs on the basis of the procedures and framework of the Rural Electrification Fund (REF), including business plans and surveys of their customer's willingness to pay for electricity. Experience shows that schemes often follow similar structures. As such, different service categories are set up according to rural customers' electricity needs. To allow poor customers to access energy services, monthly lump sum payments for basic services (which are usually around USD 5) and a monthly contribution to street lighting were created. Rural energy subscribers with higher power demands are billed according to their metered consumption at a tariff of about USD 0.50/kWh<sup>34</sup>. 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 additional subsidies, local private operators of these isolated mini-grids currently charge their customers prices that are up to two times higher than the prices charged to social tariff customers by the national utility. Over the last years, AMADER recognized a growing demand from local energy service companies to switch to renewable energies as a means of reducing the cost of electricity provided and expand affordable and renewable electricity access in all regions of Mali.

31 EDM-SA: <http://www.edm-sa.com.ml/edmsa/chiffres.asp>

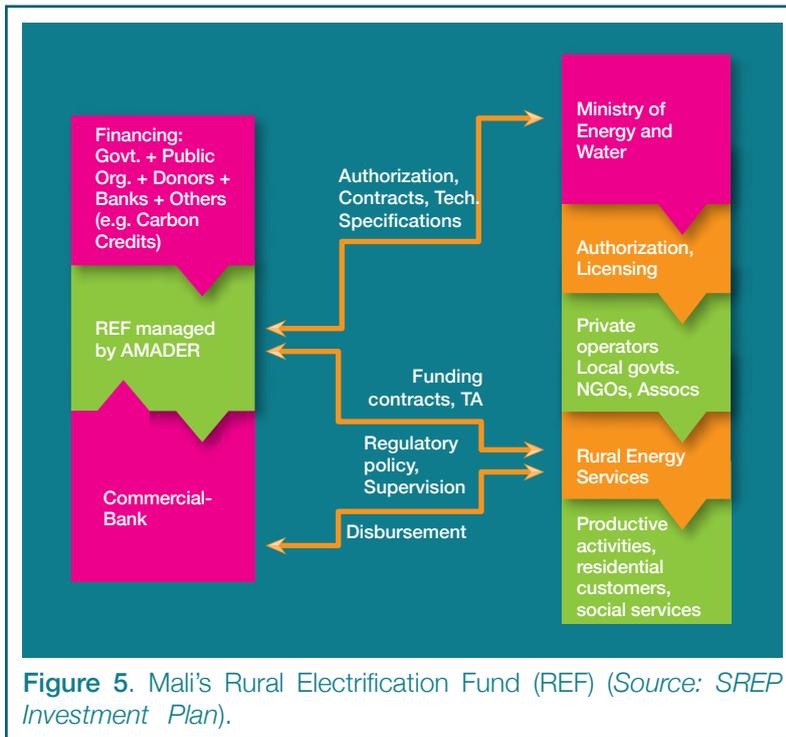
32 EDM SA 2008 figure.

33 Source: Task-Force - Rapport Provisoire - Perspectives énergétiques à court terme du réseau interconnecté - Recommandations pour le redressement de la situation financière et opérationnelle du secteur de l'électricité pour la période 2014-2020..

34 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 at least 70% have been deemed necessary in Mali to arrive at average end user tariffs of about USD 0.50/kWh (PRODER, 2003). Without capital cost investment subsidies, rural electrification schemes are expected to be 4-5 times above average utility tariffs..

## Rural electrification

In 2003 Mali developed and adopted a reference framework for rural electrification, leading to the creation of AMADER, with a mandate to promote rural energy services and household energy. The REF to promote rural energy access was set up in 2000 and has been managed by AMADER since 2005. The GoM's rural energy access agenda aims to create an enabling environment to attract private energy service companies to rural energy service delivery schemes, by facilitating access to the REF. The REF aims to (i) make rural electrification projects commercially viable; (ii) allow cost reflective and affordable tariffs



for the country's rural population; (iii) utilize subsidies to buy down capital investment costs; and (iv) promote PPPs. AMADER thereby plays a central role as the agency in charge of (i) promoting electrification in rural and suburban areas; (ii) working with all types of operators, national and international private operators, NGOs, decentralized groups, cooperatives, etc.; (iii) providing technical assistance and financial support (investment subsidies); and (iv) acting as a de facto regulator in rural and suburban areas (Fig. 5).

