GEF-6 PROJECT IDENTIFICATION FORM (PIF)

PROJECT TYPE: Full-sized Project
TYPE OF TRUST FUND:GEF Trust Fund

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PART I: Project Information

Project Title:	**Promoting better access to modern energy services through sustainable mini-grids and low-carbon bioenergy technologies among Guinea-Bissau's forest-dependent communities**		
Country(ies):	Guinea Bissau	GEF Project ID:[1]	9561
GEF Agency(ies):	UNDP	GEF Agency Project ID:	5885
Other Executing Partner(s):	Direction General of Environment/Secretariat of State of Environment, Direction General of Energy/Ministry of Energy, National Institute for Research and Applied Technology (INITA)	Submission Date: Resubmission Date:	18 July 2016 29 July 2016
GEF Focal Area(s):	Climate Change	Project Duration (Months)	60
Integrated Approach Pilot	IAP-Cities ☐ IAP-Commodities ☐ IAP-Food Security ☐	Corporate Program: SGP ☐	
Name of parent program:	[if applicable]	Agency Fee ($)	276,707

A. INDICATIVE FOCAL AREA STRATEGY FRAMEWORK AND OTHER PROGRAM STRATEGIES[2]

Objectives/Programs (Focal Areas, Integrated Approach Pilot, Corporate Programs)	**Trust Fund**	**(in $)**	
		GEF Project Financing	**Co-financing**
CCM-1: Technology Transfer, and Supportive Policies and Strategies **Program 1**: Promote timely development, demonstration and financing of low-carbon technologies and mitigation options	GEFTF	2,000,000	6,000,000
CCM-2: Demonstrate Systemic Impacts of Mitigation Options **Program 4**: Promote conservation and enhancement of carbon stocks in forest, and other land-use, and support climate-smart agriculture	GEFTF	912,702	3,000,000
Total Project Cost		**2,912,702**	**9,000,000**

B. INDICATIVE PROJECT DESCRIPTION SUMMARY

Project Objective: To promote integrated investment in sustainable mini-grids and low-carbon bioenergy technologies, and develop an appropriate business model for the sustainability of the system

Project Components	**Financing Type[3]**	**Project Outcomes**	**Project Outputs**	**Trust Fund**	**(in $)**	
					GEF Project Financing	**Co-financing**
1. Policy and financial instruments and incentive scheme for sustainable mini-grids and low-	TA	Institutional and financial viability of RE[4] mini-grids ensured	1.1 Policy package to operate RE-based mini-grids and low-carbon bioenergy technologies developed and adopted 1.2 Financial viability mechanism and tariff criteria for RE mini-grid	GEFTF	320,000	1,000,000

[1] Project ID number will be assigned by GEFSEC and to be entered by Agency in subsequent document submissions.
[2] When completing Table A, refer to the excerpts on *GEF 6 Results Frameworks for GETF, LDCF and SCCF*.
[3] Financing type can be either investment or technical assistance.
[4] (i) Throughout the document, the term 'renewable energy-based mini-grid' means a small hydro, solar PV or hybid with diesel mini-grid. The focus will be small hydro (SHP) power, especially at Cantanhez (south-west) and other forest areas where rivers are abundant and close to villages. It is only when there is no source of water or the Levelised Cost of Electricity (LCOE) for SHP is higher than that of a solar PV system that the latter is utilized for the mini-grid. 'Small hydropower', unless specifically indicated, includes all capacities below 1 MW.

