Funding Proposal

FP102: Mali solar rural electrification project

Mali | Banque Ouest Africaine de Développement (West African Development Bank) (BOAD) | Decision B.22/07

28 February 2019







Funding Proposal

Version 1.1

The Green Climate Fund (GCF) is seeking high-quality funding proposals.

Accredited entities are expected to develop their funding proposals, in close consultation with the relevant national designated authority, with due consideration of the GCF's Investment Framework and Results Management Framework. The funding proposals should demonstrate how the proposed projects or programmes will perform against the investment criteria and achieve part or all of the strategic impact results.

Project/Programme Title:	Mali solar rural electrification project
Country/Region:	Mali (West Africa)
Accredited Entity:	Banque Ouest Africaine de Développement (BOAD)
Date of Submission:	24th June, 2018. Update : 9 th , January 2019



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Note to accredited entities on the use of the funding proposal template

- Sections **A**, **B**, **D**, **E** and **H** of the funding proposal require detailed inputs from the accredited entity. For all other sections, including the Appraisal Summary in section F, accredited entities have discretion in how they wish to present the information. Accredited entities can either directly incorporate information into this proposal, or provide summary information in the proposal with cross-reference to other project documents such as project appraisal document.
- The total number of pages for the funding proposal (excluding annexes) is expected not to exceed 50.

Please submit the completed form to:

fundingproposal@gcfund.org

Please use the following name convention for the file name: "[FP]-[Agency Short Name]-[Date]-[Serial Number]"



ACRONYMS

(*) Some institutions' names and acronyms are kept in French

AER-Mali	:	Agence des Energies Renouvelables – Mali
AFDB	:	African Development Bank
AEDD	:	Agence pour l'Environnement et le Développement Durable
AMADER:	:	Agence Malienne pour le Développement de l'Energie Domestique et de l'Electrification Rural
API-Mali	:	Investment Promotion Council of Mali
AML/CFT	:	Anti-money laundering - combating finance of terrorism
APR	:	Annual Performance Report
BCEAO	:	Central Bank of West African States
BE	:	Baseline Emissions
BOAD	:	Banque Ouest Africaine de Développement
вот	:	Build Operate Transfert
CoP	:	Conférence of Parties
CREE	:	Commission de Régulation de l'Electricité et de l'Eau
ER	:	Emission Reduction
ESMP	:	Environmental and Social Measures project
EDF	:	Energy Development Fund
ESMF	:	Environmental and social management Framework
DNE	:	Direction Nationale de l'Energie
EDM-SA	:	Energie du Mali- Société Anonyme
DREP	:	Decade Rural Electrification Program
ESIA	:	Environmental and Social Impact Assessment
FER	:	Fonds d'Electrification Rurale or Rural Electrification Fund
FSR	:	Feasibility studies report
GCF	:	Green Climate Fund
GDP	:	Gross Domestic Product
	÷	Human Development Index
	÷	International Renewable Energy Agency
	:	Independent Power Producers
1373	:	Isolated Solar Photovoltaic System
	:	Investment Renewal Fund
	:	International Financial Action
	:	International Renewable Energy Agency
MEE	:	Ministère de l'Energie et de l'Equ
MPPT	:	Maximum Power Point Tracking
MFI	:	Microfinance institutions
MEF		Ministry of Economy and Finance
MSME		Micro Small Medium Enterprises
M&E	÷	Monitoring and Evaluation
NDCs	÷	Nationally Determined Contributions (NDCs)
NGO	÷	Non-Governmental Organization
NEP	:	National Energy Policy
NCSERE	:	National Center for Solar Energy and Renewable Energies
NDSPC	:	National Directorate for Sanitation and Pollution Control
O&M	:	Operation and Maintenance
OECD	:	Organization for Economic Cooperation and Development
OECD DAC	:	Organization for Economic Co-operation, and Development Assistance Committee
PE	:	Project Emissions
PANA	:	National Adaptation Program of Action
PV	:	Photovoltaique
PMU	:	Project Management Unit
PPPs	:	Public Private Partnership
RE	:	Renewable Energy
SDGs	:	Sustainable Development Goals
TOR	:	Terms of Reference
UNDP	:	United Nations Development Program
UNFCCC	:	United Nation Framework Convention on Climate Change
WEEE	:	waste management for electrical and electronic equipment's
WAEMU	:	west African economic and monetary union



PROJECT / PROGRAMME SUMMARY

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A.1. Brief Proj	A.1. Brief Project / Programme Information				
A.1.1. Project	/ programme title	Mali solar rural electrification project	:		
A.1.2. Project o	pr programme	Project			
A.1.3. Country	r (ies) / region	Mali			
A.1.4. Nationa	I designated authority (ies)	Agence pour l'Environnement et le Développe ENVIRONMENT AND SUSTAINABLE DEVELO	ment Durable (THE PMENT AGENCY) (AEDD)		
A.1.5. Accredi	ted entity	Banque Ouest Africaine de Développement (B	OAD)		
A.1.5.a. Access modality		⊠ Direct □ International			
A.1.6. Executing entity / beneficiary		 Executing Entity: Ministry of Energy and Water. Beneficiaries: a. 31 000 households (310,698 people) across 70 communities in 6 Regions (Kayes, Koulikoro, Sikasso, Segou, Mopti and Tombouctou) b. National institutions and policy makers (AER, AMADER and FER) responsible to create the enabling environment for RE investments 			
A.1.7. Project s	size category (Total investment, million USD)	□ Micro (≤10) ⊠ Medium (50 <x≤250)< td=""><td> □ Small (10<x≤50)< li=""> □ Large (>250) </x≤50)<></td></x≤250)<>	 □ Small (10<x≤50)< li=""> □ Large (>250) </x≤50)<>		
A.1.8. Mitigatio	n / adaptation focus	Mitigation Adaptation Cross-cutting			
A.1.9. Date of s	submission	1 st submission: 24th June 2018			
Contact person, position		Yacoubou BIO-SAWE, Director for Environment and Climate Finance Ibrahim TRAORE. Head of Climate Finance Division			
A.1.10.	Organization	Banque Ouest Africaine de Développement (BOA	ND)		
contact	Email address	itraore@boad.org; ybiosawe@boad.org; (cc eam	oussou@boad.org)		
details	Telephone number	+228 22 23 26 92			
	Mailing address	Avenue de la Libération, Lomé (Togo), BP. 1172			

A.1.11. Resul	ts areas (mark all that apply)
Reduced emi	ssions from:
\boxtimes	Energy access and power generation (E.g. on-grid, micro-grid or off-grid solar, wind, geothermal, etc.)
	(E.g. high-speed rail, rapid bus system, etc.)
	Buildings, cities and industries and appliances (E.g. new and retrofitted energy-efficient buildings, energy-efficient equipment for companies and supply chain management, etc.)
	Forestry and land use (E.g. forest conservation and management, agroforestry, agricultural irrigation, water treatment and management, etc.)
Increased res	ilience of:
	Most vulnerable people and communities (E.g. mitigation of operational risk associated with climate change – diversification of supply sources and supply chain management, relocation of manufacturing facilities and warehouses, etc.)
	Health and well-being, and food and water security (E.g. climate-resilient crops, efficient irrigation systems, etc.)
	Infrastructure and built environment (E.g. sea walls, resilient road networks, etc.) Ecosystem and ecosystem services (E.g. ecosystem conservation and management, ecotourism, etc.)





A.2. Project / Programme Executive Summary

The main objective of this project is to promote rural electrification through isolated solar photovoltaic systems as a lowcarbon and resilient solution to the effects of climate change in the energy sector in Mali.

The project will: (i) strengthen the capacity of public institutions (AMADER, AER and FER) engaged in rural electrification to accelerate solar-powered electrification; and (ii) increase the rural population's access to electricity in 70 communities through installation of isolated solar photovoltaic minigrid systems for a total capacity of 4.83 MW. The project will thus catalyze the development of an efficient solar market that will enable Mali to meet its renewable energy and greenhouse gas (GHG) reduction targets. In this case, it will help avoid 41 049 tCO2 / year, and 1 027 227 tCO2 for the entire life of the equipment (25 years). Direct beneficiaries are estimated at 310 698 inhabitants, 50% of whom are women in the project area. Around 31,000 new households will have access to electrification in rural areas (28,378 for Tranche 1). The project is tranched at the request of GCF Secretariat. First Tranche will achieve 80% of the impact (821 782 tCO₂ eq) and will target 50 localities (283 777 inhabitants).

The project has significant potential for paradigm shift in the rural electrification sector in Mali. Traditionally, the growing energy access demand has been met through fossil fuels. This project however provides a total shift in energy production i.e. replacing fossil fuels additions with renewable energy solutions. The project will positively contribute to the regulatory framework through capacity buildings, demonstration of technologies in areas where not available, putting in place an institutional framework for FER to strengthen its capacity to further promote the deployment of renewable energy.

The paradigm shifting potential lies in the joint efforts to create a conducive environment by putting in place an enabling regulatory framework and policies, that will incentivize the private sector participation in long term concessions under a sustainable and innovative structural arrangement. It is anticipated that the project model can be replicated accross the whole country and in the wider West African subregion, notably to support different African countries to meet their commitment under the Paris Agreement i.e. Nationally Determined Contributions (NDCs), and to achieve their 2063 Agenda as well as Sustainable Development Goals (SDGs).

A.3. Project/Programme Milestone				
Expected approval from accredited entity's Board (if applicable)	Q1 March, 2019			
Expected financial close (if applicable)	Q1 March, 2019			
Estimated implementation start and end date	Start: <u>01/07/2019</u> End: <u>30/06/2023</u>			
Project/programme lifespan	25 years			





B.1. Description of Financial Elements of the Project / Programme

Financial Model

A detailed financial model is attached in the annexes of this funding proposal. The financial model includes the breakdown of cost estimates for total project costs and GCF financing by sub-component. The project will be financed in EUR. As aforementioned, the project is tranched, and the first Tranche will target 50 communities, then BOAD will submit a request for Tranche 2 funding.

Table 1: Breakdown of cost estimates for total project (70 communities)

	Indicative cost	GCF funding	Co-financing	
Component	ELID	EUD	Amount	Institution
	EUK	EUR	EUR	Institution
1. Capacity building of rural electrification institutions and Technical Assistance	487 349	487 349		
2. Detailed Engineering and Installation of solar	13 800 107	33 354 043		
powered minigrids	43 890 497	00 004 040	10 536 454	BOAD
3. Support to Productive Use of Electricity	1 500 000	1 500 000		
Project Management Cost	404 269	307	97 694	BOAD
Indicative total cost	46 282 115	35 341 699	10 634 148	

The total amount of the project is EUR 46,282,115, including PMC.

Table 2: Breakdown of cost estimates for Tranche 1 (50 communities)

			Tranche 1				Tranche 2	
Component	Indicative cost	GCF fu	nding	BOAD Co-financing		Indicative	GCF	Co-financing
Component	ELID	EUD	Financial	EUD	Financial	cost	funding	(Loan)
	EUR	EUK	instrument	EUR	instrument	EUR	EUR	EUR
1. Capacity building of rural electrification institutions and Technical Assistance	487 349	487 349	Grant		-	-	-	
2. Detailed Engineering and	853 214	853 214	Grant		-	341 285	341 285	
Installation of solar powered	24 007 070	00 004 475	Laan	0.405.004	Leen	11 688 622	9 338 069	2 350 553
minighas	31 007 376	22 821 475	Loan	8 185 901	Loan			
3. Support to Productive Use of Electricity	1 500 000	1 500 000	Loan		-	-	-	
Project Management Cost	404 269	306 575	Grant	97 694	Loan	-	-	-
Indicative total cost	34 252 208	25 968 612		8 283 595		12 029 908	9 679 355	2 350 553

For Tranche 1, the amount is EUR 34,252,208, including PMC, and the expected GCF funding is EUR 25,968612. BOAD will provide a co-financing in loan for EUR 8,283 595.

Tranche 2 will cover the remainder of the total project funding and will be submitted after the mid-term evaluation.

The private sector will provide additional EUR 8.5 M at the whole project level and EUR 6.2 M for Tranche 1 as parallel financing, which corresponds to 20% of the investment for the installation of the mini-grids.



FINANCING / COST INFORMATION



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B.2. Project I	2. Project Financing Information									
	Financi Instrume	al ent	Am	ount	С	urrency	Tenor		Pricing	
(a) Total project financing	(a) = (b) +	- (c)	34.25 <u>million euro</u> <u>(€)</u>							
	(i) Senior Loai	าร	24	1.32	<u>mi</u>	<u>llion euro</u> (€)	40 years			0,75 %
(b) GCF	(ii) Grants		1	1.65 <u>million euro</u> ♪			N/A			N/A
financing to recipient	* Please provid provide, particu that of accredite project/program	e economi larly in the ed entities. nme's expe	omic and financial justification in <u>section F.1</u> for the concessionality that GCF is the case of grants. Please specify difference in tenor and price between GCF fi ies. Please note that the level of concessionality should correspond to the level xpected performance against the investment criteria indicated in <u>section E</u> .					is expected to financing and rel of the		
	Total request (i+ii)	ed	25,97		<u>mi</u>	<u>llion euro</u> (€)				
	Financial Instrument	Amo	ount	Currenc	у	Name of Institutio	n Tenor	Prie	cing	Seniority
(c) Co- financing to	<u>Senior</u> <u>Loans</u>	8	.3	3 <u>million euro</u> BOAD				5.97	%	<u>senior</u>
recipient	Lead financing institution: BOAD (co-financing) in the amount of EUR 8.3 M									
	parallel financin	g, which c	vide additio	to 20% of th	ne inv	estment for t	the installation of	UR 6.2 the min	igrids.	anche 1 as
	Find in annex le	etter of con	nmitment is	sued by BO	AD.					

Financial instrument 1: Senior Loan: The loan will be used for installation of minigrid systems and needs a lower interest rate, for concessional loans are needed to finance projects as this one in a least developed country such as Mali, where national debt ration is over 98% of GDP since 2016. It is important to notice that with a lower concessionality, the indebtness level of the country will increase and IMF controls will be triggered, resulting in the impossibility for Mali to take the loan. Therefore, the project would fall apart.

Regarding BOAD's loan, it is made in local currency, which limits foreign exchange risks and favors a sustained debt. The interest rate is indicative and will be negotiated with the government at the time of project appraisal. Actually, BOAD is the common development financial institution for the 8 west African economic and monetary union (WAEMU) countries, and though it mobilizes resources at a market rate, its financing conditions are quite the lower one in the subregion's financial market. Every year, BOAD makes available to each country an amount of \in 16 million of concessional financing at rates of up to 3%. The government decides in a sovereign way which project will benefit from those resources. So, when BOAD will appraise this project for consideration to its Board, negotiations with the government will help to agree on the appropriate rate to be applied.

The loan is directly given to the Malian Government. The beneficiairies will benefit from the concessionality of GCF through electricity tariffs that will be capped at 0.26 EUR/kWh (174 XOF/kWh) including an electricity price of 0.24 EUR/kWh, which is within communities' ability to pay, as informed by the feasibility study. According to the baseline scenario, the average tariff generally applied in rural areas for minigrid operated by private sector is 0.35 EUR/kWh (235 XOF/kWh) up to 0.53 EUR/kWh (350 XOF/kWh) whilst in urban areas and for grid connected systems, a subsidized tariff of 0.26 EUR/kWh (174 XOF/kWh) is applied by the government.





The Mali Government is the borrower and the owner of the assets. Ownership will remain with the public sector while concession agreements will be signed with private sector for Operation and Maintenance (O&M). The treasury of the Government of Mali will be the source of repayment of the loan. The loan will not be repaid from the cash flows to be generated by the project.

Financing instrument 2: grant

Mali is a highly indebted country with a high poverty rate. The GCF grant is specially needed for capacity building, Technical assistance and sensitization activities under component 1, with the aim to incentivize the private sector participation in long term concessions under a sustainable and innovative structural arrangement in clean energy sector, and to support the replication of the project's model accross the whole country.

B.3. Financial Markets Overview (if applicable)

How market price or expected commercial rate return was (non-concessional) determined?

Commercial banks throughout West Africa including Mali would offer too high rates (12 - 15%) is typical in this region) and they usually require shorter terms of maturity (5 - 7 years). Mini-grid operators are new to the Region and commercial banks consider it too high risk to lend money to them. The prevailing high interest rate offered by commercial banks are one of the greatest barriers prohibiting private sector participant from investing in rural electrification projects because they cannot offer cost-reflective tariffs while as the same time having to bear high capital costs. The consequence is that the private sector operators would always resume to the need of subsidies, otherwise they will not be able to pay back the loan.

We have never observed a single case where a commercial debt transaction took place in our subregion to implement a mini-grid system project. All of the observed debt to mini-grid projects have been made possible based on concessional terms through peculiar grant for projects that are considered innovative enough and energy efficient. The cost of technology has not reach yet the lows where commercial debt alone would suffice to do mini-grid projects.

Blending concessional resources with commercial debt is detrimental a first stage to building the foundation of the market that would attract local and regional financial institutions. In this Mali project, it is anticipated that a positive shift in paradigm will commence through:

- a) Meeting the rapidly growing electricity access demand by renewable energy instead of continuous addition of fossil fuels generating units;
- b) Establishing a conducive regulation framework in order to attract private sector participants to come into the rural elecrification business; and
- c) Establishing a sustainable rural electricity tarrif model that will make it financialy viable for private minigrid operators to self regenarate, renew and expand their operation, so as to build a further momentum to shift the paradigm, which shall set up an example that can be easily and quickly be duplicated throughout the West Africa region and beyond.