Minimum technical specifications and mandatory quality of service standards are indicated in the contract documents of operators and translated into business plans

for rural electrification projects. The REF is based on a technology-neutral approach, looking for feasible and cost-effective solutions for both provider and customer needs. The REF succeeded in attracting more than 60 energy service companies to the rural energy service delivery business in Mali; they are active on about 190 mini-grids. Initial investment subsidies from the REF are designed to make tariffs acceptable for rural customers as well as to generate a financial rate of return for private operators. Investment subsidies are limited to 70-80% of capital investment costs and rely on results-based approaches (established based on the number of customers to be connected during the first two years, the average tariff and the cost of investment for connected off-grid customers). No subsidies for energy consumption are provided.

Private operators obtain off-grid concession for a 15-year period and have tested, through their pilot projects, both market appetite and different technical and institutional arrangements for rural electrification schemes. A generation capacity of about 15 MW (mainly diesel-run mini-grids) has been installed through this PPP approach. Recent initial calculations in the context of Pre-PIN preparations indicate that the installed capacity of hybrid mini-grids could be scaled up to about 53 MWp within 15 years. Currently, six additional MW are either under preparation or installation. These rural energy projects have demonstrated the interest of rural populations and private operators in energy service delivery. The most recent rural electrification objective is to reach 61% by 2033.

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## Policies promoting private investments for the energy sector

The regulatory environment is relatively favourable for energy investments in general. It is governed by: (i) the REF described above; (ii) Mali's Industrial Development Policy (aimed at an orderly, rapid, sustainable, balanced and employment-generating industrial development); (iii) the PPPs Framework<sup>35</sup>; (iv) the Investment Code (establishing a preferential customs and tax regime for the promotion of investments); (v) the 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) guidelines for an application decree<sup>36</sup>, 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 sector)<sup>37</sup>.

The GoM recognizes the value added of PPP 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 to promote RE and strengthen 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 PPP exists in the form of Build Own Operate and Transfer concession contracts.

Although efforts have been made in recent years to improve the energy sector investment climate, some barriers like the weakness of the investment code, the limited financial capacity of local actors and the need for capacity building remain. To overcome these difficulties, a process of improving the enabling environment for RE implementation is ongoing, supported by a SREP-related project. It is foreseen that this will lead to (i) a revision and update of the energy policy and strategic framework in a way that makes it more coherent and conducive to RE investment; (ii) a new power master plan for long-term investment planning including RE, and a consolidation of the energy planning process; (iii) new standard Power Purchase Agreements (PPAs) documents for RE; (iv) availability of standard bidding documents and other contractual documents for RE; (v) guidelines for investors in RE; and (vi) developing a capacity building and skills enhancement program for key technical, economic, financial and legal aspects of RE technologies.

## Trade barriers and trade policies (tariff and non-tariff barriers in RE technologies)

There exists a decree on "suspension of the value added tax and duties on imported renewable energy equipment". It abolishes these taxes for five years starting from September 2009, thereby promoting the importation of solar panels, solar lamps and other RE equipment<sup>38</sup>. The decree is being renewed – and improved – in early 2014, for the next five years to come.

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35 Under the Build Own Operate and Transfer 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.

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

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

38 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.)

## International agreements on energy

Mali is part of the West African Power Pool (WAPP), a specialised institution of ECOWAS with a mandate of realising regional power system integration. It is also member of the Senegal River Basin Authority and the Niger River Basin Authority. In this context, Mali hosts the Manantali Dam, developed as an international project with Senegal and Mauritania, with whom the electricity generated is shared. Mali also imports electricity from Côte d'Ivoire (equivalent to a 50 MW peak) and is likely to import more from Senegal and Mauritania in the coming years<sup>39</sup>.

## SWOT box

Strengths	Weaknesses
Many energy reforms implemented Active rural electrification policies Regulatory framework rather favourable to private investments	Tariffs raised but not yet sufficient for cost-recovery Private participation still limited
Opportunities	Threats
Regional integration in the WAPP Revision of the whole policy and strategic framework in 2014/15 Planned improvement of regulatory environment for more private sector participation in RE investment	Financial situation of EDM SA is extremely fragile

39

Source: Task-Force - Rapport Provisoire - Perspectives énergétiques à court terme du réseau interconnecté - Recommandations pour le redressement de la situation financière et opérationnelle du secteur de l'électricité pour la période 2014-2020..

V.