carbon bioenergy technologies		Firewood and charcoal are produced and utilized in a sustainable manner in Guinea-Bissau's forest-dependent communities	operation defined, adopted and enforced 1.3 Financial incentives and market mechanisms to secure supply and stimulate demand for energy-efficient stoves and firewood/charcoal are provided 1.4 Developed gender-sensitive capacity development and modules for the production and utilization of improved kilns and cookstoves 1.5 Alternative sustainable solutions to wood energy explored and assessed			
2. Capacity building for RE-based mini-grid and low-carbon bioenergy system management	TA	Capacity to deliver turn-key solutions and quality O&M&M services for SHP developed Capacity to deliver efficient technologies for fuelwood and charcoal production and utilization	2.1 Published guidebook (10,000 printed copies) on RE-based mini grids development (both solely RE and hybridized) specifically tailored for the country's context 2.2 On-the-job capacity building programme for 500 RE plant installers delivered, including on materials, plant design, combination, construction, O&M 2.3 Business and technical advisory services to the power utility and other mini-grid plant developers 2.4 On-the-job capacity building for 300 craftsmen, farmers and other actors in the fuelwood value chain. 2.5 Tailored capacity building programme delivered to relevant national agencies 2.6 National clearing-house mechanism for sustainable mini-grids and/or low-carbon bioenergy developers set-up 2.7 Public relations and investment promotion campaign conducted	GEFTF	450,000	1,300,000
3. RE-based mini-grids and low-carbon bioenergy technologies roll-out	INV	A functioning business model is demonstrated for the technical and financial viability of RE-based mini-grids A functioning business model is demonstrated for the technical and financial viability of	3.1 4 pilot sites for mini-grids[5] identified and assessed, and institutional / investment model defined 3.2 Up to 4 public-private partnerships are established for the exploitation of mini-grids 3.3 2 MW of RE-based power generation capacity installed 3.4 2 specific and sustainable O&M&M models demonstrated for all mini-grid schemes 3.5 Productive use promoted to increase electricity demand in 4 targeted sites	GEFTF	2,000,000	6,400,000

[5] In community forest areas in Cantanhez (south-west), Lagoas de Cufada (centre), Tarrafes do Rio Cacheu (north) and Gabu (east). To be assessed during PPG phase.

		improved kilns and stoves	3.6 5,000 improved cookstoves commercialized and 50 improved kilns disseminated 3.7 Replication and scale-up plan is developped			
				Subtotal	2,770,000	8,700,000
				Project Management Cost (PMC)[6]	GEFTF	142,702	300,000
				Total Project Cost		**2,912,702**	**9,000,000**

For multi-trust fund projects, provide the total amount of PMC in Table B, and indicate the split of PMC among the different trust funds here: ( )

C. INDICATIVE SOURCES OF CO-FINANCING FOR THE PROJECT BY NAME AND BY TYPE, IF AVAILABLE

Sources of Co-financing	Name of Co-financier	Type of Co-financing	Amount ($)
National Government	Secretariat of State of Environment, Ministry of Energy and Ministry of Economy and Finance	In-kind	900,000
National Government	Secretariat of State of Environment, Ministry of Energy and Ministry of Economy and Finance	Grant (Cash)	100,000
National Government	TERRA RANKA (Government development programme) – funded by various bilateral and multilateral aid donors	Grant / Loans	7,000,000
GEF Agency	UNDP	Grant	500,000
Private Sector	Technology suppliers/IPPs	Equity	500,000
Total Co-financing			**9,000,000**

D. INDICATIVE TRUST FUND RESOURCES REQUESTED BY AGENCY(IES), COUNTRY(IES) AND THE PROGRAMMING OF FUNDS [a)]

GEF Agency	Trust Fund	Country/ Regional/ Global	Focal Area	Programming of Funds	(in $)		
					GEF Project Financing (a)	Agency Fee (b)[b)]	Total (c)=a+b
UNDP	GEFTF	Guinea-Bissau	Climate Change		2,912,702	276,707	3,189,409
Total GEF Resources					**2,912,702**	**276,707**	**3,189,409**

a) Refer to the Fee Policy for GEF Partner Agencies.

E. PROJECT PREPARATION GRANT (PPG)[7]

Is Project Preparation Grant requested? Yes ☒ No ☐ If no, skip item E.