Please fill out applicable sub-sections and provide additional information if necessary, as these requirements may vary depending on the nature of the project / programme.

C.1. Strategic Context

This is a greenfield rural electrification project with the aim to meet the growing demand for power from the non-electrified communities. Greening the current energy provision would require extensive measures and gigantic investments that are not available to the country. However, it is anticipated that the successful implementation of this project will spur and foster further diffusion of renewable energy. It has been observed that in the past few years there has been continuous growth in fossil fuel based generating capacity. Therefore, it is of critical importance to meet future demand through renewable energy instead of continuously adding fossil fuel based power generation units.

Geography and climate

The Republic of Mali is a landlocked country in the Sahel belt of West Africa located between 11 ° and 25 ° North latitude. It covers an area of 1,246,814 km² of which 51% consists of desert land and 4% of cultivated land. This geographical situation, combined with the fact that Mali does not have fossil fuels on its territory, forces the Government to import all the fossil fuels it needs and makes it highly dependent on price volatility.

The country has an intertropical climatic regime of Sudano-Sahelian character, with high temperatures (average between 26 and 30 ° C), influenced by its continentality and is dominated by an alternation of dry season whose duration varies between 6 to 9 months of the south to north and a rainy season from 6 to 3 months.

Rainfall is characterized by high inter-annual variation and poor spatial distribution. There is a steady decrease in rainfall from the South (1000 mm / yr) to the North (<200 mm / yr) and the duration of the rainy season (MEA, 2009a). While historical records show a rise in average temperatures of about 0.7 ° C since 1960, projections project a continuation and acceleration of this rise in average temperatures as well as a decrease in overall rainfall amounts (with extreme events - floods - more frequent).

Socio-economic context

The population of Mali is estimated at about 18,957,258 inhabitants in 2017. The population growth rate is estimated at 3.4% per year with 62.5% of the population residing in rural areas. This population growth is a major concern for the future of the country, as it leads to an increase in needs to be met, which will inevitably lead to additional pressure on electricity production. The average population density is 15.2 inhabitants per square kilometer.

The administrative division of Mali comprises ten (10) administrative regions and one urban district (Bamako). These are the regions of Kayes, Koulikoro, Sikasso, Segou, Mopti, Gao, Timbuktu, Kidal, Taoudenit and Menaka. The regions are subdivided into 49 circles and 703 communes (including 684 rural) with more than 12,000 villages and fractions.

Gross Domestic Product (GDP) per capita was US \$ 781 in 2016. Dominated by agriculture and the mining sector, the Malian economy recorded a GDP growth rate of 5.3% in 2017. The economic outlook remains positive with projected real GDP growth rates of 5% for 2018 and 4.9% for 2019.

Energy situation and state of play of the subsectors of electricity and renewable energies

Energy balance of Mali

Mali's energy situation is characterized by a biomass-dominated balance sheet that accounts for 76% of primary energy, followed by 20% for hydrocarbon imports and 4% for electricity.



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Figure 1: Energy balance of Mali, 2014 Source : Malian Energy Information System, Direction Nationale de l'Energie (DNE), 2017

Energy consumption in Mali is dominated by the residential sector which basically relies on biomass. Wood and charcoal are mainly used as cooking or heating fuels, a situation which results in strong pressure on the country's forest resources. In a country exposed to the harmful effects of climatic variations and where the degradation of land and natural resources is a real problem, fuelwood as a resource cannot adequately meet the increasing energy needs. Nevertheless, since Malian households will not do away with the use of wood fuels in the short term, primary energy in Mali will continue to depend on biomass (particularly fuelwood).

Apart from biomass, the sector is, therefore, characterized by a strong dependence on petroleum products whose importation is on a constant increase as a result of economic growth and the increasing demand of the population. Between 2000 and 2015, the quantity of imported hydrocarbons doubled from 0.5 million tonnes of oil equivalent (Mtoe) to 1.05 Mtoe and maintained a net increase until 2016 when it reached 1.37 Mtoe.

Mali imports 100 % of its consumption basically through road transport, representing about 26% of the country's total imports, a situation which, as the hydrocarbon monitoring indicators show, consequently makes it highly sensitive to the trends of hydrocarbon prices on the international market as well as the stability of the neighbouring countries. The main countries from which petroleum products come to Mali (2016) are Benin (45%), Senegal (30%) and Togo (15%)¹, followed by other countries like Cote d'Ivoire, Ghana or Mauritania.

This situation exposes the economy in its entirety to the volatility of petroleum prices and makes it vulnerable to foreign exchange reserve pressures, including in the energy sector.

In fact, the cost of hydrocarbons required to run thermal plants accounts for a significant share of the total national import burden and is one of the factors responsible for the high cost of electricity. In spite of the fall in the pump prices of super petrol, diesel, and fuel oil 180 between 2014 and 2016, a slight increase was observed in 2017 before reaching FCFA 692/I for super petrol, FCFA 603/I for diesel and FCFA 415/I for fuel oil 180. Kerosene, which was cheaper than super petrol and diesel in 2014 and 2015 (FCFA 570/I), reached FCFA 684/I in 2016.

The electricity subsector

According to 2017 figures, the rate of access to electricity was estimated at 42% at the national level (19% in the rural areas and 94% in the urban areas), with an increase of about 4% per year (DNE, 2016). Electricity demand in Mali increased historically by 10% a year (an average of 7.8% a year between 2005 and 2015, due to the strong impact of the crisis period (2012)).

The electricity sub-sector can be divided into four segments: the interconnected network of the Malian National Electricity Company (EDM-SA), isolated EDM-SA centres, integrated electricity production of private producers (mining and manufacturing companies in particular) which can sell their potential production surplus to the network and rural



DETAILED PROJECT / PROGRAMME DESCRIPTION



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electrification. The transmission and distribution network of EDM SA is made up of two components: (i) the interconnected network covering a number of urban centres including the capital, and (ii) isolated centres covered mainly by thermal plants operated by EDM-SA.

On the interconnected network, electricity is produced by hydroelectric plants, particularly the Manantali dam (out of which 104 MW of the total of 200 MW belong to Mali) and the Sélingué dam (46 MW), and thermal plants. In the current situation, the Manantali hydroelectric plant covers 26% of Mali's demand, followed by imports from Cote d'Ivoire (baseload imports of 30 MW increased to 45 MW through a provisional amendment), following the commissioning of the 225 kV Ferkéssédougou-Sikasso line in 2012, and leased plants.

According to EDM-SA data, energy security in Mali is suffering from a chronic gap characterized by:

- ✓ at least 300 MW of electricity demand to be covered immediately or in the short term on the network;
- ✓ about 200 MW of thermal power to be replaced by competitive sources of energy;
- ✓ at least 500 MW in the long term for the connection or supply of big industrial extractive and food-processing units, etc.;
- \checkmark at least 150 MW to be rehabilitated on the network's production capacity, and
- ✓ a fast-expanding network to support the development of the import and/or export of electric energy.

It is very unlikely that over the next ten years, the expected expansion of the national electricity network can ensure that a significant proportion of the low-income population living in isolated areas is connected to the network. This situation is expected to create an important market for off-network electrification schemes.

Off-network, the distribution of electricity is mainly ensured by local energy service providers who operate in isolated rural areas. In 2015, the country had 160 isolated mini-networks. The production technologies used to this day basically include diesel-run units (in 2015, 96% of the electricity produced off-network was through diesel) as well as related transmission and distribution systems. The total installed capacity of the mini-networks is about 15 MW.

It is important to note that the energy mix underwent a significant change with the contribution of hydroelectric power dropping from 80% in 2005 to 45% in 2015 and the contribution of thermal plants doubling to 41% over the same period, a situation projected by the electricity recovery plan in 2014 (see figure).



Figure 2: Energy mix in the interconnected network of Mali, including imports. Source: Mali - Provisional Electricity Recovery Plan 2014





The tariffs within the mini-grids reflect the cost prices as well as the very high prices of the transportation of fuel to the hinterland; weighed against the purchasing power of many households, they prove to be inadequate.

The rural electrification sub-sector

Rural electrification in Mali is characterized as follows:

- \checkmark about 70% of the Malian population live in the rural areas;
- ✓ the rate of electrification in the rural areas was 19% in 2016 against less than 1% in 2004;
- ✓ Mali has more than 10,000 rural towns;
- ✓ at least 255 towns are currently being supplied with electricity by private operators with the support of Donors and Technical and Financial Partners;
- \checkmark the rural electrification systems developed by the operators are basically thermal;
- ✓ in 2015, about 131 towns were connected to diesel units, 32 towns were connected to hybrid PV-Diesel systems, 15 towns used biofuel units, 20 towns benefitted from the extension of the EDM-SA network, 43 towns were supplied by Multifunctional Platforms, 13 towns were supplied by solar kits and one town was supplied by a hydroelectric micro-plant;
- ✓ a total installed power of about 23 MW, with nearly 2 MWc PV solar, and
- ✓ operators enjoy subsidies from the Rural Electrification Fund managed by AMADER.

It should be noted that rural energy service providers operating mini-grids fueled by fossil fuel power plants are particularly affected by volatile oil prices, as well as exorbitant fuel transportation costs.

The renewable energy subsector

With the exception of medium-scale and large-scale hydroelectric production, the production of electricity from renewable sources connected to the network was 8.7 MW in 2016 (EDM S.A), while the off-network installed renewable energy capacity consisting mainly of small-scale solar energy reached 15 MWc in 2015. These rural energy production projects show the interest of the rural population and private operators in electricity supply.

The current development of renewable energy in Mali is characterized by a technological development of equipment which has significantly taken the concerns of Sahelian users into consideration as well as by an appreciable drop in the prices of equipment.

Many PV projects are being developed particularly at the Kati (65 MWc), Kita (50 MWc), Ségou (33 MWc), Sikasso (50 MWc) and Koutiala (25 MWc) sites. Plans are afoot for others, especially Fana (50 MWc), SREP Mali project (20 MWc) and Sélingué (Greenwish – 40 MWc), and the construction of several other plants hooked onto to the interconnected network for an accumulated power of 260 MW.

Solar PV is the subject of many applications:

- photovoltaic lighting (domestic needs, lighting of health centres, literacy centres and public areas);
- photovoltaic refrigeration used mainly in health centres to preserve pharmaceutical products;
- broadcasting, telecommunications and radio communication;
- solar pumping for irrigation and village water systems (water for domestic use) and grazing systems (watering places for animals), and
- solar fields and hybrid systems for the decentralized production of electricity (mini-networks) or connected to the network.

National Energy Policy

The sector is mainly governed by the National Energy Policy (NEP) adopted in 2006 and targeted at promoting the sustainable development of the country through the provision of affordable energy services in order to increase access to electricity and to promote socio-economic activities.

The specific objectives of the NEP are as follows: i) meet energy needs in terms of quality, quantity and cost; ii) protect persons, goods and the environment from the risk of a shortfall on the part of energy providers; iii) strengthen capacity in





the area of policies, management, monitoring and control of the energy sector, and iv) consolidate the gains from international cooperation in the area of energy.

The issue of renewable energy has been tackled in several regulatory enactments, particularly the NEP (2006) and the above-mentioned statement (2009). The most important policy document on this issue is the National Renewable Energy Development Strategy adopted in 2006 and with the objective of: i) promoting a vast use of renewable energy technologies and equipment to increase the share of renewable energy in national electricity production (up to 10% in 2015); ii) developing the biofuel sub-sector for various uses (electricity production, transport, agricultural mechanization, etc.); iii) creating better conditions to make renewable energy services sustainable; and iv) looking for sustainable financing mechanisms suited to renewable energy.

Policy Framework for Private Sector Engagement

Generally speaking, the policy environment is relatively favourable for energy investments. It is characterised by the following policy tools: (i) the Rural Electrification Fund; (ii) the National Industrial Development Policy (whose overall objective is to ensure an orderly, rapid, sustainable and balanced industrial development of the country while generating employment); (iii) the Public Private Partnership Framework (in the form of a concession contract based on a BOOT)² arrangement); (iv) the Investment Code (which is aimed at establishing a privileged customs and tax regime with a view to promoting investments); (v) the role of the Investment Promotion Council of Mali (API-Mali), offering a one-stop-shop for all procedures in setting up businesses, assisting investors and issuing permits in accordance with the Investment Code of Mali; and (vi) the directives of an *Ordonnance*³ guaranteeing the free exercise of competition and organising the public power service sector (including, among other things, the role and capacities of various players in the power sector, the conditions governing the exercise of the public electricity service contracting authority, the conditions governing the delegation and operation of the public electricity service, tariff and accounting principles in the sector)⁴.

United Nations Framework Convention on Climate Change

Apart from the strategies linked to the energy sector, the energy issue is taken into account in the commitments made by Mali to protect the environment and to combat climate change.

Mali has signed the United Nations Convention on Climate Change and the Kyoto Protocol as well as formulated its National Adaptation Programme of Action (PANA) on the harmful effects of climate change in 2007. The PANA consists of renewable energy development projects, some of which have been partly implemented.

Furthermore, in 2011, the Government of Mali formulated a national policy on climate change and a national climate change strategy (both of them factor RE into their thrusts of action).

At the COP 21 held in Paris in December, 2015, Mali committed to contribute to the reduction in GHGs by up to 31% for the energy sector. The Government of Mali intends to gradually reduce the carbon intensity of the electricity network by increasing investments and the use of renewable energy sources like photovoltaic solar (PV).

Moreover, Mali is fully committed to the protection of the environment and the fight against climate warming. The Government of Mali demands the systematic consideration of the assessment and reduction of environmental impacts in the design, manufacturing and use of energy infrastructure and equipment.

The country's solar potential and key constraints

The solar potential (PV and CSP) of the whole of Africa was analyzed by IRENA in 2014 (IRENA, 2014). According to this study, Mali is situated in a region with high solar potential and is considered as a country that is particularly conducive

² Under the BOOT contract, a company or a consortium of companies' finance, build, own and operate a new facility or a system,

which is transferred back to the government after a predetermined period of time.

³ Ordonnance n. 00-019/P-RM du 15 mars 2000.

⁴ In this regard, many forms of partnerships aimed at enhancing a conducive environment for private investors (under various forms of contracts, such as concession contracts, leasing and management contracts).





to the development of solar technologies. The average solar radiation is estimated at 5-7 kWh/m²/day with a daily sunshine duration of 7 to 10 hours. Thus, the production potential from solar PV is estimated at 7906 TWh/year (IRENA, 2014).

According to the categorization made in relation to solar resources (GHI for PV and DNI for CSP) (see table below), this potential is considered adequate.

Categorization	Limited relevance	Adequate	Very adequate	Excellent
PV (GHI in [kWh/m²/year])	<1000	1000-1500	1500-2500	2500-3000
CSP (DNI in [kWh/m²/year])	<1800	1800-2000	2000-2500	2500-3000

The following figures show at the continental level the potential regions for the development of solar PV and CSP indicating that Mali is located in a region with high solar potential and presents itself as a country particularly conducive to the development of solar technologies. (IRENA, 2014).

Moreover, malian solar radiation map (see figure 5) shows that solar radiation is more important in the northern part of the country than in the southern part.



Fig 5. Solar Radiation in Mali

Despite the immense potential of the country, it represents only 3% of electricity production from renewable sources (excluding hydroelectric production). Its development remains slow and should reach only 10% of the energy mix by 2020 (national policy objective). Indeed, the widespread use of renewable energy technologies encounter significant barriers from a economic and financial, institutional, regulatory, sociocultural and environmental point of view. Mobilizing related investment is necessary to see a transformation of the sector.

Nonetheless, there are a number of major constraints to overcome for this purpose:



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• 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.

• **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).

• **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.

C.2. Project / Programme Objective against Baseline

1. Baseline Scenario

1.1. Climate change and energy challenges

1.1.1. Vulnerability of the energy sector to climate change

Climate change is one of the major challenges for the development of countries like Mali, which is ranked 175th out of 187 countries on the Human Development Index (HDI), as a result of their low incomes, weakness of their human capital and the weakness of their economies which basically depend on natural resources and climatic factors.

It has been observed that since the advent of the periods of drought in 1970, Mali has been experiencing a more arid climate throughout the country characterized by a 20% overall decline in useful rain. This situation leads to the worsening of the vulnerability of the main sectors like energy, particularly hydroelectric power which accounts for nearly 45% of cheap electricity supply by the national network from the Manantali dam (of which 104 MW out of a total capacity of 200 MW belong to Mali) and the Sélingué dam (46 MW).

With regard to energy production, one can find two hydroelectric plants in the River Niger basin – one at the Sélingué dam on the Sankarani and the other on a diversion of the river at Sotuba near Bamako. At the first one, the average annual production was 226,8 GWh, while the second one recorded 35,6 GWh in 2007 (EDM-SA report, 2007). The energy produced by the two plants met some 30% of the country's electric energy demand.