**ENERGY  
STAKEHOLDERS  
AND  
INSTITUTIONAL  
FRAMEWORK**





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## V. ENERGY STAKEHOLDERS AND INSTITUTIONAL FRAMEWORK

*Many institutions participate in the energy sector of Mali, including the Prime Minister's Office, a few ministries and their technical services, and some autonomous agencies. A regulatory commission is in charge of licenses and tariff fixing for the grid-connected system managed by EDM SA. The latter is a vertically integrated utility in its concession zones, but IPPs are foreseen. In rural areas, a specific agency for domestic and rural energy regulates the sector in a simplified manner.*

### Structure of the energy sector

The energy sector of Mali is divided into three areas: the concession zones operated by the national utility EDM SA either reached by the national grid or in isolated centres; small producers in rural areas; and self-producers. The national grid and the isolated centres are owned and operated by EDM SA, while small and large self-producers manage their own infrastructures. IPPs using RE technologies to feed the national grid are foreseen but not yet operative.

### Ministries with energy competences

The energy sector in Mali is characterized by a multitude of actors. The Prime Minister's Office coordinates the sector with responsibility for the regulatory organ, namely the Electricity and Water Regulatory Commission (CREE). Five ministries have mandates related to the energy sector and its subsectors, each overseeing specific directorates:

- **The Ministry of Energy (ME)** has a critical function, setting the role for the sector. ME oversees the DNE, which formulates the National Energy Policy and caters for the coordination and technical control of regional and sub-regional services as well as relevant services that contribute to implementation of the policy. ME also directs several technical agencies (see par. 5.3);
- **The Ministry of Environment, Sanitation and Water (MAEE)** is responsible for the National Directorate of Water and Forestry (DNEF);
- **Ministry of Economy and Finances (MEF)** supervises the National Office for Petroleum Products (ONAP);
- **Ministry of Rural Development (MDR)** is responsible for the National Directorate for Agriculture (DNA);
- **Ministry of Women, Children, and Families (MFEF)** manages the Multi-Functional Platform Program.

### Other governmental bodies with energy competences

Various governmental bodies are acting in the energy sector, reporting to the relevant ministers and to the Prime Minister's Office.

**CNESOLER** is the National Centre for Solar and Renewable Energies, which, since the 1980s, has curated the development of small-scale RE technologies and appliances, under the responsibility of the DNE. The main mission of the CNESOLER is to collect basic data and undertake research, update/review, produce and market appropriate technologies and equipment, train and supervise groups of artisans, and protect small- and medium-sized enterprises.

**ANADEB** is the National Agency for the Development of Biofuels created in 2006. ANADEB is in charge of 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.

**AMADER/REF.** The GoM established a REF in 2000, and AMADER, the specialized rural and domestic energy services agency, in 2003. AMADER manages REF and implements policies in domestic and rural energy. In particular, for rural electrification, AMADER acts as a regulatory authority for installations below 250 kWh across the country, and above this limit in its concession zones. 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, since 2003 AMADER has supported the development of RE in all regions of Mali on a project-by-project basis in partnership with CNESOLER and ANADEB.

There are ongoing consultations for the restructuring of the energy sector that could result in a redefinition/clarification of the missions of various governmental entities. In this context, the transformation of CNESOLER into a National Renewable Energies Agency (ANAER) has been endorsed in early 2015 by Government.

## Energy regulator

The Electricity and Water Regulator Commission (CREE) was created in 2000<sup>40</sup>. The commission is composed of experts nominated by Government with the objectives of ensuring the quality of the public services, protecting consumer interests, promoting competition between private actors and setting the tariff scheme. CREE regulates the activities of energy concessionaries and self-producers, as well as public water operators in urban areas.

## Energy utility

EDM SA operates as a vertically integrated utility in its concession zones. After privatization failed (see par. 2.2), it went back to majority ownership and management by the state, although a retirement of the state from its ownership is still foreseen. Its financial situation is very fragile, due to the rising costs of generation, low tariffs, technical and non-technical losses and the necessity of making large investments to upgrade and expand its installed base. EDM accumulated vast debts and is only able to operate because of large fund transfers from Government.

## Other private companies

As of mid-2014, there were no grid-connected IPPs in Mali for RE technologies (hydro < 10 MW), although the establishment of the first IPP with solar technology is foreseen with support from the SREP Investment Plan.

## NGOs active in the area of energy

There are several non-governmental and professional organizations that have an interest in various aspects of the energy sector.