PPG AMOUNT REQUESTED BY AGENCY(IES), TRUST FUND, COUNTRY(IES) AND THE PROGRAMMING OF FUNDS

Project Preparation Grant amount requested: $90,000				PPG Agency Fee: $8,550			
GEF Agency	Trust Fund	Country/ Regional/Global	Focal Area	Programming of Funds	(in $)		
					PPG (a)	Agency Fee[8] (b)	Total c = a + b
UNDP	GEFTF	Guinea-Bissau	Climate Change		90,000	8,550	98,550
Total PPG Amount					**90,000**	**8550**	**98,550**

[6] For GEF Project Financing up to $2 million, PMC could be up to10% of the subtotal; above $2 million, PMC could be up to 5% of the subtotal. PMC should be charged proportionately to focal areas based on focal area project financing amount in Table D below.

[7] PPG requested amount is determined by the size of the GEF Project Financing (PF) as follows: Up to $50k for PF up to$2m (for MSP); up to $100k for PF up to $3m; $150k for PF up to $6m; $200k for PF up to $10m; and $300k for PF above $10m. On an exceptional basis, PPG amount may differ upon detailed discussion and justification with the GEFSEC.

[8] PPG fee percentage follows the percentage of the Agency fee over the GEF Project Financing amount requested.

F. PROJECT'S TARGET CONTRIBUTIONS TO GLOBAL ENVIRONMENTAL BENEFITS[9]
Provide the expected project targets as appropriate.

Corporate Results	Replenishment Targets	Project Targets
4. Support to transformational shifts towards a low-emission and resilient development path	750 million tons of CO_{2e} mitigated (include both direct and indirect)	*190,288 metric tons*

PART II: PROJECT JUSTIFICATION

1. *Project Description.* Briefly describe: 1) the global environmental and/or adaptation problems, root causes and barriers that need to be addressed; 2) the baseline scenario or any associated baseline projects, 3) the proposed alternative scenario, GEF focal area[10] strategies, with a brief description of expected outcomes and components of the project, 4) incremental/additional cost reasoning and expected contributions from the baseline, the GEFTF, LDCF, SCCF, and co-financing; 5) global environmental benefits (GEFTF) and/or adaptation benefits (LDCF/SCCF); and 6) innovation, sustainability and potential for scaling up.

1) The global environmental and/or adaptation problems, root causes and barriers that need to be addressed

Guinea Bissau is a small country in West Africa and one of the poorest nations in the world. According to the 2015 UNDP Human Development Report (HDR), Guinea Bissau is ranked 178th in the Human Development Index, out of 188 assessed countries. Guinea Bissau is classified as a Small Island Developing State (SIDS) and a Least Developed Country (LDC). The country has faced several civil wars and political instability.

The total population of the country is estimated at 1.7 million inhabitants (2014), and its surface at about 36,125 km^2. Part of the country is an archipelago, with about 88 islands and islets located in the Atlantic Ocean. Roughly 25% of the population lives in urban areas, against 75% in rural areas.

Status of the energy sector

Guinea-Bissau has one of the lowest electrification rates and highest electricity service costs in Africa. The country is completely dependent on petroleum products despite its own high energy potential, especially in terms of hydroelectric power. Energy use in Guinea-Bissau is roughly 0.3 toe per person per year, one of the world's lowest. The national final energy consumption is characterized by the predominance of traditional use of biomass (up to 87.8%), followed by 11.7% from petroleum products and only 0.5% from electricity. Wood is the dominant fuel, with a demand that exceeds 500,000 tonnes per year, followed by charcoal, which is the most commonly used fuel in the capital, Bissau. The quantity of the biomass used is estimated at around 738,000 tonnes per annum.

The situation in the electricity sector is characterized by a structurally flawed service, both in quantity and quality, due to the obsolescence of production, the intermittency of electricity production and the high dependence on imported oil in a context of scarce financial resources. Only a small proportion of the population has access to electricity: the national electrification rate is estimated at 11.5%, although this average masks huge disparities between Bissau (29%) and the other major cities of the country (with an average of only 4% electrification), and the rural areas with less than 1% electrification rate. With 75% of the population living in the rural areas, rural electrification is almost non-existent in Guinea-Bissau.

[9] Provide those indicator values in this table to the extent applicable to your proposed project. Progress in programming against these targets for the projects per the *Corporate Results Framework* in the *GEF-6 Programming Directions*, will be aggregated and reported during mid-term and at the conclusion of the replenishment period. There is no need to complete this table for climate adaptation projects financed solely through LDCF and/or SCCF.