However, the rainfall situation, coupled with the technical constraints, affected the production of hydroelectric power by the said dams, where it was observed that there was a drop of more than 20% and 10% respectively over the last ten years.



by the Sélingué dam (2007-2016)

1.1.2. Projections and future impacts on the energy sector

Climatic scenarios provided by the MAGICC and SCENGEN tools of the GIEC reckon a +3°C average increase in temperatures and a 22% decrease in rainfall throughout the country by 2100, with a risk of a reduction in water resource





recharge. Yet, it is acknowledged that a 1% decline in flows will bring about a reduction in electric power production in the region of 1.3 million kWh.

The consequence of this situation is poor access to affordable energy which limits the social opportunities of the poor segments of the population, particularly women and the youth in the rural areas, especially where the access rate is lower than 20%. Thus, energy is one of the sectors requiring an urgent roll-out of climate change adaptation measures in accordance with the National Adaptation Action Plan (PANA) on climate change in Mali.

1.2. Overview of Mali's GHG Emissions Profile due to the Energy Sector

The three national communications of Mali (1st in 1995, 2nd in 2000 and 3rd at the formulation stage) all established that the energy sector is one of the biggest emitters of greenhouse gases (GHGs), having increased from 945 kT to 2,782 kT, i.e. an increase of more than 190% over the 17-year 1995-2012 period. The basic scenario shows that GHG emissions will increase from 3,400 kTeq CO₂ in 2015 to 4,750 kTeq CO₂ in 2020, before reaching 9,269 kTeq CO₂ in 2030. This gives an average annual increase of 6.91% between 2015 and 2030.

This situation is correlated with a major deployment of thermal plants over the last few years by both EDM-SA, the national company, and private operators for the electrification of the country's isolated areas. Notwithstanding the high cost prices and the low profitability of this electrification option, this situation is highly unlikely to improve in the next few years without a sustainable alternative due to the ever-growing demand of the population (3.6% a year), economic growth and social pressure. In fact, it appears that it is simple and quick to deploy the thermal solution. Thus, to meet this demand, EDM-SA, the national company, is investing more and more in medium-sized thermal plant projects (fuel oil plants) and is also supplying more than twenty isolated centres solely with plants operating on diesel. Furthermore, the huge consumers of the mining and industrial sector exclusively use thermal energy for their needs (200 MW), while rural electrification is basically provided by local suppliers who operate diesel-powered isolated mini-networks.

Although the country's contribution to greenhouse gas emissions (GHGs) in the world is very low (0.06%), the government has agreed to participate in the collective ambition to attain the ultimate objective of the United Nations Framework Convention on Climate Change (less than 2°C) by reducing GHG emissions in the energy sector by 31% and introduced an investment plan in this regard in order to attain its objectives.

The National Environmental Protection Policy is being updated under the supervision of the Ministry of Environment and Sanitation. Achieving the political objectives related to environmental sustainability requires the prioritization of new energy investments for energy infrastructure that is environmentally friendly and resilient to climate change.

Constraints and challenges to the development of solar-based electrification in the context of the fight against climate change

- At COP 21 held in Paris in December 2015, Mali committed to contributing to the 31% GHG reduction mitigation scenario for the energy sector and included it in its document on defined NDCs and then in the Investment Plan for implementation of the NDCs. During consultations with the various actors for drawing up the Plan, it was noted that a good number of actors lacked knowledge of the NDCs document. Thus, it was identified that there was a priority need for awareness on the NDCs in each of the various areas, including the energy sector. Such an approach could enable the main players in the energy sector, particularly public institutions (National Energy Directorate -NED-, AMADER, AER-Mali), the private sector (investors and operators of existing rural electrification services) and the end users of basic energy services to work towards achieving the objectives set in terms of commitment by the country.

- The high initial investment cost in PV plants is a major obstacle to private sector involvement in rural electrification, as private investors are called upon to mobilize resources from the local banking system, at a cost which is expensive for them. The second main obstacle concerns the fixing of an appropriate tariff that ensures the financial viability of the system, while taking into account the capacity to pay in rural areas. The extent to which cost and risk factors apply varies with the technology used and the geographical location, and project promoters expect some form of financial risk sharing to offset them. To date, this risk has been covered by external donors through the Rural Electrification Fund (FER). The FER has therefore succeeded in encouraging more than 60 energy supply companies to intervene in Mali. They are involved in nearly 200 mini-grids. The initial





investment subsidies granted by the FER aim at making tariffs acceptable for consumers in rural areas and thereby guarantee financial profitability for private operators. Investment subsidies are limited to 70-80% of the investment cost and are based on a results-based approach (determined by the number of consumers expected to be connected to the grid during the first two years, the average tariff and the investment cost for off-grid consumers). No subsidy is granted for electricity consumption. However, the Rural Electrification Fund (FER) is, in practice, a bank account managed by AMADER which was first created to manage direct grants or an onlending of concessional loans. This fund is still not a real financial institution capable of borrowing, issuing guarantees and equity, setting up loans, towards rural electrification companies (for a fixed or unlimited period). It goes without saying that this situation is not sustainable, due to the decrease in the financial resources available from external sources to continue providing such subsidies. The government is therefore considering strategic actions such as building capacity of the FER to co-ordinate the mobilization of the financial resources on the international market which are needed to finance investments by the agencies in charge of promoting the State's renewable energy programmes.

Minigrid companies focus primarily on supply of power and often do not pay enough attention to demand stimulation. Too often, new customers have been slow to connect and only use a small amount of electricity. leading to lost revenue and insufficient volume to spread fixed cost. Productive-use appliances, like grain mills, carpentry, irrigation, and cold storage, are particularly important because they are often coincident with cheaper generation from solar and have higher consumption than residential loads. Commercial and productive use customers are thus critical for long-term viability of minigrids/microgrids - as they have higher demand per connection, their loads are more coincident with solar generation, and they can provide immediate new income for the community to help afford the new electricity service. Furthermore, this is particularly important for rural areas where energy sources are needed in synergy with potentials for productive energy uses and employment creation. However, the upfront cost to connect or for purchasing electric appliances may be too high, requiring financing or subsidy whilst rural population in Mali faces several difficulties, including the lack of an appropriate financial service to support Productive Users of Energy (PUE) and back them up. Indeed, despite the significant demand for financial services in rural areas, institutions offering financial services – such as banks, credit unions, microfinance institutions (MFI) or insurance companies – are typically reluctant to serve rural areas. The key issue is often related to guarantee. Indeed, surveys revealed that although some producers' cooperatives are eligible to credit from financial institutions, they have trouble accessing credits due to issues of guarantee.

The removal of these barriers, supported by this project, will help the country to strengthen the resilience of the energy sector and hence the resilience of local populations to the effects of climate change, while satisfying the growing need for electricity, and reduce GHG emissions related to the energy sector.

C.3. Project / Programme Description

Describe the main activities and the planned measures of the project/programme according to each of its components.

1. Components of the project

The main components of the project are: (i) Capacity building of rural electrification institutions and Technical Assistance; (ii) Detailed Engineering and Installation of 70 solar powered minigrids (50 mini-grids at Tranche 1) to achieve access for 31,000 households and businesses (28,378 at Tranche 1); and (iii) Support to Productive Use of Electricity for solar based mini-grids.

Component 1: Capacity building of rural electrification institutions and Technical Assistance

This component takes into account activities related to the establishment of an enabling environment for the promotion of rural electrification from solar photovoltaics. It focuses on capacity building for structures such as AMADER, AER, and the Rural Electrification Fund as well as actions to raise investor awareness and disseminate project activities and results.

1.1. Training, raising awareness of stakeholders and dissemination of project activities/results





The project will contribute, on the one hand, to raising awareness among stakeholders on the country's commitments through the NDCs in the field of energy and related implications, by:

- organizing dissemination workshops on potential actions to be implemented in order to achieve the objectives of the CDN in the field of energy;
- organizing specialized training sessions for designated executives of NED, AMADER and AER-Mali on climate change and issues related to the energy sector;
- developing and disseminating public awareness material on climate change and CDN in the energy sector.

These activities will be carried out with support from the Environment and Sustainable Development Agency (AEDD) which is in charge of the national policy on climate change drawn up in 2011 together with a strategy and an action plan.

1.2. Communicating project results and lessons learned

Communication will be made towards various stakeholders on project activities, results achieved and best practices/lessons learned from the project, for replication across the country and the West African sub-region.

The expected results from this activity include particularly:

- Developing a communication and raising awareness/promotion plan for national (and international) investors and production of materials (including videos) will be published on the experience/best practices and lessons learned from the project. These materials will be made available electronically and they will be widely disseminated throughout the region and in countries considering similar renewable energy systems for rural electrification. In addition, they will be posted on the project website;
- Organizing information sessions with investors who are already active in the energy/renewable energy sector in the country, local businessmen who wish to develop their activities to include energy for rural areas and, possibly, organize a roadshow to attract foreign investors in order to create consortia with local companies to provide rural areas with modern quality energy services.
- Organizing mid-term and end-of-project workshops for institutions concerned (DNE, AMADER, AER-Mali, FER) to ensure monitoring and document the project experience. Training will be provided by international/local consultants for stakeholders on how to monitor, record and document the project experience.
- 1.3. Capacity building of the Rural Electrification Fund (Fonds d'Electrification Rural -FER)

This project will work to achieve this objective by supporting the setting up of technical assistance to develop the Rural Electrification Fund into a financial institution with its own legal status, through:

- (i) drafting of organisational and operational legal provisions as part of a reform of the FER;
- (ii) recruitment of a dedicated staff; and
- (iii) capacity building of the FER staff.
- 1.4. Technical Assistance on Regulatory Framework and on Procurement and Contracting of minigrid construction and O&M companies

Technical assistance will further be provided for the tender process and selection of O&M companies that will operate the mini-grids. This will include the writing of standard contract for 15 years O&M and the procedures that set the relations between AMADER and O&M companies.

A detailed implementation plan is provided on Annex 10.

Component 2: Detailed Engineering and Installation of solar powered minigrids

For each of the selected localities, this component includes specific engineering studies including site





identification/selection and E&S analysis, acquisition, installation and commissioning of the following equipment: (i) 50, 80 and 150 kWp stand-alone solar power plants with storage systems; (ii) low and medium voltage grids with their respective lengths of 8, 10 and 12 km; (iii) 14,189 prepaid meters; (iv) household in-door electrical wiring; (v) civil engineering works of buildings; and (vi) 10 stand-alone street lighting solar systems.

The project will set up a certain amount of metering equipment and grid connection line, then in the implementation of the project a deployment will be made according to the demand thanks to the income from the sale of electricity. The operators will charge an additional fee for households' connections according to the national regulation and within the limits of predetermined fees agreed with the rural electrification regulator (AMADER).

The equipment and their auxiliaries will be supplied with the essential spare parts and the specific tools for their maintenance as well as the required documentation.

AMADER is the entity which on behalf of Mali government will have the ownership of the assets. A concession agreement for 15 years (renewable) will be awarded by AMADER to eligible operators. The financial eligibility criteria is the ability to invest 20% of the total cost per minigrid. Detailed technical selection critera will be developed as part of the Technical Assistance in component 1.

2.1 Preparation of detailed engineering studies

This component includes activities such as site selection, engineering studies and specific environmental and social analysis for each site.

2.2. Supply installation and commissioning of equipment

The 14 localities in category 1 (population less than or equal to 2,000 inhabitants) will each be supplied by a 30 kWp photovoltaic solar power plant and a 5 km-long three-phase LV grid.

The 21 localities in category 2 (population between 2,000 and 4,000 inhabitants) will each be supplied by a 50 kWp photovoltaic solar power plant and a 8 km long three-phase LV grid.

The 27 localities in category 3 (population between 4,000 and 7,000 inhabitants) will each be supplied by an 80 kWp photovoltaic solar power plant and a 4.5 km-long three-phase LV grid.

The 8 localities in category 3 (population of 7,000 inhabitants or more) will each be supplied by a 150 kWp photovoltaic solar power plant and a 12 km-long three-phase LV grid.

The total installed power will be: 0,42 MW + 1,05 MW + 2,16 MW + 1,2 MW = 4,83 MW.

For Tranche 1 the total installed power will be: 0,42 MW + 2,16 MW + 1,2 MW = 3.78 MW

2.3. Implementation of Environmental and social measures

This subcomponent takes into account the environmental and social actions for the purpose of mitigating the negative impacts and risks of the project on the environment and the project area. These include:

(i) institutional strengthening measures (strengthening the environmental expertise of the AER, AMADER and private operators); (ii) Technical studies, audits and procedures (environmental and social impact notices to be prepared; facilities maintenance manual); (iii) Training of the stakeholders involved in project implementation, particularly the Environmental and Social Safeguard Unit/AER, Information and sensitization of communities and populations in the project area; (iv) Monitoring, supervision and evaluation of project activities.

Component 3: Support to Productive Use of Electricity

This component is in line with the need to improve the profitability of electrification in rural areas and encourage investment, through support for energy demand, particularly with regard to the "productive use of energy".





Indeed, by supporting the acquisition of equipment for productive use by rural populations, the project will contribute to increasing the use of energy for income-generating activities, which will stimulate the sale of electricity and economic development of the beneficiary localities.

For this purpose, local financial institutions (microfinances) are wiling to put in place "equipment or investment credit" for productive users. Types of energy equipment for productive use include: electric tools for carpentry, woodworking and small industry; sewing machines; welding machines; battery charging equipment; refrigeration and ice cube production; seed oil presses, grain mills, crop drying equipment and other equipment for value-added processing of local agricultural produce (honey, mango, cashew nuts, etc.).

However, in order to succed in this operation, there is a need for risk guarantee in order to encourage banks and nonbank financial institutions to provide financial services to productive energy users. This will also make it possible to control the interest rates of the loans granted to the populations to support the users of productive energy.

Surveys conducted in local communities showed that the terms for credit dedicated to equipment for productive use would be as follows:

- loan amount between XOF 250,000 and 5 Million (Euro 381 to 7622) estimated at XOF 500,000 (Euro 762) on average;
- down payment requirements of 20 to 30% of the equipment cost;
- Tenor of 6-24 months, usually 12 months on average;
- interest rates between 18 and 20% per year, with set-up costs;

This component aims at promoting increased access to financial services for productive energy users in rural areas through setting up a financial guarantee fund toward financial institutions, for derisking purposes.

Upon BOAD's experience, this financial guarantee will be a loan proceed commited for covering part of the risk taken by the microfinance insitutions (maximum 40% of receivables deemed irrecoverable). With hindsight, the following conditions are required:

- when all avenues have been exhausted in recovering overdue credit in accordance with the institution's credit policy;
- where the delay period exceeds 24 months, which is the legal period for downgrading credits as a loss.

The loan proceeds will be exclusively used for the garantee itself and will be effectively in place upon completion of minigrids. The resources will be managed by BOAD via FER. FER is part of government of Mali who is the borrower. No new legal entity will be created since FER is already existing. The mechanism and the operationalisation of the garantee fund are covered in component 1 (Capacity building and Technical Assistance to the Rural Electrification Fund – FER). Once FER has the capacity in place, it will use the proceeds to garantee micro loans given by the local microfinance institutions for productive use. The productive use micro loans will be given to productive use consumers in the areas where the minigrids will be installed.

Microfinance Institutions which will be partners for this project will comply to Malian regulations fo microfinance institutions suc as:

- approval given by the Ministry of Economy and Finance (MEF)
- losses must not exceed 5% of the institution's total loan portfolio;
- interest rates are capped at 27%;
- loans to a client may not exceed 10% of total portfolio;
- 50% of the profits must be reserved and reinvested in the MFI;
- 15% of the loan portfolio must remain on deposit

- Annual financial reports and returns must be submitted to the Ministry of Economy and Finance and must indicate the following:

- o amount of deposits taken from customers;
- total loan portfolio;
- o number of customers;
- o Interest rate





Mali is a member of the Central Bank of West African States (BCEAO), and therefore its banking system is regulated by this regional monetary institution which has drawn up a set of regulations covering MFIs. A copy of the above reports will therefore be shared with BCEAO for registration under the decentralized financial systems.

A partnership and performance agreement will be signed between the FER and the eligible MFIs.

Eligibility of the LFIs will be proven through the following: (i) approval given by the Ministry of Economy and Finance (MEF); (ii) number of years of experience, and (iii) effective and continuous implementation of activities in the field; (iv) a reassuring financial situation over the last three (03) years through the following indicators: (i) solvency (equity capital/total net assets is greater than or equal to 15%); (ii) portfolio quality (90-day overdue/portfolio outstanding less than 3%); and (iii) internal control quality.

In the context of this project, concerning ALM/FT, eligible LFIs will:

- ensure that the funds financing the Project are not of illicit origin and in particular are not related to fraud against Mali's financial interests, corruption, organized criminal activities, terrorism or drug trafficking; and

- forward to the Bank without delay any information raising suspicions as to the unlawfulness of the sums invested in the company and in the Project;

- notify the Bank without delay if it has known at any time of any information indicating the illicit origin of all or part of the funds of the structure;

- will not enter into a business relationship, directly or indirectly, with persons or entities on the lists established by the United Nations Security Council or its committees pursuant to Security Council resolutions, by the Council of the European Union in application of its Common Positions and / or by the African Union as well as any other relative or complementary resolution and any act of implementation thereof in connection with the fight against the Laundering of Capital and the financing of terrorism.

Under its due diligence, BOAD will assess civil / criminal and regulatory antecedents and sanctions lists. The Bank conducts also administrative investigations into corruption, fraud, coercion, collisions and inconvenient practices, and make use of the relevant national authorities for the necessary criminal investigations.