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## Private sector and professional organizations

- Solar Professionals Association - Association des Professionnels du Solaire (APS)
- Female Engineers of Mali - Association des Femmes Ingénieurs du Mali (AFIMA)
- Mining and Solar Development Association - Association de Développement des Mines et du Solaire (ADMIS)
- Chamber of Commerce and Industry - Chambre de Commerce et d'industrie du Mali

## Civil society organizations

- Malian Association for the Environment Protection - Association Malienne pour la Protection de l'Environnement (AMPERE)
- Helvetas Swiss Cooperation - Mali
- Inter coopération
- Malian Association of Awakening on Sustainable Development - AMEDD
- Group for Renewable Energies, Environment and Solidarity - GERES Mali
- International Network on Energy and Sustainable Development - Energia Mali
- Group of Research and Technical Application - GRAT
- Jatropha Mali Initiative
- Council of Concertation and Support for ONG - CCA/ONG
- Malian ONG Concertation Secretariat - SECO/ONG
- Mali FolkCenter

## Malian private sector

- SSD
- Diawara Solar
- ZED. SA
- Mali Biocarburant

## Donors/Financing institutions

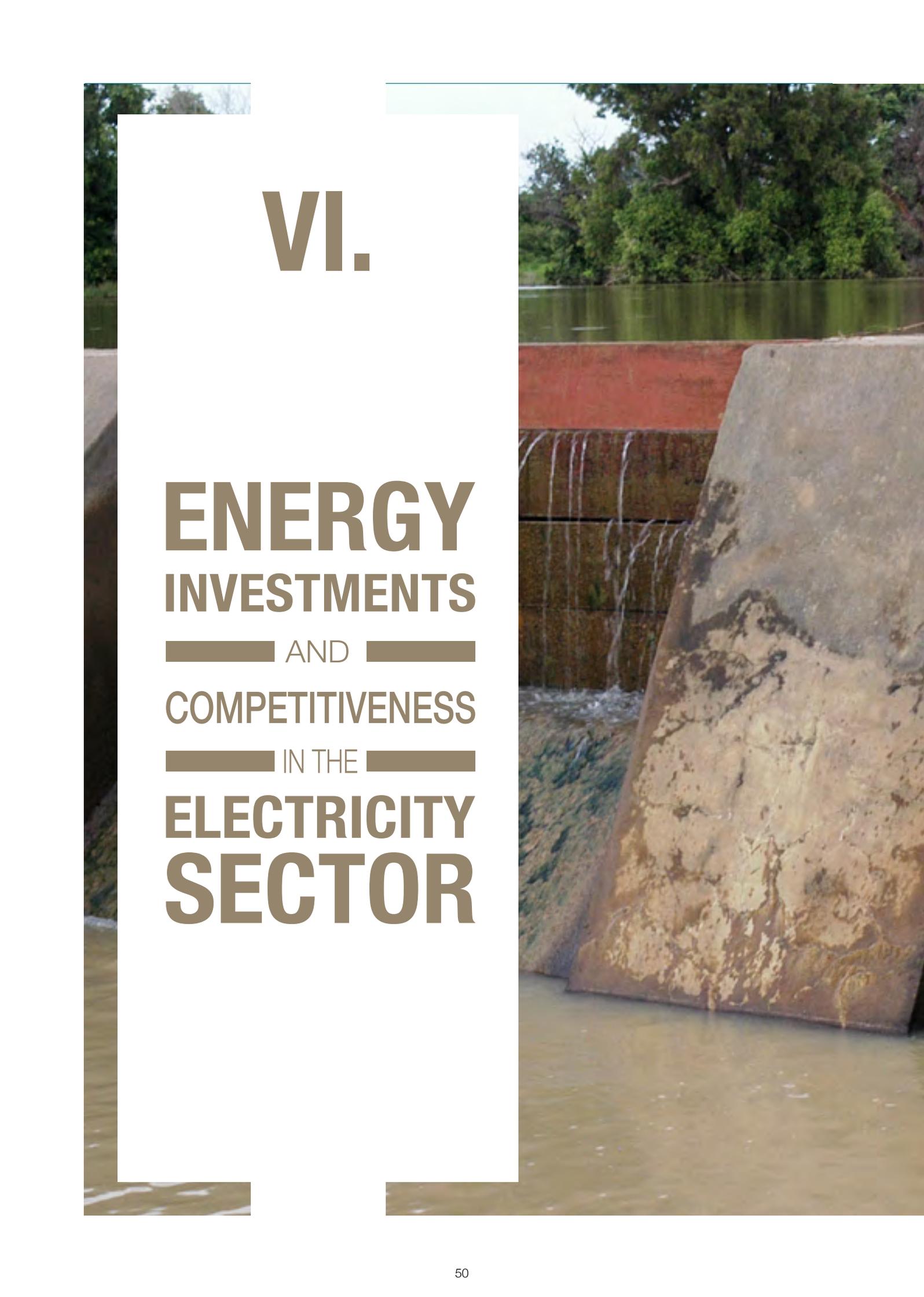
Mali's development partners play a major role in promoting and disseminating RE technologies. They are divided into three groups:

- The first group concerns *multilateral cooperation institutions* that participate in financing projects and programs through public and private institutions: World Bank Group, 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: GIZ and KfW (Germany), United States Agency for International Development, Danish Cooperation, 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 beneficiary communities. These are Mali Folkcenter, SNV (Netherlands) and the Technical Research and Applications Group.

## SWOT box

Strengths	Weaknesses
Long-term existence of dedicated institutions for RE (CNESOLER, ANADEB, etc.) Independent energy regulator Rural energy agency	EDM financial situation Not yet PPP Many energy-related institutions that do not always coordinate
Opportunities	Threats
Interest from donors to support the sector Creation of an agency dedicated to RE	



**VI.**

**ENERGY  
INVESTMENTS  
AND  
COMPETITIVENESS  
IN THE  
ELECTRICITY  
SECTOR**



## VI. ENERGY INVESTMENTS AND COMPETITIVENESS IN THE ELECTRICITY SECTOR

*RE investments in Mali are focused on hydro grid-connected facilities, taking advantage of the large flows of the rivers Senegal and Niger. They are also very competitive cost-wise. On a smaller scale, in areas not connected with the main grid, a decentralised approach is being attempted, in particular with solar systems, small-hydro and biomass/biofuels. Despite their higher investment costs, off-grid RE is competitive compared to the difficulty of managing diesel fuel generation in remote areas. Private investments in the energy sector are encouraged, but, so far, limited to small rural applications. That said, the interest of private sponsors is significant and some big IPPs are being prepared, mostly with solar PV technology. Most of these investments should be connected to the grid. There is some experience with CDM in the country, along with consistent support from the donor community to scale-up RE deployment.*

Diverse government institutions and development partners have introduced many small-scale installations and appliances in Mali. There has not been an exhaustive and detailed monitoring and evaluation system in place at the national level, however.

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 few new studies and national databases are available for RE.

Preliminary cost estimates show the need for substantial investment support for the promotion of RE in Mali.

### Competitiveness of RE grid-connected generation

Grid-connected RE in Mali is traditionally large hydro whose generation cost can be as low as USD 0.07/kWh. The importance of hydroelectricity in the national grid has lowered in recent years. This is due to the demand increase that is being addressed by thermal power plants for reasons of faster deployment and due to maintenance problems at the Manantali Dam that caused a lower than expected output.

Table 3 - Competitiveness of RE Grid Connected Technologies

Technology	Location	Installed capacity (MW)	Power generated (GWh)	Production cost kWh (in USD)
Mini hydro on grid power plants	Sotuba	5.7 MW	36 GWh	0.07 (average)
Large-scale on-grid power plants	Sélingué	46.24 MW	220 GWh	
	Manantali	104 MW	416 GWh	

Source: SREP-IP

## Competitiveness of RE off-grid generation

In the past 15 years Mali has begun to harness this RE off-grid potential through mainly small-scale installations and appliances, targeting all available RE sources and building the capacity of involved actors. 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 for providing quality electricity supply to households and promoting productive energy uses to a wider range of appliances relying on electricity supply<sup>41</sup>.

**Hydro:** A few mini-hydro projects have been under implementation for the past few years, managed by the utility EDM SA (e.g. the 5.7 MW Sotuba hydro power plant on the Niger River). Further sites for mini and micro hydro power plants were identified and feasibility studies were proposed to scale up this potential 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. Waste 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 sugarcane and biodiesel or pure vegetable oil is under implementation<sup>42</sup>. Mali also has widespread experience in *Jatropha* plantations for producing biofuels used in local areas to power engines for different uses such as Multifunctional Platforms.

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

Table 4 - Off-Grid RE characteristics (2012)

Type	Quantity	Installed Capacity (MW)	Power generated (Kwc)	Power generated in Mwh/year	Cost of Kwc off-grid in USD	Uses
Solar Pumps	1300	2.4	0.900	3500	16.6	Water pumping
Off-grid installations	700	0.21	0.6	360.6	11.1	Lighting, freezers, buildings
Mini grid installations	400	0.5	1.2	730	8.9	Telecommunication, Offices, City Halls, Schools, Hospitals, etc.
On-grid installations	None	N/A	N/A	N/A	N/A	N/A
Solar kits	130 000	5.8	75	8468	7.8	Solar kits disseminated in households, schools, health centres, etc.