[10] For biodiversity projects, in addition to explaining the project's consistency with the biodiversity focal area strategy, objectives and programs, please also describe which Aichi Target(s) the project will directly contribute to achieving.

Due to almost-continuous political instability, the available power in Guinea Bissau has dropped by more than 80% in the past years (from 13 MW in 2003 to 2 MW in 2013). Today, the available power capacity ranges between 2 to 8 MW while demand is estimated at 30 MW and increasing.

Guinea-Bissau has one national power utility, EAGB, created in 1983 and 100% owned by the State (public company). The Company of Electricity and Water of Guinea-Bissau (Empresa Publica de Electricidade e Aguas da Guine Bissau) is responsible for electricity generation, transmission and distribution. Its electricity generation cost is US$0.51/kWh while the average applied tariff is US$0.34/kWh (i.e. partially subsidized).

The 75% of the population living in rural areas directly depends on natural resources for their living. Forests cover 73% of total land area; especially in the south and south-east. The continental portion of the country features the Forest Belt, a region that is characterized by patches of dense forests and open forests, predominantly intertwined with woodland savannahs. Increasingly unsustainable land clearing for shifting cultivation, biomass energy use, illegal logging activities, expansion of cashew plantations and mining have all been cited as contributing factors to increased deforestation and forest degradation in the country. At present, Guinea-Bissau has only one protected forest and few areas of remaining native forests[11]. Between 1990 and 2005, Guinea-Bissau lost 6.5% of its forest cover, or around 144,000 hectares. Lately, since 2007, the deforestation rate is estimated to be 1% per year.

The country is facing the interrelated challenges of energy access, energy security and climate change mitigation and adaptation simultaneously. The chronic energy crisis hampers the social, economic and industrial development of Guinea-Bissau. The need for sustainable, reliable and affordable energy services is significant at all levels. The lack of access to affordable and reliable energy services is interlinked with a variety of economic, social, environmental and political problems experienced in the country.

The efficiency of the use of traditional stoves through the “three stone fireplaces” and “metal braziers” is very low, between 5 and 7% and between 12 and 15%, respectively. Furthermore, traditional kilns for charcoal production have very low efficiency (33%). Thus, the biomass energy sector in Guinea-Bissau could significantly improve in terms of overall efficiency through improved efficiency in the production and consumption of biomass-based fuels.

An integrated approach is key. There is a close link between the forest and water resources in Guinea-Bissau. Forest degradation leads to a number of negatives outcomes, including the reduction in water flow of rivers. Promoting small hydro power systems will be highly dependent on the conservation of forests and avoidance of deforestation. FAO[12] has analysed this close linkage between forest and hydrological patterns in the Fouta Djallon Highlands, a mountain chain crossing Guinea-Bissau. Tackling the problem of wood energy in isolation will not be sustainable, due to its close linkage with deforestation and ecosystem loss. By combining better management of modern energy access, wood energy and forest, it is possible to find alternative long-term solutions to unsustainable firewood use while increasing the water flow of rivers and hence better hydropower potential.

Potential of Renewable Energy in the country

The country has a range of renewable energy sources, with different potential for development. Biomass, hydropower, solar and wind are available.

Biomass: Guinea Bissau has forest resources (estimated at about 2 million hectares) and agricultural residues (rice husks, cotton stalks, cashew, sugar cane residues, etc.). The quantity of the biomass used is estimated at around 738,000 tonnes per year. But biomass is not currently exploited in a sustainable or renewable manner.

Hydropower: The hydropower potential of Guinea-Bissau is estimated at 33 MW. This potential would be obtained with the implementation of two hydropower dams, Cusselinta (13 MW) and Saltinho (14 MW), and several small/micro hydropower systems, according to studies conducted in the 1980s.

[11] Cantanhez Forest is the last remaining primary forest in the country.
[12] FAO (2012), *Trends in the Hydrology of Small Watersheds in the Fouta Djallon Highlands*.