C.4. Background Information on Project / Programme Sponsor (Executing Entity)

Describe the quality of the management team, overall strategy and financial profile of the Sponsor (Executing Entity) and how it will support the project/programme in terms of equity investment, management, operations, production and marketing.

Main entities involved in the project are:

- The Government of Mali will be the borrower and will take the credit risk through a sovereign guarantee.
- The Ministry of Energy and Water as the executing entity who delegates execution to the Renewable Energy Agency (Agence des Energies Renouvelables – AER) for component 2. (see Letter of the Ministry of energy dated 11 july 2018 in Annex)
- BOAD will provide direct support (selection of consultants) to AER in executing component 1 (capacity building and technical assistance), and the Rural Electrification Fund (FER) will execute component 3. BOAD has conducted technical and financial capacity assessments of the entities involved in the project as per requirements of the Accreditation Master Agreement (AMA) in line with BOAD's policies and procedures. It is BOAD's reasonnable conclusion that the national entities involved therein are capable of carrying out the execution and operation of the project component activities under BOAD's assistance and support.

The Renewable Energies Agency (AER)

The Renewable Energies Agency in Mali (AER) is a Public Establishment of Scientific and Technological Character



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endowed with legal personality and financial autonomy (inherited from the National Center for Solar Energy and Renewable Energies (CNESOLER)). Its mission is to: i) assess and inventory the country's potential for renewable energy resources; ii) contribute to the definition of national renewable energy strategies; (iii) conduct research / development activities in the field of renewable energies; (iv) conduct studies and monitor the implementation of renewable energy programs and projects for the benefit of industry stakeholders; (v) contribute to the development and capacity building of craftsmen, agents of State technical structures, local and regional authorities and private individuals, as well as those of renewable energy equipment; vii) perform testing, quality control and labeling of renewable energy equipment for the benefit of developers; viii) research and set up sustainable and adapted financing mechanisms for renewable energy projects and programs within a Public Private Partnership framework; (ix) to participate in international cooperation actions in the field of renewable energies.

AER has a staff of 47 agents including 14 senior managers (05 researchers (including a Doctor, Research Director, a Director of Memory and 03 Research Assistants) 04 Energy Engineers, 02 Electrical Engineers, 01 Statistician-Planner Engineer, 01 Engineer in Industry and Mine and 01 administrative and financial manager. (See AER's oragnizational flowchart below)



Since its establishment, AER has conducted 7 solar based projects with the support of various partners such as UNDP, Indian Government, Chinese cooperation, European Union, AfDB, etc. A summarized list of the projects is presented below:

PROJECT TITLE	INSTALLED CAPACITY	BUDGET	FUNDING SOURCE	PROJECT DURATION	
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DETAILED PROJECT / PROGRAMME DESCRIPTION





PROMOTING SUSTAINABLE ELECTRICITY PRODUCTION IN RURAL AREAS THROUGH HYBRID TECHNOLOGIES	147 kWp	12 585 568 500 XOF	UNDP MALI Gov.	2017-2020
SOLAR ENERGY VILLAGE ELECTRIFICATION PROJECT (PEVES III)	1,287 MWp	4.676.100.000 XOF	INDIAN Gov. MALI Gov. & BENIFICIARIES	
SUPPORT PROJECT FOR THE PROMOTION OF RENEWABLE ENERGY IN MALI (PAPERM)		1. 272.000 XOF	AFDB	
SINO-MALIAN COOPERATION SOLAR ENERGY BASED PILOT PROJECT FOR KIRINA	28, 520 kWp	400 000 000 XOF	CHINESE COOPERATION	2012- 2013
RENEWABLE ENERGIES PROMOTION FOR WOMEN EMPOWERMENT (PENRAF)		1 598 000 000 F XOF	UNDP, MALI Gov.	
"ENHANCING THE LIVES OF CHILDREN AND THEIR FAMILIES THROUGH ACCESS TO MODERN, CLEAN AND AFFORDABLE ENERGY SERVICES IN 30 DEPRIVED COMMUNITIES IN THE KITA CIRCLE": PASER-K	74,18 kWp	1 725 157 000 XOF	EUREPEAN UNION, PLAN ESPAGNE	2015-2018
ACCESS TO MODERN ENERGY THROUGH 36,123 PUBLIC LIGHTING PHOTOVOLTAIC SOLAR SYSTEMS IN 311 VILLAGES AND CITIES IN MALI	11,32 MWp	36.000.000.00 0 XOF	MALI GOVERNMENT	

West African Development Bank (BOAD)

The West African Development Bank (BOAD), is a regional financial institution with a mandate to promote development in West Africa, and foster economic integration within the sub region. For over 40 years, BOAD acquired strong experience in financial resources mobilization and management from its member countries⁵ and partners, including AfDB, AFD, etc. and on international financial market.

The Bank's technical expertise and fiduciary capacity are deemed complied with international standards by several international funds, such as the Green Climate Fund (GCF), the Global Environment Facility (GEF) and the Adaptation Fund (AF) to which BOAD is accredited as project entity.

BOAD has already financed solar based rural electrification projects in Senegal, Niger and Togo over the last three years.

BOAD has significant experience in the region using loans instruments with governernment to de-risk operations with a guarantee.

As the implementing entity (the Accredited Entity) BOAD has a team of energy engineers, rural engineers, environmentalists and various experienced specialists to accompany the project in its implementation phases. Moreover, the Bank could also consider the recruitment of specialists to support the project teams if necessary.

BOAD has relevant experience in energy sector through the management of a fund so-called "Energy Development Fund (FDE)". Established in September 2009, the Fund aims to contribute to improved access to energy in the WAEMU member countries and promote the development of sustainable energy under concessional conditions in order to finance eligible projects. The Fund started its operations in the first quarter of 2010 and focuses on the following areas: emergency plans and investment projects, audits, studies, engineering and control of investment projects, capacity building and technical assistance, development and execution of business plans, reform of the legal and regulatory framework, accompaniment to the restructuring and consolidation of the energy sector. The initial allocation of the Fund is FCFA 250 billion (~USD 125 million). As at 30 September 2016, 14 projects were financed in the form of loans involving a total amount of FCFA 229.7 billion (~USD 459 million).

⁵ Benin, Burkina Faso, Côte d'Ivoire, Guinea Bissau, Mali, Niger, Senegal and Togo.





BOAD's experience in Mali as for energy sector projects is as follows.

• EDM-SA Interconnected Network Strengthening Project

The project involves the construction of a national dispatching center in Bamako and a 107-km long 63-kV power line between the towns of Ségou and Niono, as well as the renewal and extension of the distribution network. from the city of Niono.

With a total cost of M XOF 12,766 excluding taxes, the project is financed by BOAD and EDM-SA respectively for MXOF 11,000 and MXOF 1,766. The BOAD loan of MXOF 11,000 was granted by its Board of Directors in March 2008.

Interconnection project of the electricity networks of Mali and Ivory Coast

The project involves the construction of a 225-kV electrical interconnection line, covering a distance of 519 km, from Ferkessédougou in Ivory Coast to Ségou in Mali via Sikasso and Koutiala. The main objective of the project is to increase supply and strengthen the security of electricity supply in Mali.

The total cost before tax of the project is estimated at MXOF 74,177 and its financing plan is as follows: i) BOAD: MXOF 12,500; (ii) EXIM BANK from India: MXOF 33,750; (iii) EBID: MXOF 13,500; iv) Ivorian State: 976 MFCFA; v) EDM-SA: MXOF 1,527; and (vi) Government of Malian: MXOF 11,894. It should be noted that in the context of its financing of its counterpart, the Malian Government obtained from Exim Bank of India, an additional financing of US \$ 36 million.

• Rehabilitation of Sélingué and Sotuba hydroelectric facilities Project

The purpose of the project is the rehabilitation of the Sélingué and Sotuba hydroelectric power stations, including the Sélingué energy evacuation stations and lines, as well as the connection to the interconnected network of Kangaba and Ouéléssébougou to the interconnected EDM-SA network with the electrification of fifteen (15) localities. The overall objective of the project is to contribute to the regular supply of electric power at lower cost.

The total cost of the project is MXOF 28 441 and its financing plan is as follows: i) BOAD: MXOF 25 000 (88%); (ii) Mali Governement: MXOF 1,332 (5%); and iii) EDM SA: M XOF 2,109 (7%).

BOAD will monitor the project, on the basis of the Borrower's quarterly reports and field supervision missions.

An implementation team for this project will be constituted within BOAD, and be in charge of the due diligence. It is an internal bank team set up to coordinate the preparation, design, financing and implementation as well as monitoring and evaluation aspect of the project. The same team will be responsible for the liaison with the GCF and the subsequent reporting. The team at the bank will consist of financial analyst, environment social and gender specialist, renewable energy expert, monitoring and evaluation expert, climate change specialist, procurement specialist.

The organizational flowchart and the flow of funds are presented below:



DETAILED PROJECT / PROGRAMME DESCRIPTION

GREEN CLIMATE FUND FUNDING PROPOSAL | PAGE 22 OF 63







DETAILED PROJECT / PROGRAMME DESCRIPTION

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Describe the market for the product(s) or services including the historical data and forecasts.

According to EDM-SA data, energy security in Mali is suffering from a chronic gap characterized by:

- ✓ at least 300 MW of electricity demand to be covered immediately or in the short term on the network;
- ✓ about 200 MW of thermal power to be replaced by competitive sources of energy;
- ✓ at least 500 MW in the long term for the connection or supply of big industrial extractive and food-processing units, etc.;
- \checkmark at least 150 MW to be rehabilitated on the network's production capacity, and
- ✓ a fast-expanding network to support the development of the import and/or export of electric energy.

It is very unlikely that over the next ten years, the expected expansion of the national electricity network can ensure that a significant proportion of the low-income population living in isolated areas is connected to the network. This situation is expected to create an important market for off-network electrification schemes.

Off-network, the distribution of electricity is mainly ensured by local energy service providers who operate in isolated rural areas. In 2015, the country had 160 isolated mini-networks. The production technologies used to this day basically include diesel-run units (in 2015, 96% of the electricity produced off-network was through diesel) as well as related transmission and distribution systems. The total installed capacity of the mini-networks is about 15 MW.



Rural electrification in Mali is characterized as follows:

- ✓ about 70% of the Malian population live in the rural areas;
- ✓ the rate of electrification in the rural areas was 19% in 2016 against less than 1% in 2004;
- ✓ Mali has more than 10,000 rural towns;
- ✓ at least 255 towns are currently being supplied with electricity by private operators with the support of Donors and Technical and Financial Partners;
- ✓ the rural electrification systems developed by the operators are basically thermal;
- ✓ in 2015, about 131 towns were connected to diesel units, 32 towns were connected to hybrid PV-Diesel systems, 15 towns used biofuel units, 20 towns benefitted from the extension of the EDM-SA network, 43 towns were supplied by Multifunctional Platforms, 13 towns were supplied by solar kits and one town was supplied by a hydroelectric micro-plant;
- ✓ a total installed power of about 23 MW, with nearly 2 MWc PV solar

Among public sector actors involved in the energy sector, some national entities and technical services are also involved in the development of renewable energy:





Énergie du Mali SA (EDM SA), the national state-owned utility

Agence Malienne pour le Développement de l'Énergie Domestique et de l'Électrification Rurale (AMADER) aims at increasing energy efficiency and at expanding access to electricity in rural and sub-urban areas. It is also responsible for implementing the *Programme Décennal d'Électrification Rurale* (PRODER) through PPPs.

Private local energy companies and local initiatives (i.e., communities and women associations), with support from AMADER, are the drivers of Mali's rural energy access agenda. The *Fonds pour l'Electrification Rurale* has attracted almost 50 local energy service companies to the rural energy service delivery market in Mali. Most of them operate dieselbased mini-grid systems.

Autonomous producers are consumers who generate electricity for their own needs, either to cope with EDM SA failures to provide them with sufficient power or because they are outside the grid. They use diesel-powered generators.

The demand/supply projection and the cost of production show that in Mali, the cost of electricity production is high and unsustainable.



Figure 13: Demand/Supply Projection and Cost of Production in 2015

Power Tariff

General Tariff Principles

Electricity is considered to be commercial commodity, and therefore no supply to a third party may be made free of charge. Accessing such service gives rise to subscribing to a contract, which must be approved by CREE.

Equal treatment is guaranteed to all users with same consumption characteristics within the same Concession or among customers under the same lease.

Tariff regulations

- a) principle: Pricing freedom for authorisation and declarations (and regulatory tariff for concessions) in compliance with provisions of contracts signed with customers.
- b) Sales subject to tariff regulation:





The sales of Concessions benefiting from an exclusivity or natural monopoly are subjected to tariff regulation by a Directive from the CREE.

Regulated tariffs are price ceilings defined on the basis of the following principles:

- ✓ They are based on budgeted costs and allow the operator to cover all expenses and charges justified by operational needs
- ✓ They include an adequate rate of return that enables the Concessionaire to break even and get return on investment;
- ✓ They include price adjustment coefficients for the main cost components, making it possible to offset the effect of changes in the main economic parameters over which the operator has no control;
- ✓ They incorporate a downward adjustment term that forces the operator to increase productivity;
- ✓ They are in line with the Government's energy policy and aim to stimulate efficiency in the use of electricity and optimise the use of generation, transmission and distribution capacities;
- ✓ They shall be no discriminatory and transparent for same category of operator

Giving variations on characteristics of demand, regulated pricing scheme are defined by tariff quota periods and are reviewed by CREE directives.

Within the scope of the EDM-SA concession, there are provisions for tariff equalisation.

Tariff schedule and revision

The following tables show EDM-SA's low and medium voltage tariff and variations between 2009 and 2015

Table : Tariffs between 2009 and 2015

Tariff categories	2009 Tariff 2009 without VAT	2015 Tariff without VAT
social tariff (2-phase meters, 5 amps)		
Proportional price (CFA Francs /kWh)		
- Window 1: 0 – 50 kWh/month	59	59
- Window 2: 51 – 100 kWh/month	91	105
- Window 3: 101 – 200 kWh/month	94	120
- Window 4: > 200 kWh/month	108	130
Normal Tariff (2-phase meters > 5 A and meters 4)		
Proportional price (CFA Francs /kWh)		
- Window 1: 0 – 200 kWh/month	106	109
- Window 2: > 200 kWh/month	124	130



DETAILED PROJECT / PROGRAMME DESCRIPTION

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Public Lighting Tariff			
For the first 120 hours of the subscribed volt	age	107	114
For more		74	79

It should be noted that this EDM tariff does not apply to rural mini-grids that have another tariff regime.

Despite the low level of incomes in the area, households expressed their willingness to pay the monthly electricity service charge. This willingness to pay the monthly electricity service charge by households has also been confirmed by local authorities

C.6. Regulation, Taxation and Insurance (if applicable)

Regulation related to the electricity and rural electrification sector

In Mali, AMADER is the only government regulatory authority in charge of rural electrification, setting of policies under the guidance of the Ministry of Energy.

Operating Regimes for Electricity Facilities

The Government entrusts public power service to operators under either a Public Service Permit or a Concession Agreement, issued under the conditions provided for by Ordinance No. 019/P-RM of 15 March 2000.

Any person or entity wishing to carry out Power Production activities for third parties must first obtain either a Permit or a Concession, depending on the level of installed capacity envisaged.

Other permits and authorizations are required as presented below. They will be obtained by the operators once selected via BOAD tender processes.

Table 1: Permits and	Issuing Authorities
----------------------	---------------------

Permits and authorizations	Issuing authority							
 Community authorization 	Local Authority (Town Hall)							
 Construction permit 	Ministry of Urban Planning and Housing							
 Environmental Permit 	Ministry of the Environment, Sanitation and Sustainable Development							
 Preliminary permit of 6 months 	AMADER							
 Agreement between AMADER and the Operator 	AMADER							
 Authorization from the Minister of Energy for a period of 15 years 	Minister in charge of Energy							
 Specifications for the operation and maintenance 	AMADER							

Import of equipment will be exempted from taxes.

Currency regime

The currency regime is the XOF, which is locked against the EUR. The project funds will be provided in EUR.

Privileges and Immunities

The GCF resources will enjoy an equal treatment with the BOAD resources in terms of privileges and immunities. This includes especially exemption from taxation.





C.7. Institutional / Implementation Arrangements

Organization of the execution

The project owner is the Government of Mali represented by the Ministry of Energy and Water Resources. The project will be executed by the Renewable Energy Agency (AER-Mali). In this regard, AER-Mali shall see to the programming, coordination, monitoring and supervision of all Project activities.

A Project Management Unit (PMU) shall be set up within AER-Mali and managed by a senior manager Project Coordinator, who must be an Electrical Engineer or other profile with experience. In addition to the coordinator, the project unit will include nine (09) other experts namely: (02 Executive Electrical Engineers or other executives, 02 Technicians, 02 Senior Construction Technicians, 01 Procurement Specialist, an Environmentalist and an Administrative and Finance manager) as well as support staff: 02 drivers, 01 Secretary, 01 courier and one (01) responsible for monitoring-evaluation. The project team will be established by a decision of the Minister of Energy and Water Resources. The PMU Coordinator's CV must first receive a no objection notice from the BOAD.