Source: SREP-IP

41 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. This is particularly true with regards to providing energy access in rural areas, since 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.

42 Currently, the ethanol produced is mainly used for industrial and pharmaceutical products.

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## Prioritization of energy investments

The GoM is committed to scaling up RE development in an equitable way. The budget it has allocated to the RE subsector<sup>43</sup> rose from USD 3.3 million in 2008 to USD 6.7 million in 2010<sup>44</sup>, representing an annual average increase of 41.67%. The 2011 budget was about USD 8.9 million. RE's share of the 2010 national budget (amounting to USD 2.8 billion, including USD 488 million for energy) represented 0.23%. In 2011, RE's share of the national budget was about 0.30%<sup>45</sup>. Apart from the national budget, bilateral and multilateral organizations constitute the most important source of financing for RE technologies through public investment projects. Since the 2000s development partners have increased their support for the development of RE through investment projects or technical assistance/capacity building efforts.

Private sector contributions to RE are 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. These include 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.

## Foreign direct investments and clean development mechanism

No foreign direct investment in the energy sector has been recorded since the reversed privatization of EDM. However, a few IPPs (especially with solar PV technology) are being planned with foreign investment and should be completed in 2015.

There are two CDM projects in Mali: the first is the Félou Regional Hydro Power Project (shared with Mauritania and Senegal) that has been approved; the second is a Jatropha reforestation project still at validation stage. Two small-scale CDM Projects of Activities on cook-stoves are also at the validation stage. Under the SREP program, activities are also being prepared for mobilizing carbon credits from the Carbon Initiative for Development in relation to SREP investments.

## Development aid for energy projects

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 the reliability of power generation and distribution systems. In terms of RE, multilateral and bilateral partners invest in infrastructures covering all RE technologies, capacity building and technical assistance for key actors (Table 5).

Development partners have started financing larger-scale RE electrification schemes (such as mini-grids) with a systematic and standardized approach at the national level. This is crucial to providing adequate quality and quantity of electricity for productive uses and job creation for transformative RE impacts in Mali.

In terms of sector distribution of aid, the majority of assistance committed to Mali from 2000 to 2012 was in the sector of electricity transmission (42%), followed by fossil fuel power generation (27%) and hydro (15%).

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43 Consolidated figures allocated by CNESOLER and ANADEB.

44 Data provided by CNESOLER.

45 In Uganda, for example, this currently represents a little over 2% of the national budget (Source: [www.climateparl.net](http://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 RE..

Table 5: On-going Renewable Energy Initiatives supported by Development Partners

Hybrid mini-grid systems for rural electrification	WB supports the introduction, service improvement and extension/densification of hybrid PV solar/diesel mini-grids (SREP co-financed SHER project)
Solar	WBG supports the market development of solar lighting products and energy efficiency (SREP co-financed SHER project) Netherlands/GIZ support select communities for small-scale PV electricity generation The Indian Cooperation Agency is funding a village lighting project based on SHS
Small Hydro Power	AfDB supports mini hydro development (co-financed with SREP); it will consist of the construction of various micro/mini hydro plants and related mini-grids. Overall capacity is estimated at 21.6 MW at completion.
Biomass	AfDB supports large-scale transformation of sugar cane residuals for electricity creation and co-generation WB might support biofuels under the SHER project as a means to tap local RE potential (depending on resource availability) 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	UNDP providing targeted support to women's associations Under the former HEURA project (World Bank), an activity program was started in 19 rural localities called Energy for the Reduction of Gender Inequality in Mali. The SHER project will continue its gender specific support WB and the AfDB African Legal Support Facility provide TA for legal aspects in relation to PPA transactions WB is providing support to energy sector reforms, including tariffs AfDB is supporting policy revision, as well as the improvement of the enabling environment for RE investment through SREP and the Sustainable Energy Fund for Africa

Source: Updated from SREP-IP

## Swot box

Strengths	Weaknesses
RE is competitive for both grid-connected and off-grid solutions Government commitment Donor support Some experience in CDM implementation	Large-scale RE PPP foreseen but not yet implemented (hydro<10MW)
Opportunities	Threats
Regional interconnections Investments opportunities Great interest from the private sector in large IPP projects	