Solar: Solar energy is the most abundant renewable energy source in the country. The yearly irradiation ranges from 4.79 kWh/m^2/day to 6.96 kWh/m^2/day, with a yearly average of 5.87 kWh/m^2/day. So far, the solar resource has been used in a limited manner for electricity generation with photovoltaic (PV) systems in rural households, schools, offices, hospitals and health centres; for solar water pumping; for solar telecommunication systems; and for specific solar water heating applications. But these were primarily donor-driven initiatives and lacked sustainability.

Wind: There are no proper studies of the wind potential of Guinea-Bissau. Roughly, it is estimated that wind resources are mid-level, with wind velocity (measured at 50 metres) higher than 4 m/s. It may be possible to exploit wind energy throughout the year on the coast of the mainland or between the islands and in the region of Boe (east), where there are altitudes of over 200m above sea level. There is no current exploitation of the wind resource.

Main barriers to accelerated development of sustainable mini-grids and low-carbon bioenergy technologies:

Legal, regulatory and institutional framework: The current legal framework is a barrier to the development of RE in Guinea Bissau. Up to now, there are no regulations, incentives or legislative framework conditions that support the implementation of renewable energy in Guinea-Bissau. The Government is planning to create regulations that allow private operators to become involved in rural electrification, thus offering opportunities for the utilization of RE. There are, as well, plans, programmes and strategies intending to increase the utilisation of renewable energy, which mark a very important "first step" in Guinea-Bissau towards the achievement of a more sustainable development scenario in the future.

There is insufficient capacity of relevant stakeholders (Government, institutions, national agencies) to formulate and enforce policy and regulatory frameworks on biomass resources in an integrated manner, especially the use of sustainable, improved and more efficiently produced firewood, charcoal and improved cook stoves.

Technology supply chain: The technology supply chain for RE in Guinea-Bissau is at a very nascent stage. There are a few local SMEs capable of assembling simple RE installations based on imported machinery and turbines, but they lack the technical and engineering capacities to ensure optimal system design, installation and maintenance. In the rural areas, there is only very limited local technical expertise available on how to properly administer, operate and maintain RE based mini-grids. The low quality and quantity of skilled and competent workers in the power sector adds additional risks and increases the cost of mini-grid operation due to the need to rely on expensive imported services even for basic repair and maintenance.

The technology supply chain for bioenergy production and utilization is very basic and lacks coordination and optimisation between farmers, crafmen, retailers and end-users.

Sustainable O&M&M model: The lack of experience with, and demonstration of, sustainable operation, maintenance and management (O&M&M) of RE-based mini-grids represents a key bottleneck and the reason for the failure of past donor-funded projects. The barrier is aggravated by the fact that Guinea-Bissau is a post-conflict society and the political instability is still ongoing sporadically. Technical and managerial capacities are extremely low at the local level, especially in provincial and rural areas. The same problem exists with local enterprises: the ranks of experienced managers and trained technicians, already in short supply in provincial and rural areas, have been further depleted due to the effect of instability.

The key missing aspects of a sustainable O&M&M model that have to be put in place are: (i) technical oversight over plant operations and responsibility for repairing faulty equipment; (ii) an efficient and effective tariff structure which adequately covers both start-up and O&M&M costs; (iii) a robust and effective financial management, billing and payment collection system; (iv) community mobilization, customer relations and conflict resolution procedures (such as in case of illegal connections or theft), engagement of productive end-users, etc.

O&M&M is less an issue for bioenergy technologies, but still does need to be put in place for kilns, cookstoves and for alternative solutions such as biogas installations.

Access to capital: significant upfront investment requirements remain a roadblock for implementation of many projects. RE projects are capital-intensive, with significant investment requirements that are generally beyond the capacity of local companies or communities. In addition, the local banking sector is not sufficiently capitalized to facilitate financing for RE projects with longer pay-back and substantial risks.