This sub-component includes (i) feasibility studies as well as environmental and social impact assessment already carried





out; (ii) detailed technical engineering studies and environmental and social impact statements to be carried out for each locality; and (iii) the tender documents for construction works and the Request for Proposals for the control and supervision of construction works.

Control and supervision of the works will include: (i) the technical and administrative follow-up of the execution of the works; (ii) verification of calculation notes and plans for civil engineering and electromechanical equipment; (iii) factory and on-site equipment approvals, trial validation for commissioning and temporary acceptance of work; and (v) the quality control of the works and quantities implemented in accordance with the Particular Technical Prescriptions Manual.

The Bank will monitor the project from its headquarters, based on the Borrower's quarterly reports and field supervision mission's reports. A technical and financial audit of the project will be carried out by a consultant who, in accordance with the project specifications, will inspect works carried out and the services provided by the inspection team, check the books and accounting records.

Works will be carried out by companies. Work supervision and inspection as well as technical audit will be carried out by engineering firms. The technical and financial audit of the project will be conducted upon completion of works before final handing over. Services relating to raising awareness among the populations living in the project catchment zone will be conducted by local NGOs or associations with the support from the Local government.

Upon completion of works, a final report shall be prepared by the firm responsible for monitoring and control and submit to the Bank. The report shall provide detailed information on the technical progress of the project, its financial cost and the project execution timeline.

Project management and operation

AMADER is the regulator for rural electrification activities and will grant the concession agreement to the operators. There will be no legal agreement between AER and AMADER while AER will host the Project Management Unit (PMU).

The private operators will be in charge of assets management and operation. They will be selected on the basis of specifications defining the performance of the operation and preventive and curative maintenance, in accordance with the manufacturer's standards.

The operation and maintenance of the installations are carried out by the concessionaires, the rural electrification project management entities, and / or the associative structures of the rural communities of the localities concerned, according to the regulatory and legislative framework of the project. country. The policy of choosing a private operator aims to bring professionalism, skills and resources in some localities electrified and not connected to the network interconnected.

The dealer maintenance policy is characterized by the execution of a systematic maintenance program (preventive maintenance) and repair and repair interventions (curative maintenance). Maintenance by the operator is based on manufacturer's maintenance manuals, maintenance schedules developed by the programming unit, and statistics of breakdowns and incidents.

During the life of the contract, the operator must comply with a number of rules to ensure quality of service and customer satisfaction. In this context, he is responsible for the maintenance of the infrastructure entrusted in perfect working order, while ensuring regular maintenance. It also renews parts at the end of its life.

The operator manages the maintenance and upkeep of the infrastructures, on a daily basis, relying on light teams, present in each of the villages. Thus, three (03) types of intervention are retained:

- the daily maintenance is provided by a trained technician present in the locality through daily visits of the production facilities with information record (voltage, current, frequency, power, number of hours of operation, abnormal noise, leakage, etc.) and visual inspections of distribution lines;
- systematic, conditional or corrective maintenance interventions are provided by the regional private operator; and
- for breakdowns, overhauls or major repairs, the operator may call on the supplier if necessary.

Local authorities and national energy agencies control the quality of the facilities and service to ensure that the private operator manages the infrastructure.





A levy of EUR 0.02 will be collected from the private operators by the Rural Electrification Fund (FER).



C.8. Timetable of Project/Programme Implementation

Please provide a project/programme implementation timetable in <u>section I (Annexes)</u>. The table below is for illustrative purposes. If the table format below is used, please refer to the activities as numbered in Section H. In the case of outputs, please mark when all the required activities will be completed.

COMPONENT / OUTPUT		2019			2020			2021			2022				2023				2024				2025				2026		5		
		Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2 (Q3 Q4
COMPONENT: CAPACITY BUILDING OF RURAL ELECTRIFICATION INSTITUTIONS AND TECH	INICAL	ASSIS	TANCE																												
Activity 1.1 Training, raising awareness of stakeholders and dissemination of project activity	vities/	results	5																												
Sub-activity 1.1.1 - organizing dissemination workshops on potential actions to be																															
implemented in order to achieve the objectives of the NDC in the field of energy				x	x	x																									
Sub-activity 1.1.2 - organizing specialized training sessions for designated	1				v	~	v	~	v		v																				
executives of DNE, AMADER and AER-Mali					^	^	^	^	^	^	^																				
Sub-activity 1.1.3 -developing and disseminating public awareness material on climate change and NDC in the energy sector.								x																							
Activity 1.2 Communicating project results and lessons learned																															
Sub-activity 1.2.1: - Developing a communication and raising	,	1	1	1							1	1		1											1				<u> </u>		- I
awareness/promotion plan for national (and international) investors and	1				x	x	х	х																							
production of materials (including videos)	1																														
Sub-activity 1.2.2 - Organizing information sessions with investors who are																															
already active in the energy/renewable energy sector				x	x		x																								
Sub-activity 1.2.3 - organizing mid-term and end-of-project workshops for national																															
institutions (DNE, AMADER, AER-Mali, FER) to ensure monitoring and document	1									хх				ххх																	
the project experience																															
Activity 1.3 Capacity building of the Rural Electrification Fund (Fonds d'Electrification Run	al -FEF	२)																													
Sub-activity 1.3.1: - drafting of organisational and operational legal provisions as	1		~	~		~	~																								
part of a reform of the FER			^	^	^	^	^																								
Sub-activity 1.3.2 - TA for recruitment of a dedicated staff						x	х	х																							
Sub-activity 1.3.3 - capacity building of the FER staff.									х																						
Activity 1.4 Providing Technical Assistance on procurement and contracting	of min	ni-grid	l cons	tructi	on an	d 0&I	/ com	panie	s							_															
Sub-activity 1.4.1 - TA - writing of standard contract for 15 years O&M and the	1			×	x																										
procedures that set the relations between AMADER and O&M companies				<u>^</u>	<u>^</u>																										
Sub-activity 1.4.2 - tender processes and selection of construction companies	1				х	x	х	x																							
and O&M companies that will operate the mini-grids.	014/51												_																		
COMPONENT 2: DETAILED ENGINEERING AND INSTALLATION OF SOLAR P	OWER		INIG	RIDS																											
Activity 2.1 Preparation of detailed Engineering Studies		1							-	-	1	-	-	1	1		1														
Sub-activity 2.1.1 - Site selection, engineering studies & Specific environmental	1		x	х	х	x	х	x																							
Anticity 2.2. Complex installation and complexication of any import																													_	_	_
Activity 2.2: Supply, Installation and commissioning of equipment		r	1	1	1	1	1			1		-	1	1	1		r	r		-											
Sub-activity 2.2.1 - Solar PV power plants construction and minigrid deployment			<u> </u>	<u> </u>	I	I	I	X	х	х	х			<u> </u>																_	_
Activity 2.3: Implementation of Environmental and social measures			1	1	1	1	1	1	-	-	1		-	1	-				-	1											
Sub-activity 2.3.1 - Project impact mitigation and improvement activities as per	/							x	x	x	x																				
			L	L	I	<u> </u>	I							L				I													
COMPONENT 3: SUPPORT to PRODUCTIVE USE OF ELECTRICITY		-	1	1	1	1	1	1	r	1		1		1	1					I											
Activity 3.1. Operationalisation of Financial guarantee facility			-	-	-		-	-																					_		_
Sub-activity 3.1.1- Implementation of Financial guarantee activities			<u> </u>	<u> </u>	I	I	I	<u> </u>	X	X	х	х	X	X	x	x	Х	Х	Х	X	X	Х	X	X	Х	Х	Х	Х	x	x	X X
Project Management Audit and Reporting			1	1	1	1	1	1	r	-	1	1	-	1	-				-	1							1		<u> </u>	<u> </u>	
	\vdash	x		<u> </u>	<u> </u>	<u> </u>	<u> </u>		I																				\rightarrow	\rightarrow	\rightarrow
Project inception	\vdash		x	ļ			<u> </u>	<u> </u>		-				<u> </u>				L											\rightarrow	\rightarrow	\rightarrow
Annual Report	\square				x		L		x		-		X				x				x				х				x	\rightarrow	\square
Midterm report	\vdash					I							_			x													$ \rightarrow$	\rightarrow	\square
Project Completion Report					<u> </u>		<u> </u>											L	х												
Final Independant Report	1 1		1	1	1	1	1	1	1					1				1													x





D.1. Value Added for GCF Involvement

Energy access and energy savings are key to the development of Mali and in the West Africa region. Given that the energy mix in the target region already heavily depends on fossil-fuel based electricity, further adding high-emission diesel generators to power SMEs is not an option from a climate perspective. Low-carbon energy production can be achieved by scaling up the use of renewable energy resources. GCF for this programme is critically important and it provides significant value-added above the business as usual situation. Funding from government and development partner institutions is not sufficient to meet the vast demand for clean energy access. As a matter of fact, it remains a major challenge throughout West Africa to meet the installing, operating and maintaining cost requirement, not to mention the equally important costs for training and capacity building for local stakeholders, despite the obvious social and environmental benefits of renewable energy solutions.

A key reason to seek GCF financing is to help Mali scale up investment in renewable energy. Without such an incentive, the country would continue to suffer from the slow pace of investment in the renewable sector. GCF financing is critical to allow the successful structuring of finance for this project so as to address some of the barriers as faced by the private sector investors, such as by promoting the establishment of a conducive regulatory framework to encourage private sector involvement in renewable energy investment in Mali. The financing from GCF is expected to help reduce the risks of investment. Concessional financing from GCF can offset the high cost related to the barriers and risks as described in the project FSR.

The Government of Mali has been struggling to mobilize the necessary financial resources. Without GCF financing, the government will have to borrow from financial institutions at market rates, which are still very high considering their capacities, but above all faced with the urgency of the problems to be solved. Hence the need for external support becomes more urgent if community resilience is to be achieved.

Given the large investment needs in the sector, a significant volume of investments into the renewable energy markets is required. Currently, only the GCF is able to provide such finance within the given timeframe. BOAD's strategic objective is to increase its portfolio of investments in the renewable energy sectors, but so far this has been low because of the lack of alternative sources of public sector funding available. The involvement of the GCF is required as it will allow a combination of concessional lending and grant for technical assistance required to achieve the objectives of the project and the consequent paradigm shift in Mali.

D.2. Exit Strategy

The Renewable Energy Fund will be underpinned by a legal framework and an annual budget from Government and will be a real financial institution able to borrow, issue guarantees, build loans, and equity in order to coordinate the mobilization on the international market, of the financial resources necessary to the financing of the investments by the agencies in charge of promoting the energy programs renewable resources.

The projet will build capacity of the national actors (public, private and financing intitutions) engaged in rural electrification and renewable promotion. With enhanced understanding of the RE sectors and their profitability, MFIs are expected to continue providing finance to these businesses even without the project participation. It is expected that there will be a greater demand for financing energy demand projects and that MFIs will start using their own resources for climate lending.



EXPECTED PERFORMANCE AGAINST INVESTMENT CRITERIA



GREEN CLIMATE FUND FUNDING PROPOSAL | PAGE 33 OF 63

In this section, the accredited entity is expected to provide a brief description of the expected performance of the proposed project/programme against each of the Fund's six investment criteria. Activity-specific sub-criteria and indicative assessment factors, which can be found in the Fund's <u>Investment Framework</u>, should be addressed where relevant and applicable. This section should tie into any request for concessionality made in <u>section B.2</u>.

E.1. Impact Potential

Potential of the project/programme to contribute to the achievement of the Fund's objectives and result areas

E.1.1. Mitigation / adaptation impact potential

As mentionned before, traditionally, the growing energy access demand has been met through fossil fuels. This project however provides a total shift in energy production by promoting the use of renewable energy instead of continuous addition of fossil fuel based generation

The project will result in a real and visible paradigm shift inmali Rural electrification towards low-carbon sustainable development. The project directly addresses the second largest-emitting sector in the country – i.e. energy generation – and implements actions specifically recommended in the Nationally Determined Contribution and the Second National Communication to the UNFCCC.

The project is expected to result in direct emission reductions of 41 089 t CO_2 eq/year by installing solar minigrrid in 70 communities of which 32 871 t CO_2 eq/year for 50 communities for Tranche 1.

E.1.2. Key impact potential indicator

Provide specific numerical values for the indicators below.

GCF core indicators	Expected tonnes of carbon dioxide equivalent (t	Annual	41,089 t CO_2 eq (32,871 t CO_2 eq/year for Tranche 1)								
	only)	Lifetime	1,027,227 t CO_2 eq (821,782 t CO_2 eq for Tranche 1)								
	 Expected total number of direct and indirect beneficiaries, disaggregated by gender (reduced vulnerability or 	Total	310,698 (283,777 for tranche 1) (50% women)								
	 increased resilience); Number of beneficiaries relative to total population, disaggregated by gender (adaptation only) 	Percentage (%)									
Other relevant indicators	 Examples include: Expected increase in the number of households with access to low-emission energy: 31 000 (28,778 for tranch 1) 										
Describe th	ne detailed methodology used for calculating the ind	dicators above	Э.								
The methodology chosen is the AMS I.L.											

(<u>https://cdm.unfccc.int/methodologies/documentation/meth_booklet.pdf#AMS_I_L</u>) as approved by UNFCCC CDM Executive Board for CDM projects. It is considered as the most suitable methodology with robust and conservative means to estimate the mitigation impact for this project in Mali, as it provides a solid method for the quantification of the emission reduction outcome and has been approved by a constituent body under the UNFCCC:





- This methodology is applicable to electrification of a community achieved through the installation of renewable electricity generation systems that displace fossil fuel use, such as in fuel-based lighting systems, stand-alone power generators, and fossil fuel based mini-grids.
- This methodology is applicable to greenfield individual, renewable energy system projects or mini-grid activities.
- This methodology is applicable in situations where consumers that were not connected to a national/regional grid prior to project implementation are supplied with electricity from the project activity. It is also applicable to situations where a fraction of consumers that are supplied with electricity from a fossil fuel based mini-grid prior to the implementation of the project are now supplied with electricity from the project activity.
- At least 75 per cent (by number) of the consumers connected to the project renewable electricity generation system(s) shall be households

Baseline calculation

Two parameters are required to be known to determine the baseline:

- The amount of renewable electricity utilized by the consumers served by the project renewable electricity generation systems;
- The number of consumers supplied with renewable electricity by the project activity.

Baseline emissions for the entire project activity are calculated as:

$BE_y = BE_{55,y} + B$	E _{250,} 3	$y + BE_{250 \ plus, y}$	Equation (1)
vvnere:			
BE_y	=	Baseline emissions in year y (t CO ₂)	
BE _{55,y}	=	Aggregate baseline emissions for consumers that cons less than 55 kWh of renewable electricity from project ren systems in year y (t CO ₂)	umed equal to or newable electricity
BE _{250,y}	=	Aggregate baseline emissions for consumers that consurk kWh but equal to or less than 250 kWh of renewable electricity systems in year y (t CO ₂)	med more than 55 tricity from project
BE _{250 plus,y}	=	Aggregate baseline emissions for consumers that cons 250 kWh of renewable electricity from project rene systems in year y (t CO ₂)	sumed more than ewable electricity

Emission reduction calculation:

Emission reductions (ER) = Baseline Emissions (BE) - Project Emissions (PE)

Since project activity uses solar energy, PE= zero, therefore (ER) = BE.

Estimated Power Generation

Communities Type 1	919800	kWh
Communities Type 2	2299500	kWh
Communities Type 3	4730400	kWh
Communities Type 4	2628000	kWh
Total yearly generation	10 577 700	kWh
	10 578	MWh
Estimated Power Distributed	8 991	MWh



Therefore total emission reduction (ER) per year:

		Energy	Emission
Total households	31000	(MWh)	Factor
Proportion of Households that consume less than 55 kWh a year	60%	5394,627	6,8
Proportion of Households that consume less than 250 kWh a year	30%	2697,3135	1,3
Proportion of productive use with consumtion above 250 kWh per year	10%	899,1045	1,0

Emission Reduction = 41,089/year

Lifetime of the sub-projects is 25 years

Total emission reduction (ER) over the lifetime of the projects:

41,089 tCO₂ eq X 25 years = 1,027,227tCO₂ eq

For Tranche 1: ER = 32,871 tCO₂ eq/year, and 821,782 tCO₂ eq for the entire lifetime of the project.

E.2. Paradigm Shift Potential

Degree to which the proposed activity can catalyze impact beyond a one-off project/programme investment

E.2.1. Potential for scaling up and replication (Provide a numerical multiple and supporting rationale)

Mali has over 74% of the population living off-grid and without modern energy access. In the rural areas where this project targets, the proportion of the population without electricity access is 91%. The country has been making a calculated shift of attention to off-grid electrification strategies. In effect, numerous policies and regulations have been developed. Incentives such as customs rebates are in place. However, there has not been significant to-scale investments off-grid.

This GCF project seeks to remove these barriers: it has a dedicated component on institutional & technical capacity building and Technical Assistance. It will support the revision/updating of the mandates of agencies and institutions actively involved in RE. Having had a legacy of not-so-successful off-grid interventions, this project has the ambition to demonstrate working models that factor pertinent factors. The learning sub-component will ensure best practices and lessons are well-documented and communicated effectively to stakeholders in the emerging sub-sector.

The project will develop mini-grids that outnumber the existing installations and represent a significant ratio of the total Installed capacity of Mali. This way, the confidence in the community-run energy systems will rise and thereby permanently change the investment environment.