# VII.

## RE DEPLOYMENT BARRIERS

AND

## POSSIBLE MITIGATION MEASURES





## VII. RE DEPLOYMENT BARRIERS & POSSIBLE MITIGATION MEASURES

*RE can certainly play a stronger role in Mali and complement its traditional reliance on large hydro. It offers a major potential that would be worth harnessing for sustainable socio-economic development in the country. In particular, solar, mini/micro hydroelectric schemes and bioenergy potential should be further developed and scaled up to reach transformative impact at a national level. The general environment, both politically and economically, and the abundance of locally available resources, makes the perspective of wider-scale adoption positive. Some major constraints limiting a faster uptake can be found in the financial status of the sector, in the complexity of regulations and in the local experience with some technologies. The GoM, with the support of its international partners, has put in place a set of mitigation measures.*

### Barriers and mitigation measures

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 growing demand of about 10% per annum; and (iii) sustained energy access expansion in rural and peri-urban areas to support productive activities and to enhance social programs.

The RE sector in Mali builds on considerable experience gained through projects and programs as well as a number of development partners active in the sector. However, the promotion of RE at a larger scale still faces many constraints that are institutional, economic, financial, technical, social and environmental in nature. In Table 6 barriers are summarized and linked to mitigation measures identified during the SREP preparation phase.

Removing these barriers will help the country meet its growing demand for electricity, enhance energy security, improve access to electricity and reduce supply cost, while substantial economic, social, and environmental co-benefits are expected for target vulnerable groups in Mali.

Table 6: Main barriers/constraints and mitigation measures

#### Institutional, regulatory and legal constraints

Main barriers and constraints	Mitigation measures
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 RE
Regulatory (including tariffs) and legal frameworks do not favour 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 favourable 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 to take into account recent changes

## Technical capacities and human capacities

Main barriers and constraints	Mitigation measures
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 stakeholders on issues related to RE (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 the SREP approach and modalities
The lack of adequate RE economic and technical studies and impact assessments does not create appropriate conditions for a robust, standardized and programmatic approach to RE	Formulate a set of knowledge assets and products, analyses, diagnostic studies, feasibility studies, and impact assessments and methodological tools facilitating future RE investments

## Economic and financial context

Main barriers and constraints	Mitigation measures
Heavy dependence on imports of oil (impacting on the balance of trade, under the effects of oil price volatility)	Define and implement alternative energy sector development and low-carbon growth models
The poverty of Malian rural households leads to poor affordability, access and use of modern RE without subsidy schemes	Design interventions and financial/subsidy mechanisms aimed at reducing the costs of kWh and improving access to and use of modern RE by households and communities
Upfront investment costs of RE 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 prove long-term financial viability of RE versus thermal
Difficult return on investment, because of high investment costs and the need for an affordable price of kWh for poor households	Mobilization of additional funding (grants) from development partners (to subsidize initial investment costs)
Lack of adequate and affordable financial instruments does not sufficiently attract large scale RE-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 favouring private investments; provide greater guarantees and security to private investors and define conditions to improve PPPs for utility scale projects, such as grid-connected IPPs

## Main strengths

Mali's energy sector has many assets that will favour the development of REs. 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 record in rural energy access expansion over the last decade by decentralized energy services companies operating in PPP with AMADER); (iii) opening of the national electricity grid to neighbouring countries (interconnection with Senegal and Mauritania-OMVS and on-going regional interconnection with Ivory Coast and Ghana-Burkina Faso 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 SA, and the opening of the electricity subsector to competition. All three actions have contributed to an increase in the effectiveness of the energy sector as a whole, accelerating the withdrawal of the public sector from operations and expanding service coverage.