Investors' awareness and perception of risks: Information about the potential and the benefits of RE (especially small hydropower) for provincial and rural electrification development is scarce in Guinea-Bissau. There is very little data about prospective sites and their hydrological, climatic and other characteristics. Even when such studies exist, they often are not publicly available. Basically, there is no single information point where a potential developer can receive required guidance and data to make an informed investment decision. The Government is unable to pull such guidance/data together on its own due to limited budget resources, staff capacities, lack of prior experience and overall vision of how to promote RE-based mini-grids and private sector investment. Whilst the national energy strategy does acknowledge the importance of RE development in tackling energy deficits in secondary cities of Guinea Bissau, the primary focus and efforts of the Government so far have been on addressing the energy deficit in the capital Bissau, and facilitating implementation of large hydropower and solar PV projects with public and IFI financing. Promotion of small hydropower and solar PV-based mini-grids requires a different approach, more geared towards private sector and local communities, and requiring open and transparent access to information for investors. The scarcity of successful and sustainable RE projects is limiting opportunities to raise awareness and to build up the confidence of local communities, project developers and investors, and is in itself a big deterrent to market development.

Very little private sector interest: With the political instability, there are very few private investors and all projects are donor-driven and largely non-sustainable. Nearly all private sector investors perceive Guinea Bissau as too risky for investment in renewable energy projects. In the WB/IFC Doing Business 2016 data, Guinea-Bissau is 155th out of 188 economies on protecting investors and 162nd out of 182 on enforcing contracts.[13]

Information/cultural sensitivities: There is still a lack of knowledge and negative perception (lack of or limited social and cultural acceptance) on the use of new technologies for cooking.

2) The baseline scenario or any associated baseline projects

The Government of the Guinea realizes that lack of energy access in provincial and rural areas is a major detrimental factor for country's economic development, social stability and environmental sustainability. To address the problem, the Government intends to create a rural electrification agency, a national agency responsible for rural electrification, under the Ministry of Energy. There is also a plan to create another agency dedicated to the promotion of renewable energies. Neither of these agencies has yet materialized.

The Government has also embarked on an ambitious programme (Terra Ranka) to improve the energy infrastructure in the country. This programme includes major investment plans in power generation and transmission lines, including a thermal power plant construction of 55 MW in Bôr (staggered, with a first phase of 15 MW), costing $30 million USD, to be funded by BOAD (West African Development Bank). On the renewable energy side, there are two hydropower dams under consideration, Cusselinta (13 MW) and Saltinho (14 MW). But this would require over $200 million USD, which has not yet been secured. There is also a plan for a solar PV plant of 10 MW in Gardette, which would require $30 million USD, which has not yet been leveraged. All these plans are grid-connected projects. Even if they materialize, they will be limited to the capital Bissau and major cities, and will certainly not serve the rural areas where the main grid is non-existent.

There are, however, a few initiatives for off-grid electricity in the rural areas. The most important one, already under implementation, is the Bambadinca project developed by TESE, an international NGO. It consists of a 314 kW solar PV hybrid mini-grid plant. The mini-grid provides electricity to some 450 homes in Bambadinca. The overall project cost $2

[13] See http://www.doingbusiness.org/data/exploreeconomies/guinea-bissau

million. The Bambadinca project is rich in lessons learned, from the legal aspects to the business model challenges, which will inform the design of the GEF-financed project.

In the clean cooking sector, there have been a lot of initiatives in the past, but these were mainly donor-driven or pilots and did not lead to true transformation of the sector. Past initiatives have included: (i) the 'Rational Use of Forest Resources' – an FAO/EU-funded project - that aimed to protect forests through the rational use of wood products, the dissemination of improved carbonization techniques (kilns) and cookstoves; and (ii) a biogas project funded by the Chinese Government.

3) The proposed alternative scenario, GEF focal area strategies, with a brief description of expected outcomes and components of the project

This project is consistent with the GEF-6 strategy to address climate change (*CCM-1 Technology Transfer, and Supportive Policies and Strategies*), Programme 1 (*Promote timely development, demonstration and financing of low-carbon technologies and mitigation options*) and *CCM-2: Demonstrate Systemic Impacts of Mitigation Options,* Programme 4 (*Promote conservation and enhancement of carbon stocks in forest, and other land-use, and support climate-smart agriculture*) because its main objective is to facilitate investment in RE-based mini-grid systems and low-carbon bioenergy technologies in Guinea Bissau.