The project is founded on existing experiences from historic and ongoing projects and programmes. All stakeholders will be involved. It will therefore contribute sound and pragmatic additions and/or amendments to the existing regulatory framework and policies.

The promotion of demand to increase productive uses of renewable energy will demonstrate the competiveness of isolated grids with respect to grid tariffs so as to influence the national tariff regime (for both on-grid and off-grid).

A successful scale up of Mali's rural electrification project combined with the greening of Mali's rural energy mix will provide lessons to be learned and best practices for rural energy agencies in the sub-region in the framework of the African club of rural energy agencies. BOAD is committed to developing a case study replicable in the 8 member countries and across the WAEMU countries.

In Mali, AMADER is the only government authority in charge of rural electrification regulation, setting of policies under the guidance of the Ministry of Energy.

At present the government of Mali is in the process of revising the current regulatory framework







The theory of change of the is described below, based on activities that support enabling environment through strengthening policy regulation and national institutions involved in rural electrification, private sector engagement in clean energy thanks to affordable financing that makes solar investments attractive and viable. The project intervention will result in a paradigm shift in terms of avoiding substantial GHG emissions for the country.







Describe how the project/programme contributes to the creation or strengthening of knowledge, collective learning processes, or institutions.

The project is creating a unique partnership consisting of multiple stakeholders (public, private and NFI) who will work together in a collective learning process. Transfer of expertise and skills is a core objective of this project (component 1). It will mainly benefit local NFI, while potential clients active in promoting sustainable energy will also receive support. In this context, the following learning and know-how transfers and benefits will be achieved:

On the NFI's side, the project will enhance their understanding of evaluating RE investments and change the risk perceptions towards these new financing opportunities.

The project will deliver trainings to public intitutions (AER, AMADER) staff on climate change issues and RE technologies development.

Potential MSME clients will also benefit from technical support on how to structure climate business plans to make them bankable.

E.2.3. Contribution to the creation of an enabling environment

Describe how proposed measures will create conditions that are conducive to effective and sustained participation of private and public sector actors in low-carbon and/or resilient development that go beyond the program.

The project will contribute to creating an enabling environment for RE investments through targeted capacity building, awareness raising activities and connecting a diverse range of private sector stakeholders under component 1. The technical assistance activities will achieve a framework in Mali that enables AMADER to unlock private sector resources on rural electrification activities while also having their participation on O&M activities. This will shift from current paradigm where public and private are competing and pave the way for a PPP model.

It will contribute to structuring the solar based rural electrification market through financial mechanism such as financial guarantee to remove the barrier of lack of a financial service adapted to support Productive Energy Users and de-risk loans demands for rural areas productive users of energy.

E.2.4. Contribution to regulatory framework and policies

Describe how the project/programme strengthens the national / local regulatory or legal frameworks to systematically drive investment in low-emission technologies or activities, promote development of additional low-emission policies, and/or improve climate-responsive planning and development.

GCF financing is critical to allow the successful structuring of finance for this project so as to address some of the barriers as faced by the private sector investors, such as identying and establishing a conducive regulatory framework to encourage private sector involvement in renewable energy investment in Mali. The financing from GCF is expected to help reduce the risks of investment. Concessional financing from GCF can offset the initial high cost related to the barriers and risks as described in the project FSR.

The current regulatory framework allows concession agreements; however, this was never operationalized at scale. The standard O&M contracts will contribute to the regulatory environment by setting a framework that can be replicated and which operationalizes the regulation.

This project will contribute to having a fully functional rural electrification agency in place and produces contracts and supervision reports in line with industry standards.





E.3. Sustainable Development Potential

Wider benefits and priorities

E.3.1. Environmental, social and economic co-benefits, including gender-sensitive development impact

The environmental and social benefits, including gender-sensitive development impacts are as follows: Environmental cobenefits:

- reduction of air pollution due to fossil fuel consumption and improvement of air quality thanks to promotion of renewable energies;
- reduction of greenhouse gas emissions;
- reduction of pollution by waste oils at thermal power plants;

Socio-economic and gender-sensitive development impacts

- increased socio-economic activities,
- Improvement of the health and hygiene conditions of local populations;
- Improvement of the living conditions and comfort of local populations;
- access to public lighting and improvement of security conditions;
- increase in the duration of supply of electricity;
- increase of the service and the access rate for the safety of people and goods;
- better conservation of pharmaceutical and food products;
- improvement of the permanent drinking water supply of the populations;
- lightening women's work,
- improvement of household income levels and creation of income-generating activities;
- improvement of the literacy rate;
- development of the emergence of manufacturing and processing industrial units;
- opportunity for local people to benefit from capacity building actions.
- The focus on gender in ownership and management of the energy services centres will ensure inclusion of all gender and youth. So the improvement of livelihoods and other development benefits will be shared fairly.

E.4. Needs of the Recipient

Vulnerability and financing needs of the beneficiary country and population

E.4.1. Vulnerability of country and beneficiary groups (Adaptation only)

Describe the scale and intensity of vulnerability of the country and beneficiary groups, and elaborate how the project/programme addresses the issue (e.g. the level of exposure to climate risks for beneficiary country and groups, overall income level, etc).

In Mali, most of the energy supplied comes from biomass (78%). It represents the largest source of energy for the majority of the population, while fossil fuels contribute 21% of the energy supply and 1% hydroelectricity (excluding electricity trade). All of these factors are vulnerable to climate and economic shocks. Due to the impacts of climate change, such as drought and decreasing rainfall, wood energy is suffering from increasing cutting, soil degradation, etc., and the hydroelectricity of the energy deficit, water for its operation. As for fossil fuels, their fluctuations strongly impact Mali's trade balance, which imports all its consumption. This situation of poverty is accentuated in rural areas which use mainly biomass.





Mali is particularly vulnerable to climate change. The most plausible scenarios foresee a rise in temperatures and a decrease in precipitation in all the localities of the country, with possibly serious repercussions on agriculture, forests, health, energy and water, among others. According to the National Adaptation Program of Action (NAPA) Mali, energy is considered one of the sectors requiring urgent adaptation measures to climate change. In terms of vulnerability, climate variability particularly affects the hydroelectricity subsector. Under the climate scenario developed under the NAPA, a 1% drop in flow would result in a 1.3 million kWh reduction in electricity generation. In particular, the mitigation of the impacts of climate change on hydroelectric production and biomass production will be at the heart of any strategy for energy development and poverty reduction.

The majority of the population of Mali (about 64%) lives in rural areas but the urban population is growing at a constant rate of 5% per year. This demographic growth is a major concern for the future of the country because it implies a sharp increase in basic needs, in particular energy. Mali's economy is dominated by the primary sector, which contributes to 36.5% of GDP and employs almost 85% of the working population. The electricity and water subsector contributes to 1.91% of GDP. Mali imports all of its fossil fuel needs, making it highly sensitive to price volatility.

The results of the Survey of Consumption, Praetorship and Welfare of the National Institute of Statistics of Mali reveal an incidence of poverty estimated at 11.1% in Bamako against 46.6% and 52 respectively, 8% in other cities and rural areas.

This level of poverty accentuated the vulnerability of rural communities through the following factors:

- At the level of education, the literacy rate in relation to the 15-year poverty level in rural areas is 17.9% compared with 52.3% in Bamako and 44% in other cities;

- at the health level, because of the costs deemed too high by the poor (74.9%), they are consulted by traditional healers or community health centres that do not have sufficient resources,

- at the level of access to energy, 92% of poor rural households use wood as a source of cooking and only 23.3% have access to electricity compared to 74% of poor households in Bamako.

E.4.2. Financial, economic, social and institutional needs

Economic co-benefits

The project will create 600 permanent jobs when fully implemented and another 1,500 temporary jobs during the construction period. With the skills attained from the installation period, the temporary workers will be available for similar subsequent projects in the localities with the most need.

Assuming each site would be the equivalent of a 20kVA diesel generator, an all RE system would avoid 21,000 litres of diesel annually. This translates to 1,470,000 litres annually. This would save the country upwards of EUR 13,41 million annually. This would in turn improve the fiscal balance.

Social co-benefits

The absence of modern energy hinders community development; climate change complicates the situation. Poor lighting & indoor air pollution increases the prevalence of health complications including respiratory tract infections and heart complications (16,900 people die in Mali annually due to indoor air pollution, WHO, 2012), which dramatically reduce life expectancy and strain the national health budget.

The introduction of modern energy in the rural communities will lead to various social benefits including:

- better social services such as medical services and education
- increased safety in communities following the introduction of street/public lighting
- better health of especially women and girls following improved indoor lighting and decreased air pollution; as well as reduced distances to cover in search of energy services and/or resources
- better sanitation and increased availability of clean safe drinking water





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Increased access to and improved use of basic social services, such as education and health care (lighting/heating/cooling of schools and health centers through solar panels), and increased access to water in rural areas (through solar PV pumping systems). Solar home systems also prevent health issues related to indoor use of firewood and improve household safety by decreasing domestic accidents caused by candles and kerosene lamps.

E.5. Country Ownership

Beneficiary country (ies) ownership of, and capacity to implement, a funded project or programme

E.5.1. Existence of a national climate strategy and coherence with existing plans and policies, including NAMAs, NAPAs and NAPs

Please describe how the project/programme contributes to country's identified priorities for low-emission and climateresilient development, and the degree to which the activity is supported by a country's enabling policy and institutional framework, or includes policy or institutional changes.

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).

BOAD has a strict focus on ensuring that not only do countries own and lead all projects financed but also that the beneficiary community needs drive the choice of interventions. This project will take this approach ensuring that communities have full control of the systems created while at the same time supporting the country to have a proper policy environment for this and similar projects in future to thrive.

Mali's NAMA aims at reduction of GHG emissions by 1,285,034 tCO2 per year through renewable energy production (e.g. with hydro, wind, biomass and solar PV). The UNFCCC lists of 19 priority projects in Mali contains 2 projects that are directly related to this GCF project: Contribution to barrier removal for the promotion of the use of solar energy in Mali, and promotion of income-generating activities and development of mutual assistance.

Mali's National Adaptation Programme of Action, completed in 2007, identifies Agriculture and Health as the most vulnerable sectors, followed by Fisheries, Energy and Water Resources.

Implementing these mitigation and adaptation activities are slower than desired because of various constraints include absence of capital and weak institutional capacity and experience. However, the country has instituted the agencies and structures required for actualisation of these climate action plans/strategies.

E.5.2. Capacity of accredited entities and executing entities to deliver

Please describe experience and track record of the accredited entity and executing entities with respect to the activities that they are expected to undertake in the proposed project/programme.

Please refer to section C4 for information about the Executing Entity and Responsible Parties

The West African Development Bank (BOAD) is the common development finance institution of the member countries of the West African Monetary Union (WAMU). It was established by an Agreement signed on 14 November 1973, and became operational in 1976. Member countries include Benin, Burkina, Côte d'Ivoire, Guinea Bissau, Mali, Niger, Senegal, and Togo.

BOAD is an international public institution whose purpose, as provided under Article 2 of its Articles of Association, is to promote the balanced development of its member countries and foster economic integration within West Africa by financing priority development projects





The Bank's financial support has made it possible not only to increase power generating capacities in the member countries, but also to erect more than 3,527 km of interconnection lines among them, and to reinforce as well power generation, transmission and distribution facilities on the interstate grids for a nominal power of over 1,350 MW.

As at 30 September 2016, the aggregate amount of funding provided by the Bank in the energy sector stood at XOF 863.9 billion excluding the Energy Development Fund

- BOAD provides financial assistance to WAEMU member countries to support their development efforts. Such assistance targets various areas, including the organization of workshops, conferences or seminars, the training of government officials and the implementation of social projects.
- The Bank also grants interest rate subsidy for non-commercial public sector loans to member countries. Also, BOAD participates in various roundtable meetings with a view to financing national development programmes in the member countries.

E.5.3. Engagement with NDAs, civil society organizations and other relevant stakeholders

During project preparation, several project stakeholders were consulted on the basis of the potential impacts analyzed in order to gather their points of view. The consultations took place from 02 to 17 May 2018 in the regions of Sikasso, Segou, Koulikoro and Kayes. They mainly concerned local elected representatives, civil society actors and local populations. The methodological approach adopted is the participative approach: meeting information, exchange and discussion around the project. The exhaustive list of the villages consulted and persons met is in Appendix.

Key points discussed

To collect the population opinions, the following points were discussed after presentation of the project by the consultant.

- Possible sites for the implementation of equipment;
- Advantages of such a solar equipment project for them;
- Special concerns or possible fears for a successful project;
- Experiences or have they heard about this kind of solar electrification projects;
- Project benefits for village women and youth;
- Training needs for equipment maintenance or other;
- Suggestions and recommendations for the project.

Furthermore, the national regulator for rural electrification (AMADER) and the the Private operators' organization were fully engaged. The 20% of investment cost as parallel financing demonstrates strong support from the private sector for the proposed project.

NDA was also engaged and provided no-objection letter (see appendix)

E.6. Efficiency and Effectiveness

Economic and, if appropriate, financial soundness of the project/programme

E.6.1. Cost-effectiveness and efficiency

Describe how the financial structure is adequate and reasonable in order to achieve the proposal's objectives, including addressing existing bottlenecks and/or barriers; providing the least concessionality; and without crowding out private and other public investment.

Component 1 (capacity building) is not revenue-generating in any meaningful sense.





Component 2 has revenue-generation aspects. Therefore, detailed financial and economic analyses have been conducted.

The GCF support to component 3 (financial guarantee mechanism) is designed to ensure that productive use for electricity is implemented and therefore there is enhancement of the consumers' ability to pay when generating income with electricity, and as a consequence there is an enhancement of the commercial viability of mini-grids, which as a consequence results in GCF investment being more sustainable

The GCF grants will be augmented by considerable loans provided as co-finance by BOAD. Therefore, the project is proposing a package for investors consisting of a mix of grants, BOAD loans.

E.6.2. Co-financing, leveraging and mobilized long-term investments (mitigation only)

Please provide the co-financing ratio (total amount of co-financing divided by the Fund's investment in the project/programme) and/or the potential to catalyze indirect/long-term low emission investment.

Co-financing details are provided in Section B.2.

The co-financing ratio of the entire project is 3:1. The private sector's contribution to the investment for the assets is 20%. If further investments in renewable energy as a result of creating an enabling environment through institutional capacity building and technical assistance are taken into account, then the co-financing ratio, including leveraged funds from private investors for another 10.000 off-grid rural communities will be much higher.

E.6.3. Financial viability

FINANCIAL ANALYSIS OF THE PROJECT

Methodology and assumptions

The criteria used is the cost price per kWh and the valuation is made on constant basis. The study covers a period of 15 years of operation. It was considered a unique model for financial analysis, corresponding to the electrification of new localities by a system including a photovoltaic solar field and a low voltage mini grid. The methodology used is the computation of expected cost of operating the mini photovoltaic power plants compared to the use of thermal production source of isolated plants of private operators in rural areas. Thus, a cost per kWh was calculated taking into account the cost of the project's power plants and mini grids over their entire life cycle (construction, operation, maintenance and renewal) in relation to the net quantity of power produced over the same period.

Therefore, the financial projections of the model used were based on the following assumptions:

- that the facilities start operating from 2021 and their technical lifetime is 30 years for the photovoltaic solar field and the mini-grids;
- that battery and inverter life is 8 and 15 years, respectively;
- that depending on the size of villages, four (04) types of solar power plants shall be considered: 30 kWp, 50 kWp, 80 kWp and 150 kWp;
- the various photovoltaic solar fields have a total power of 4 830 kWp;
- total annual production is estimated at 14,103,600 kWh;





- that the price of electricity is EUR 0.24/kWh (XOF156 FCFA/kWh) to which will be added a levy of EUR 0.02, leading to a tariff of 0.26 (XOF 174/kWh);

- that photovoltaic fields will run for 8 hours and batteries for 6 hours;

- that the operating costs of photovoltaic fields and mini distribution grid are 10% of sales turnover;
- that the maintenance cost of photovoltaic fields and mini distribution grid is estimated at 3.5% of the turnover of the power sold;
- that the cost of facilities is XOF10.8528 billion for the hybrid solar systems (photovoltaic solar field + mini grids + connections + batteries + inverters + spare parts + training);
- the average cost for the transmitting of power from isolated plants operated by private operators in rural Mali is about 350 CFA Francs/kWh;
- that the periodic expenses for replacing defective equipment are estimated at XOF5.423 billion for batteries;
- that the operating period of the project extends from 2021 to 2035 and the residual value of the investments amounts to XOF6.58 billion for the photovoltaic solar fields and the mini-grids.

Tariff per kWh

The above assumptions show that the tariff will be EUR 0.26 (XOF 174 /kWh) against an average (current) cost of XOF 235 /kWh for isolated groups (from private operators' generating park) supplying some villages far from the electricity grid.

Financial viability for operators

Based on these assumptions, and considering the private operators' contribution being 20% of the assets value, the project IRR at an electricity price of XOF 156/kWh would be 18%.

Economic analysis of the project

Methodology and assumptions

The criteria used for economic appraisal of the project is the Economic Rate of Return (ERR) determined according to the economic costs and benefits method. It has been retained that the economic costs are equal to 85% of the financial costs to take into account the transfers contained in the costs excluding taxes. The assumptions for computing the economic benefits are same as those set out in the project financial appraisal. However, for economic analysis, the cost used is 85% of the total investment cost.