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## APPENDIX

### Main stakeholders' websites and contacts

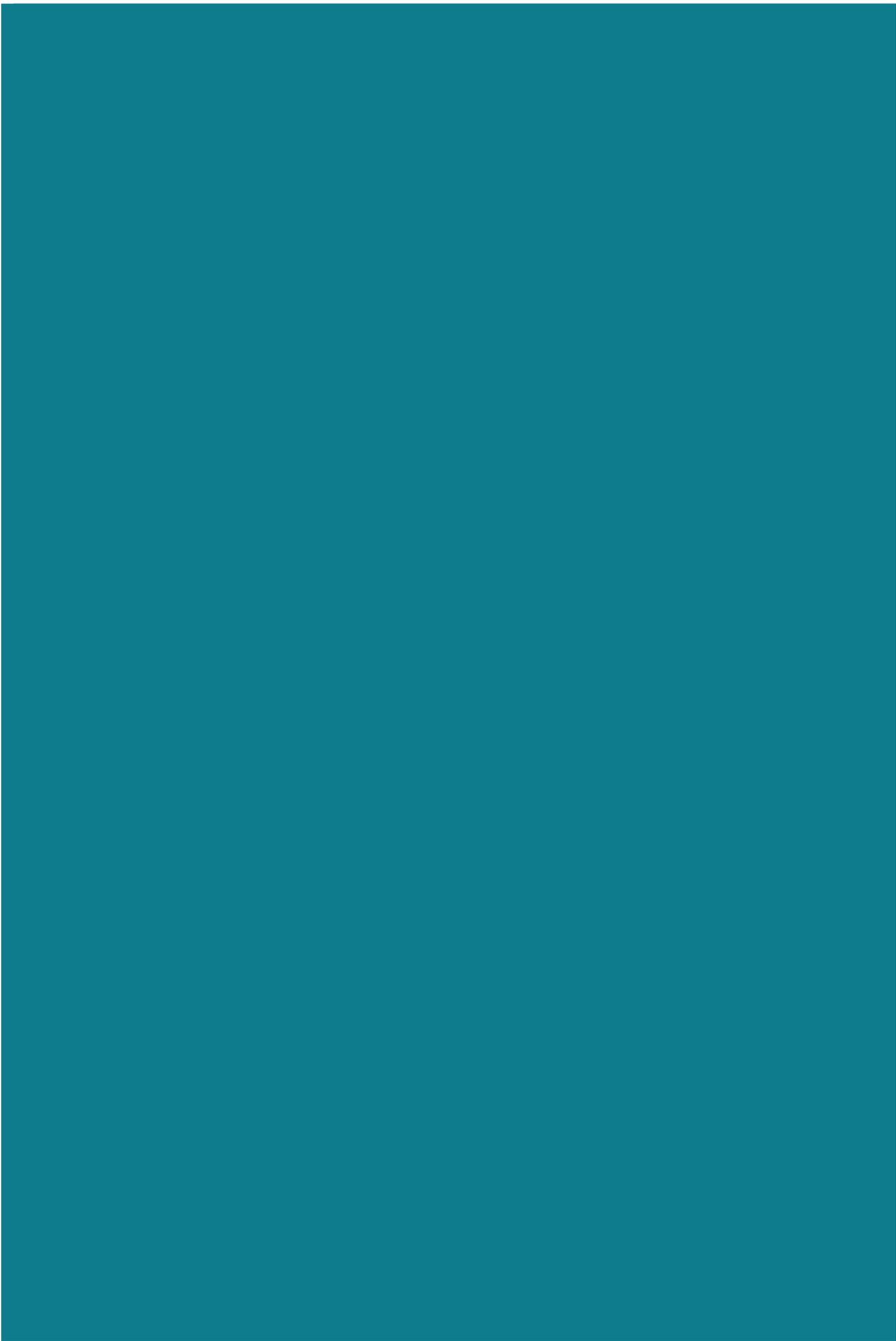
<b>Government of Mali</b>	<a href="http://www.primature.gov.ml">http://www.primature.gov.ml</a>
<b>Minister of Energy</b>	<a href="http://www.mmee.gov.ml">http://www.mmee.gov.ml</a>
<b>National Energy Directory</b>	<a href="http://www.mmee.gov.ml/dne.php">http://www.mmee.gov.ml/dne.php</a>
<b>Energy and Water Regulatory Commission</b>	<a href="http://goo.gl/4y3hOL">http://goo.gl/4y3hOL</a>
<b>National Biofuels Agency</b>	<a href="http://anadeb-mali.org">http://anadeb-mali.org</a>
<b>Rural and Domestic Energy Agency</b>	<a href="http://www.amadermali.com">http://www.amadermali.com</a>
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# RENEWABLE ENERGY IN AFRICA

## About the African Development Bank Group

The AfDB is a multilateral development bank whose shareholders include 54 African countries and 27 non-African countries. The AfDB Group's primary objective is to contribute to the sustainable economic development and social progress of its regional members, individually and jointly. It does this by financing a broad range of development projects and programs through policy-based and other public-sector loans, private-sector loans and equity investments; providing technical assistance for institutional support projects and programs; making public and private capital investments; assisting countries with development policies and plans; and supplying emergency assistance.

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## MALI COUNTRY PROFILE



2015