The proposed UNDP-GEF project will address barriers that are specifically related to the investment in decentralized mini-grids and low-carbon bioenergy technologies. The focus will be small hydro (SHP) power, especially at Cantanhez (south-west) and other forest areas where rivers are abundant and close to villages. It is only when there is no source of water or the Levelised Cost of Electricity (LCOE) for SHP is higher than for solar PV systems that the latter will be utilized for the mini-grid.

Small hydropower, unless specifically indicated, includes all capacities below 1 MW.

The project consists of the following four components.

<u>Component 1: Policy and financial instruments and incentive scheme for renewable energy mini-grids and low-carbon bioenergy technologies</u>

This component will develop two sets of policy and financial instruments and incentive schemes. First, it envisages the preparation and adoption of a comprehensive policy framework for the promotion of RE--based electrification. The framework will complement existing policies on power sector development and rural electrification by putting explicit emphasis on, and providing more favourable conditions for, decentralized RE technologies. The policy framework will include specific timeframes, targets and roll-out plans for the development of mini-grids. The decentralized RE policy framework will also establish a cornerstone policy instrument (e.g. a financially viable tariff for RE-based mini-grids) and supporting policies and regulations, including, but not limited to, harmonized and simplified concession regimes and licensing rules for RE technologies, standardized PPAs, and land and water use rights for mini-grid projects. In order to support the implementation of the proposed policy framework, a capacity building programme will be provided to relevant national agencies and directorates, potential private-sector IPPs and community groups.

Setting financially viable tariffs to obtain the right energy price is one of the most important factors to ensure sustainability of RE-based mini-grids. Under Component 1, the project will assist the Ministry of Energy with developing and introducing a new regulation for decentralized RE tariffs. It is proposed that the mini-grid tariff system have a graded tariff regime, similar to the system in place for the main grid system. This will allow the tariffs to be set in better proportion to the customer's ability to pay. As most of the planned mini-grids will be fairly small in terms of the user-base, there will be natural constraints on how differentiated the tariff levels can be. Also, since most customers will be poor, it is envisaged that productive uses (businesses) will shoulder a disproportionate burden of electricity cost-recovery. The identification and inclusion of financially-robust anchor customers will therefore form a central element of the mini-grid roll-out planning to be undertaken under Component 4.

As indicated earlier, the current tariff paid by grid-connected consumers in Guinea-Bissau is on average 34 cents US$/kWh, while the production cost is 51 cents US$/kWh (largely due to the obsolete equipment in use). This level of tariff, should, in principle, be sufficient to make investment in SHP (and solar PV) commercially viable. For example, recent analysis from IRENA and ESMAP has shown that, in Africa, the average production cost is 7.7 cents US$/kWh for SHP. However, the PPG phase will help to run financial models to better determine the financial viability of different tariff options. The project will conduct a comprehensive assessment that will balance the requirements for minimizing public subsidies, ensuring adequate rates of return for investors and respecting the social electrification objectives set by the Government.