Economic Rate of Return

Based on the above assumptions, the project's economic rate of return, presented in Annex Excel spread sheet, is





16.61%.

Sensitivity tests

The sensitivity test of the project is based on assumptions of a 10% increase in investment costs, a 10% decrease in benefits and a one-year delay in project execution. The results are as follows:

	Project	10% increase in investment costs	10% decrease in benefits	a one-year delay in project execution
ERR	16.61%	16.00%	15.82%	15.98%

The appraisal shows that the ERR is appreciably high, which confirms the economic viability of the project. However, the AER-Mali will have to ensure that deadlines are respected when executing the project and the Consulting Engineering Firm and companies are recruited on time in order to guarantee the beneficiary populations all the benefits thereof.

Financial viability for operators

The government is the borrower of GCF proceeds and will use the proceeds as 80% subsidies to the mini-grids, through construction. Private sectors operators will be selected based on 20% equity contribution. The financial analysis gives a return of 18% to the operators, based on their 20% expected contribution.

E.6.4. Application of best practices

A solar photovoltaic (PV) micro-plant comprises four large parts; namely: i) the solar field; ii) the storage system; (iii) the regulatory system; and iv) the conversion system.

Regarding the solar field, there are four (04) types of solar panels: flexible, amorphous, monocrystalline and polycrystalline.

- Flexible solar panels: These panels are designed for so-called nomadic applications: to charge mobile devices, camping, hiking, boating. The average yield is about 9%;

- The amorphous solar panels: These panels have the palm of the report quality / price; they work very well even with a weak luminosity. The average yield is about 7%;

- Monocrystalline solar panels: These panels are currently the most on the photovoltaic market, they are real generators of energy by any time. The average yield is between 18 and 21%;

- Polycrystalline solar panels: These panels are used when direct sunlight is guaranteed, they are generally used to create large photovoltaic plants. The average yield is about 15% to 18%.

The tender will look for crystalline panels.

As far as storage is concerned, there are several types of batteries, the main ones being acid lead, nickel-cadmium and Silicuim batteries.

E.6.5. Key efficiency and effectiveness indicators								
GCF core indicators	Estimated cost per t CO_2 eq, defined as total investment cost / expected lifetime emission reductions (mitigation only)							





(e) Estimated GCF cost per tCO ₂ eq removed (e = b / c)	EUR 31.6/ tCO₂eq
(d) Estimated cost per tCO ₂ eq (d = a / c)	EUR 41.7 / tCO₂eq
(c) Expected lifetime emission reductions overtime	821,782 tCO ₂ eq
(b) Requested GCF amount	EUR 25.97 million
(a) Total project financing	EUR 34.25 million

By the end of the project, 224,776 MWh will have been consumed, or 8 991 MWh per year over the expected life of 25 years of equipment. This scenario does not include any allocation for additional minigrids that could be installed over the life of the project taking advantage of the momentum created by the project.

Thus, in the framework of the hypothesis of a strong interest aroused for the solar-based mini-grids for rural electrification in connection with the execution of the projects and taking into account the favorable environment for the investment that the project will have created, it is highly likely that more mini-grids of this type will be built during the 10-year period after the project, exceeding several times the number installed during the project implementation period. This is especially true given the donor's interest in promoting scaling up in the event of successful results under this project.

Thus, indirect emission reduction estimates after the project, based on the conservative scenario of the status quo and a causal factor of 80% considering 10,000 villages to be electrified in Mali, may be of the order of magnitude 117 397 359 tonnes of CO2 avoided. In total, the project will have contributed to 118 424 586 tonnes of CO2 avoided.

The project is considered to be highly cost-effective, providing 1 027 227 tCO2eq of emission reductions and 821,782 tCO₂eq for tranche 1 at a cost to the GCF of EUR 31.6/tCO2eq. This is considerably lower than the social cost of carbon estimated as approximately USD 40.

Expected volume of finance to be leveraged by the proposed project/programme and as a result of the Fund's financing, disaggregated by public and private sources (mitigation only)



EXPECTED PERFORMANCE AGAINST INVESTMENT CRITERIA



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				_				1			
				T	ranche 1						
	Component	Activity	Indicative cost	GCF fu	nding	BOAD C	o-financing				
	Component		EUR	EUR	Financial instrument	EUR	Financial instrument				
		Activity 1.1 Training, raising awareness of stakeholders and dissemination of project activities/results Activity 1.2 Communicating	164,645	164,645							
		project results and lessons learned	164,645	164,645							
	1. Capacity building of rural electrification institutions and Technical Assistance	of the Rural Electrification Fund (Fonds d'Electrification Rural -FER)	98,787	98,787	Grant		-				
		Activity 1.4 Technical Assistance on regulatory framework and on Procurement and Contracting of minigrid construction and O&M companies	59,272	59,272							
		Activity 2.1 Preparation of detailed Engineering Studies	853,214	853,214	Grant		-				
	2. Detailed Engineering and Installation of solar powered mini−grids	Activity 2.2 Supply installation and commissioning of equipments	31,007,376	22,821,475	Loan	7,891,892	Loan				
		Activity 2.3 Implementation of environmental and social measures	294,009	-	-	294,009					
	3. Support to Productive Use of Electricity	Activity 3.1 Financial guarantee	1,500,000	1,500,000	Loan		-				
	Project Management Cost		404,269	306,575	Grant	97,694	Loan				
	Indicative total cost		34,252,208	25,968,612		8,283,595					
	The private sector will provide additional EUR 8.5 M at the whole project level and EUR 6.2 M for Tranche 1 as paral which corresponds to 20% of the investment for the installation of the minigrids.										
	Actor Amount (EUR)										
	GCF		25.9 M								
	BOAD		8.3 M								
	Private sector					6.2 M					
	(Additional Parallel financing (20% of assets investment))										
Other releva	ant indicators (e.g. estim	ated cost per co-benel	fit								
generated a	as a result of the project/	programme)									

* The information can be drawn from the project/programme appraisal document.





Methodology and hypotheses

The criterion used for the economic analysis of the project is the economic rate of return (ERR) determined according to the cost-benefit method. It has been assumed that the economic costs are equal to 85% of the financial costs to take into account the transfers contained in the pre-tax costs. The assumptions used to calculate the economic benefits are the same as those described in the financial analysis of the project. However, for the economic analysis, the cost is 85% of the total cost of investments.

Economic rate of return

On the basis of the above assumptions, the economic rate of return of the project, presented in Annex 13, amounts to **16.61%**.

Financial viability for operators

The government is the borrower of GCF proceeds and will use the proceeds as 80% subsidiesgrant to the mini-grids, through construction. Private sectors operators will be selected based on 20% equity contribution. The financial analysis gives a return of 18% to the operators, based on their 20% expected contribution.

F.2. Technical Evaluation

Component 2: Detailed Engineering and Installation of solar powered mini-grids

For each of the localities selected, the acquisition, installation and commissioning of the following equipment: (i) autonomous solar power plants of 30, 50, 80 and 150 kWp power with storage systems; (ii) low and medium voltage networks of respective lengths 5, 8, 10 and 12 km; (iii) 14,189 prepaid meters; (iv) domestic electrical installations of households; (v) civil engineering of buildings; and (vi) 10 autonomous solar street lighting systems.

F.3. Environmental, Social Assessment, including Gender Considerations

The project is classified in Category B, according to the BOAD classification, as a project for installation and production of renewable energy. In practice, for projects with multiple sites and where the exact location of the sites is unknown, an ESMF is developped.

Locations and scope of the environmental and social impacts for each minigrid will be determined during the project execution based on a screening process will be undertaken according to the guidelines provided in the ESMF. For such small scale minigrids, there is no need for a fully detailed ESIA, since the overall project is categorized medium risk (B).

The sites of mini solar power plants will not affect protected areas and reserves because they will be located at the village level; and in general protected areas and reserves are far from the villages. Besides, the project sites will be set up so as not to displace populations or destroy economic assets. The beneficiary communities will provide small sites in villages for small scale solar plants as their contribution to the project. There is no need for resettlement plan since there will be no resettlement. So PS5 will not be triggered. PS 7 does not apply for there is no indigenous as defined by the World Bank Group's policy, on which those of BOAD and GCF are based, in the project area. Furthermore, PS8 does not apply too for activities related to such small isolated solar PV systems' construction will not need great excavation and there will be no potential risk for cultural heritage degradation in beneficiaries' communities.

A simplified E&S analysis is sufficient as per BOAD ESS. Required studies (ESIA/analysis) will be realized when specific site is identified before installation of the minigrids. The ESIA documents for subprojects will be disclosed locally in the local administrative buildings (townhall, and local chief offices).





Environment and Social Management Framework (ESMF) and the Gender Assessment and Action Plan documents were prepared and are attached to this Funding Proposal and also published in both English and French under the links provided bellow as a Category B project:

English:

- Parent link to the document on BOAD web site: https://www.boad.org/en/environmental-and-social-assessments/
- Direct link to the document on BOAD website: <u>https://www.boad.org/wp-content/uploads/2016/10/ESMF_Report_Mali_EN.pdf</u>

French:

- Parent link to the document on BOAD web site: <u>https://www.boad.org/evaluations-environnementales-et-sociales/</u>
- Direct link to the document on BOAD website: https://www.boad.org/wp-content/uploads/2016/10/Rapport_CGES-PERS-Mali_FR2.pdf

A certification letter has been issued following the national validation of the ESMF which stands for the environmental permit. (Please see letter attached).

Potential impacts and risks of the project

The major potential positive impacts of this type of project relate to i) the creation of jobs for the realization of the works; (ii) improvement of land-use planning; (iii) development of rural entrepreneurship through access to electricity; (iv) improving the conditions of care in social structures (health centers, education, etc.); (v) improving the security of goods and people through public lighting; (vi) reduction of greenhouse gas emissions per kWh produced; and (v) strengthening the resilience of populations to the adverse effects of climate change.

Regarding gender aspects, access to electricity in rural areas will save time on domestic chores to which women are subjected, eg. thanks to the installation of electric mills, and electric water pumps. This time-saving can be devoted to the development of income-generating activities (IGAs) and the schooling of the girl, which will contribute to strengthening women's empowerment and their participation in the country's development. In addition, the availability of electricity will improve the functioning of social services for women (eg ease of deliveries during the night), etc.

The main risks and potential negative impacts are related to the phase of the works: (A) on the biophysical environment, i) the deterioration of air quality and the pollution of soil and surface water; (ii) noise pollution caused by machinery traffic and site-level activities; iii) the destruction of vegetation and wildlife habitats; and (iv) waste generation at worksites; (B) on the human environment; (i) the spread of STIs due to the arrival of foreigners in villages and unprotected sex; (ii) accidents during brushing, installation of equipment and drawing of power lines.

During the operation phase of the project, there are risks of: i) accidents by electrocution of workers responsible for the maintenance of equipment and populations; (ii) fire related to the use of hydrocarbons at the sites; and (iii) lack of management of waste electrical and electronic equipment (WEEE) from batteries and photovoltaic panels.

Mitigation measures for Project activities

For the most part, the significant negative impacts can be greatly reduced with the application of (i) appropriate planning measures (good implementation and landscape integration of equipment); (ii) environmental and social clauses relating to safety, hygiene, the management of solid and liquid waste (batteries and used oils) during the construction and operation phases.



F

The coordination of the implementation of these measures will be the responsibility of the AER. To this end, under its Environmental and Social Management System (ESMS), AER will develop an appropriate policy, environmental and social guidelines, and will have an Environmental Specialist to lead the planning and environmental monitoring of projects. rural electrification. In the context of this project, the Environment Specialist will be responsible, among other things, for (i) support for the selection of sub-project sites in accordance with BOAD's land acquisition policy; (ii) the development of Terms of Reference (TORs) and the conduct of the consultant recruitment process for specific environmental assessments, as appropriate; (iii) monitoring the integration of the environmental and social clauses in the DAO, and the examination of the E & S aspects of the companies' offers; and (iv) coordinating the development of EHS manuals and organizing OSD training sessions in environmental monitoring and collaboration and monitoring the implementation of mitigation measures at the construction phase.

As part of the environmental monitoring of the project, an agreement will be signed with the the National Directorate for National Directorate for Sanitation and Pollution Control (DNACPN), and capacity building sessions will be organized for the different actors involved in the project.

Gender considerations

The project is linked to national and international framework documents and policies for the promotion of gender equality, the national gender policy and the SDGs provide for an important place for the implementation of projects in the field of energy and solar energy as a means of promoting gender equality. as well, gender is mainstreamed in particular project context analysis, objectives and results definition, activities and indicators determination. In this case, women and men are part of the project implementation. In the impact analysis, women and men are equaly addressed and it shows that the project will have positive impacts for both women and men. Among the positive impacts, there are (i) the increase in socio-economic activities, the improvement of the health and hygiene conditions of local populations; (ii) the improvement of living conditions and the comfort of local populations; (iii) improving the permanent supply of drinking water to the population, (iv) the reduction of women's labour, (v) the improvement of the literacy rate, etc. To alleviate potential negative impacts, measures have been taken to benefit men and women. Above all, a gender action plan has been draft to higlight gender consideration in the project. The purpose of this gender action plan is to mitigate gender risks and constraints and to operationalize opportunities for women and men identified during the gender analysis. Base on a participative diagnostic, the plan includes (i) gender-responsive actions that address and strengthen the voice and agency of vulnerable women and men in climate action; (ii) gender performance indicators and sex-disaggregated targets that can be incorporated into a results framework; and (iii) presentation of genderresponsive development impacts. Consultations to date with stakeholders such as the EAR, AMADER, local authorities and beneficiaries have revealed the needs and priorities of men and women in the renewable energy sector, and the way in which whose project will respond to it. These elements are taken in consideration in priority as actions and presented in the gender analysis; and it is on this that actions have been proposed jointly with beneficiaries in view of a greater relevance of these actions proposed in this plan. These actions are concretely related to (i) Stakeholders' Institutional and organizational governance capacity strengthening, (ii) Improving rural women accessibility to offgrid/mini grid mode based on renewable energies (solar PV, wind), (iii) Supporting beneficiary communities, and (iv) Communication and capitalization on gender best practices and approaches in gender mainstreaming and scaling up.

At the end of the project implementation, a capitalization study will show results, changes, impacts, good approaches and best pratices in gender promoting in energy and solar domain. The gender focal point of AMADER is chosen as the gender staff to be part of the implementing staff to ensure gender mainstreaming during the implementation, reporting, evaluation, and to take the lead on all the works. This gender staff will have the technical assistance of the AE gender Expert in this work.

The gender action plan in annex gives more information on gender considerations in the project.

F.4. Financial Management and Procurement





The provision of the BOAD loan will be made either by direct payment to the suppliers (BOAD / I procedure), according to the schedule of payment provided for in the contract and at the express request of the Borrower, or on reimbursement of the expenses made according to the BOAD / II procedure.

Goods, and services financed from the GCF loans and the BOAD Loan will be acquired by:

- limited consultation after expression of interest for sub-components "Training, awareness raising and dissemination of knowledge", "RMF capacity building" and the "Financial mechanism to support the rural electrification market", component
- international call for tenders for the components "setting up an equipment control system", "supplies, installation and commissioning of equipment";
- open consultation on a UEMOA scale of specialized design offices for the realization of the sub-components "control and inspection of works", "Technical and financial audit of the project;
- National call for tenders for the "Environmental and Social Measures" components and the "Procurement of 03 vehicles" for the "Project Management" component;
- direct agreement with AMADER for monitoring the implementation of the ESMP of the "Environmental and Social Measures" sub-component;

Procurement

To ensure that financing is applied in ways that adequately secure the BOAD's mandate while maximizing development effectiveness, the Bank encourages and promotes sound, fair, transparent and well performing procurement systems.

BOAD's Guidelines for procurement of consultancy services financed by a loan or advance of funds (2016); and Guidelines for the award of works contracts, goods and services (other than consultancy services) (2016) will be applied to the project's procurement.

The bank will conduct an analysis of the procurement files and give its no objection.

AML/FT Due diligence

As part of the prevention and fight against money laundering, BOAD has developed a Financial Security Policy (2016). This internal document constitutes the general framework of the control system covering all of BOAD's activities relating to the prevention, surveillance and management of money laundering and terrorist financing risks.

BOAD's Financial Security Policy is inspired by the international standards defined by the United Nations through its specialized structures, the Organization for Economic Cooperation and Development (OECD) whose recommendations are issued by the Groupement d ' International Financial Action (FATF) and provisions of Directive 02/2015 / CM / UEMOA of 02 July 2015 on the fight against money laundering and terrorist financing in the Member States of the Economic and Monetary Union. West African currency ("WAEMU Directive").

The policy requires to disclose information about its clients' transactions to the relevant authorities in cases where international rules and local law require regulated financial institutions to do so, including with respect to against money laundering.





Under its due diligence, the Bank will assess civil / criminal and regulatory antecedents and sanctions lists. The Bank conducts also administrative investigations into corruption, fraud, coercion, collisions and inconvenient practices, and make use of the relevant national authorities for the necessary criminal investigations.

The Bank integrates measures to combat illicit financial flows, the fight against money laundering and terrorist financing in the internal operations of the Bank Group.

In the context of this project, concerning ALM/FT, the concerned stakeholder will:

- ensure that the funds financing the Project are not of illicit origin and in particular are not related to fraud against Mali's financial interests, corruption, organized criminal activities, terrorism or drug trafficking; and

- forward to the Bank without delay any information raising suspicions as to the unlawfulness of the sums invested in the company and in the Project;

- notify the Bank without delay if it has known at any time of any information indicating the illicit origin of all or part of the funds of the structure;

- will not enter into a business relationship, directly or indirectly, with persons or entities on the lists established by the United Nations Security Council or its committees pursuant to Security Council resolutions, by the Council of the European Union in application of its Common Positions and / or by the African Union as well as any other relative or complementary resolution and any act of implementation thereof in connection with the fight against the Laundering of Capital and the financing of terrorism.

AUDIT

Audits will be undertaken in accordance with BOAD Guidelines for Financial Reporting and Auditing of Projects. The Financial Agreement with Mali will require the submission of Audited Financial Statements to BOAD within six months after each year-end. An independent external auditor will be recruited based on Terms of Reference acceptable to the Bank (not later than four months after effectiveness) for the entire duration of the project. The Financial Statements will be audited in accordance with international auditing standards.

BOAD will prepare a Management Letter to provide observations, comments, and recommendations for improvements in accounting records, systems, controls and compliance with financial covenants in the Financial Agreements. The cost of the audit will be met from project resources.

BOAD will ensure KYC standard due diligence process including anti-money laundering and other evaluations of sponsors is followed thoroughly.





G.1. Risk Assessment Summary

The main risks identified are related to the failure that could occur in the realization, project management and operation of equipment to be acquired under the project.

Risks in a project could be determined at a planning stage or during project implementation. However so, the foresee risks seems modest and could be managed through preventive measures and complementary BOAD programs such as

- 1. Construction risk: Failure in the installation of equipments of the mini-grid plants. This will be mitigated by applying best practices in the selection process.
- 2. Environmental and social risk (site-specific): This is mitigated as described in the ESS report.
- 3. Operating and maintenance Risk: This will be mitigated by the choice of quality equipments at construction
- 4. Regulatory Risk: This is mitigated by implementation of component 1 Technical Assistance activities
- 5. Currency exchange Risk: this is mitigated since by allowing 20% deposit in local currencies
- 6. Country security Risk

G.2. Risk Factors and Mitigation Measures

Please describe financial, technical and operational, social and environmental and other risks that might prevent the project/programme objectives from being achieved. Also describe the proposed risk mitigation measures.

Selected Risk Factor 1

Description	Risk category	Level of impact	Probability of risk occurring
Construction risk: Failure in the installation of equipments of the mini-grid plants	Technical and operational	Low (<5% of project value)	Low
Nitigation Maggura(a)			

Mitigation Measure(s)

This risk will be mitigated by applying best practices in the selection process. Indeed, this risk is mitigated by the arrangements made for the choice of high-performance companies and the quality of the technical teams of the AER, supported by the Consulting Engineers' offices, which have proven references for the control and supervision of similar works.

Selected Risk Factor 2			
Description	Description Risk category Level of impact		Probability of risk
·			occurring
Environmental and social risk (site-specific)	Social and environmental	Low (<5% of project value)	Low
Mitigatio	n Measure(s)		
The Environmental and Social Management Framework All sub-projects will be assessed according to the relev plan (ESAP) will be developed during the implementation	(ESMF) for the rant BOAD policion on of the project.	project has been de es, and an environn The project ESAP w	veloped and submitted. nental and social action <i>i</i> ill be an integral part of
the required agreement with the project developers. B	OAD will apply	its highest standard	s in the screening and



RISK ASSESSMENT AND MANAGEMENT GREEN CLIMATE FUND FUNDING PROPOSAL | PAGE 53 OF 63



managing of E&S related issues. The framework targets only small-scale projects and the sites will be multi-location, which will reduce the overall E&S risk. Selected Risk Factor 3 Probability of risk Description Risk category Level of impact occurring Operating and maintenance Risk Medium (5.1-Technical and 20% of project Medium operational value) Mitigation Measure(s) The operation and maintenance of a solar based mini-grid systems is relatively simple as it consists of cleaning, regular inspections, minor repairs and measurements, data verification, reporting and site security. The Project benefits from a 15-year Operation & Maintenance (O&M) Agreement. A performance bond will be made available by the operator for failure of the plant to achieve performance guarantee. Furthermore, this risk will be mitigated by the choice of quality equipments at construction. **Selected Risk Factor 4** Probability of risk Description Risk category Level of impact occurring Medium (5.1-Technical and 20% of project Medium **Regulatory Risk** operational value) Mitigation Measure(s) This is mitigated by implementation of component 1 Technical Assistance activities. Selected Risk Factor 5 Probability of risk Description Risk category Level of impact occurring Currency exchange Risk: Medium (5.1-Financial 20% of project Low value) Mitigation Measure(s) Project financing will be in EUR. This risk is therefore mitigated given the stowage of the EUR to the XOF. Selected Risk Factor 6 Probability of risk Description Risk category Level of impact occurring Social and Low (<5% of Country security Risk Medium environmental project value) Mitigation Measure(s)





The security situation which used to be fragile has improved. Despite a difficult security past, medium term macroeconomic prospects are good with overall growth forecast of 5% in 2017. This important factors can positively contribute to a consolidation of Mali political situation and secure stability in future. In fact it is expected that with the secure and wider access to clean energy services, economic activities will further emerge and the society feeling much safer.

Other Potential Risks in the Horizon

Please describe other potential issues which will be monitored as "emerging risks" during the life of the projects (i.e., issues that have not yet raised to the level of "risk factor" but which will need monitoring). This could include issues related to external stakeholders such as project beneficiaries or the pool of potential contractors.





H.1. Logic Framework.

Please specify the logic framework in accordance with the GCF's Performance Measurement Framework under the Results Management Framework.

H.1.1. Paradigm Shift Objectives and Impacts at the Fund level ⁶						
Paradigm shift objective	S					
Shift to low-emission sustainable development pathways	The project intends to contribute to the reduction of Mali's chronic electricity deficit which will result in reducing energy-related CO2 emissions by introducing photovoltaics (PV). At the same time, it will enhance the access to clean energy in rural and remote households, specifically in the 70 villages targeted. In addition, the project will develop local capacities to identify technical and financing options and to formulate the regulatory, financial and marketing instruments necessary to demonstrate the technical, economic, and financial viability of using the private sector as a vehicle to deliver basic electricity services.					
Expected Result	Indicator	Means of Verification (MoV)	Baseline	Tar Mid-term (if applicable	get Final	Assumptions
Fund-level impacts					·	
M1.0 Reduced emissions through increased low-emission energy access and power generationM1.0 Reduced emissions through increased low- emission energy access and power generation	Tonnes of carbon dioxide equivalent (t CO2eq) reduced or avoided as a result of the funding of Projects/programs (main indicator)	Annual CO2 performance monitoring reporting and validation	0	821,782 tCO2eq	821,782 tCO2eq	CO2 emission reduction was based on the most conservative calculations and data using international default values. CO2 emission reduction could be increased if local data will be available.

⁶ Information on the Fund's expected results and indicators can be found in its Performance Measurement Frameworks available at the following link (Please note that some indicators are under refinement): http://www.greenclimate.fund/documents/20182/239759/5.3_-Performance Measurement Frameworks PMF .pdf/60941cef-7c87-475f-809e-4ebf1acbb3f4





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Volume of finance leveraged by Fund funding (funding leverage factor)	Project management report	0	EUR 5,98 M	EUR 19,92 M	We assume that private sector will participate in the project
Cost per tCO2 eq decreased	Annual CO2 performance monitoring reporting and validation	0	EUR 31.6/t CO2eq	EUR 31.6/t CO2eq	





H.1.2. Outcomes, 0	Outputs, Activit	ties and Inputs at Pr	oject/Programm	e level		
		Means of		Tarç	get	
Expected Result	Indicator	Verification (MoV)	Baseline	Mid-term (if applicable)	Final	Assumptions
Project/program outcomes	Outcomes tha	t contribute to Fund	d-level impacts			
M6.0 Increased number of small, medium and large low-emission power suppliers	6.2 Number of Households and individuals (males and females) with improved access to low- emission energy sources	Project management Report, household surveys, Malian Agency for the Development of Domestic Energy and Rural Electrification (AMADER) report	0	At least 283,777 people directly benefit [of which 50% are female]	At least 283,777 people directly benefit [of which 50% are female]	Households are aware of the climate change; Households have the capacity to pay; households are sensitized about using clean energy
	6.3 MWs of low- emission energy capacity installed, generated and/or rehabilitated as a result of GCF support	Utility company (EDM) report; AMADER report	0	3,78 MWp	3,78 MWp	Private enterprises are interested in investing in the sector
M5.0 Strengthened policy and regulatory framework, regulation of tarrifs	5.1 Institutional and regulatory systems that improve incentives for low emission planning and development and their effective implementati on	National Energy Stategy and policy documents, EDM and AMADER annual reports	National Energy Sector Policy 2006 does not take into account regulation regarding climate change challenges	Reinforcement of existing 2006 policy taking into account climate change issues	Climate change issues are addressed in all energy policies and enforced in projects implemented in Mali	Political willingness to implement policies and regulations



connected

financial

households

have access to

connected

households

have access

to financial





the energy

sector

Project/program outputs	Outputs that o	contribute to outcor	nes			
1. Strengthened Rural Energy Regulatory Agency	Functional rural electrification Agency with trained agents in legal matters (concession contracts), technical aspects (tariff methodology), supervision of the sector (monitoring and evaluating the project)	AMADER report, project report.	Regulatory agency exists but need capacity reinforcement	Legislation and regulations to encourage clean energy use and facilitate private sector involment in place	Fully functional rural electrification agency in place and produces contracts and supervision reports in line with industry standards	Investment targets are achieved, less turnover and higher retention rate of trained agents
2. Rural localities electrified with solar PV power plant	Number of Isolated solar PV installed Number of Localities benefiting from PV installations in the project site MW produced by installed solar plants	Household surveys, Installation project reports and end of Project execution	0	50 number of installed solar PV plants installed 50 localities benefiting from power supply from project financed solar plants 3,78 MW clean energy generated by project financed solar plants	50 number of installed solar PV plants installed 50 localities benefiting from power supply from project financed solar plants 3,78 MW clean energy generated by project financed solar plants	Investment targets are achieved, Government willingness to electrifie rural localities with clean source energy
 Increased access to clean energy by households and for 	Number of households connected to the clean solar energy	Household surveys Evaluation of development result, audit report, private	0	28,378 households connected of which 10% of	28,378 households connected of which 10% of	Mali government willingness to reduce GHG emissions in

Proportion of

connected

households

benefiting

productive use

sector structures

reports



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	due to access to credit under financial mechanism (guarantee scheme) for productive use of clean energy	mechanism (guarantee scheme)	mechanism (guarantee scheme)
Activities	Description	Inputs	Description
1.1 Training, raising awareness of stakeholders and dissemination of project activities/results	 1.1.1 - organizing dissemination workshops on potential actions to be implemented in order to achieve the objectives of the NDC in the field of energy 1.1.2 - organizing specialized training sessions for designated executives of DNE, AMADER and AER-Mali 1.1.3 -developing and disseminating public awareness material on climate change and NDC in the energy sector. 	Consultancy services	Consultancy services will be required to organize sensitization and information dissemination workshops and train target beneficiaries
1.2 Communicating project results and lessons learned	 1.2.1: - Developing a communication and raising awareness/promotion plan for national (and international) investors and production of materials (including videos) 1.2.2 - Organizing information sessions with investors who are already active in the energy/renewable energy sector 1.2.3 - organizing mid-term and end-of-project workshops for national institutions (DNE, AMADER, AER-Mali, FER) to ensure monitoring and document the project experience 	Consultancy services	Consultancy services will be required to develop communication and awareness raising plan, produce related materials and organize sensitization sessions as well as project workshops with relevant stakeholders and agencies
1.3 Capacity building of the Rural Electrification Fund (Fonds	 1.3.1: - Drafting of organisational and operational legal provisions as part of a reform of the FER 1.3.2 - TA for recruitment of a dedicated staff 	Consultancy services	Consultancy services will be required to build and train staff, draft organizational and ooperational legal provisions, etc





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d'Electrification Rural -FER)	1.3.3 - Capacity building of the FER staff		
1.4 Providing Technical Assistance on procurement and contracting of mini-grid construction and O&M companies	 1.4.1 - TA - writing of standard contract for 15 years O&M and the procedures that set the relations between AMADER and O&M companies 1.4.2 - Tender processes and selection of construction companies and O&M companies that will operate the mini-grids. 	Consultancy services PMU Staff time	Consultancy services and staff time will be required to support the procurement and contracting construction and O&M companies
2.1 Preparation of detailed Engineering Studies	2.1.1 - Site selection, engineering studies & Specific environmental and social analysis for each site	Consultancy services	Consultancy services will be required to support site section, preparation of engineeding and environmental studies and analysis for each site
2.2: Supply, installation and commissioning of equipment	2.2.1 - Solar PV power plants construction and minigrid deployment	Consultancy services Goods Works	Consultancy services, equipment and construction works will be needed to install Solar Mini-grids
2.3: Implementation of Environmental and social measures	2.3.1 - Project impact mitigation and improvement activities as per the ESMF	Consultancy services PMU Staff time	Consultancy services and works and PMU staff will be needed to mitgate and ensure compliance with ESMS standards
3.1 Operationalisation of Financial guarantee facility	3.1.1- Implementation of Financial guarantee activities	staff time	Staff time will be needed

Most of mid-term data are not applicable to the project because if we refer to the timetable c.8. the project will be completed in the fourth year. Therefore, the key deliverables will be available at the end. However, there will be a mid-term evaluation that will allow to monitor the progress of the implementation. In the mi-term, other important activities will be implemented such as tender & selection of construction companies. But there will not be PV power plant installed yet.

H.2. Arrangements for Monitoring, Reporting and Evaluation

Monitoring of the project

As with all projects supported by BOAD, this intervention will be monitored by BOAD project management team as per the relevant internal policies and procedures. As the accredited executing agency, BOAD will be responsible for supervising the monitoring activities, implementation conditions and reporting periodically to the GCF under the terms to be defined by GCF and BOAD. The project progress will be monitored by the responsible of M&E of the Project Management Team based in Mali.

The present project will comply with the BOAD appraisal, approval, monitoring and supervision standards and procedures





involving all relevant teams (engineer, financial analyst, procurement expert, E&S specialist, climate finance specialist, financial management officer, and monitoring specialist). The implementation and monitoring of each stage of the project will be guided and managed by the BOAD project cycle management framework. The Division in charge of Climate finance will perform due diligence, implementation monitoring, risk monitoring and mitigation. For that purpose, the Division in charge of finance climate assisted by the Department in charge of Monitoring and Evaluation will be working closely with the project management team based in Mali in order to monitor the progress of each component of the Project.

Reporting

Reporting of project management team based in Mali to BOAD will be in line with the standard loan agreement, and the BOAD will conduct a by-annual supervision.

Reporting of the BOAD to GCF: The BOAD will comply with the relevant GCF policies in reporting and evaluation arrangements for this framework. The BOAD will provide the annual performance report (APR) to the GCF during the four-year implementation period. In addition, during the sub-loan lifetime, semi- annual activity report on the status of the GCF-financed individual sub-projects will be provided.

In addition, following the arrangement under the AMA, inception report, mid-term and final evaluation reports, and financial information reports (semi-annually throughout the life of the loan) will be submitted.

Evaluation

The evaluation arrangements for this framework will comply with the related BOAD and GCF policies. A formative evaluation will be carried out by the BOAD's project management team that is composed of (engineers, lawyers, project finance specialists, procurement experts, E&S specialists, climate finance officers, supervision and monitoring specialists). The final evaluation is conducted 06 months after the reception of the project achievement report.

After two to five years of closing, the project will undergo ex-post evaluation that is guided by internationally accepted principles for the evaluation of development assistance, in particular, the Organization for Economic Co-operation, and Development Assistance Committee (OECD DAC) evaluation guiding principles, and the good-practice standards.

<u>Budget</u>

The monitoring and evaluation budget, estimated at EUR 41 161, will be used to conduct monitoring and evaluation activities related to indicator collection and impact evaluation activities.



I. Sup	porting Documents for Funding Proposal
\boxtimes	NDA No-objection Letter
\boxtimes	Feasibility Study
\boxtimes	Integrated Financial Model that provides sensitivity analysis of critical elements (xls format, if applicable)
\boxtimes	Confirmation letter or letter of commitment for co-financing commitment (If applicable)
\boxtimes	Project/Programme Confirmation/Term Sheet (including cost/budget breakdown, disbursement schedule, etc.) – see the Accreditation Master Agreement, Annex I
\boxtimes	Environmental and Social Impact Assessment (ESIA) or Environmental and Social Management Plan (If applicable)
	Appraisal Report or Due Diligence Report with recommendations (If applicable)
	Evaluation Report of the baseline project (If applicable)
\boxtimes	Map indicating the location of the project/programme
\boxtimes	Timetable of project/programme implementation
* Pleas	se note that a funding proposal will be considered complete only upon receipt of all the applicable supporting

* Please note that a funding proposal will be considered complete only upon receipt of all the applicable supporting documents.