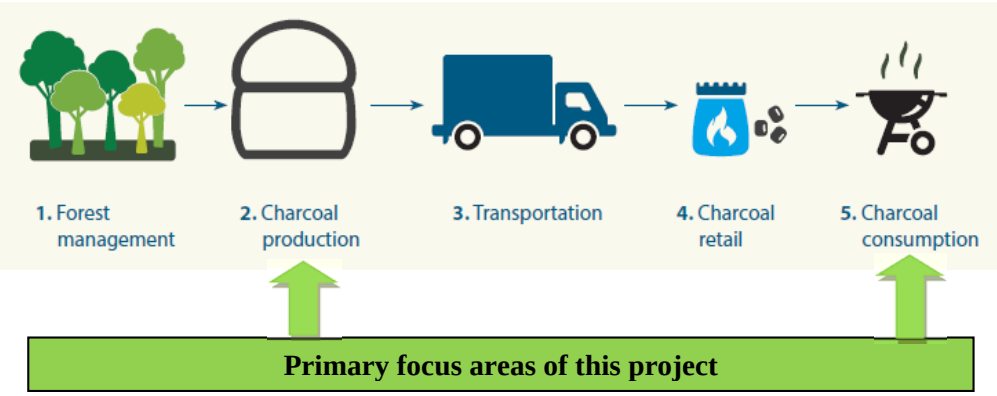
There are essentially 4 internationally-proven business models for rural/off-grid energy development[14]: a utility business model, a private sector business model, a community business model and a hybrid business model, meaning a combination of two of the previous listed models. The business model that is proposed under the GEF-financed project will be a combination of the utility and private sector models. This will be done mainly through public-private partnerships (PPPs). For example, the utility could invest in the mini-grid installations, while a local private company could be responsible for the overall daily management, maintenance and operations. This kind of arrangement will serve to lower O&M&M costs whilst ensuring harmonised grid expansion and mini-grid roll-out strategies. The PPG phase will help to better define the proposed business model.

Second, because there is a close link between the forest and water resources in Guinea-Bissau. Promoting small hydro power systems will be highly dependent on the avoidance of deforestation. The Component will address one aspect of forest degradation, by (i) reducing the pressure on forest for firewood production and utilization, and (ii) looking for alternative long-term solutions to firewood.

It is designed to integrate a top-down approach of providing support through policy measures and demand-side management (standards, testing, certification and scaling-up of kilns and cookstoves), and a bottom-up approach of providing financial incentives and market mechanisms to secure supply and stimulate demand for energy-efficient stoves (both wood and charcoal based models). To enhance the effectiveness of these approaches and to create an enabling environment among the stakeholders and value chain actors in the project, capacity building and training activities will be conducted to enhance the technical and business capacity of the value chain actors.

There are essentially 5 stages in the charcoal value chain. In light of the discussions with key stakeholders in Guinea-Bissau, the project proposes a series of integrated interventions that are mostly focused on stages 2 (charcoal production) and 5 (charcoal consumption) of the value chain. This also applies to fuelwood production and utilization.

Charcoal Value Chain – Interventions by Stage



Improved kilns under stage 2 will consist mainly of Casamance prototypes. Improved cookstoves under stage 5 will include prototypes using charcoal or fuelwood. Through this component, a viable business model for improved kiln and

[14] Alliance for Rural Electrification (2011), *Hybrid Mini-Grids for Rural Electrification: Lessons Learned.*

improved cookstove production and distribution will be designed and implemented, focused primarily on the deployment of microfinance and loan guarantee schemes.

Alternative sustainable solutions to wood energy will also be explored and assessed.

Component 2: Capacity Building for RE-based mini-grid and low-carbon bioenergy system management

This component will address technical barriers to the implementation of RE-based mini-grids and low-carbon bioenergy technologies. First, the aim is to help the power utility EAGB and potential service providers upgrade their capacity for delivering turn-key solutions for RE and hybrid systems. Technical assistance will be provided to a number of competitively-selected local Small & Medium Enterprises (SMEs) through an open Call for Expression of Interest. An international technology transfer partner (an experienced SHP manufacturer) will be sub-contracted to deliver such assistance. Second, the project will build capacities of key actors of the bioenergy technology value chain: i.e farmers, craftsmen, retailers and end-users. In addition, the project will provide training courses to system designers and end-users, develop and publish guides on design, installation and maintenance of RE and low-carbon bioenergy systems. Also, community organizations in pilot locations (local NGOs and SMEs/productive users) will be provided with assistance and advice on the relevant aspects of RE operations, such as identification of potential sites, pre-feasibility assessment andbusiness planning.

The component will also establish a national clearing-house mechanism for decentralized sustainable mini-grids and low-carbon bioenergy developers and national entities. Assistance will be provided to collect and present all essential information for potential RE developers, such as: a) prospective sites and their characteristics; b) the required process for permitting and licensing; c) policies and regulations governing RE project development; d) information about local technology service providers; and e) potential sources of financing and incentives. The information will be presented online and published as an investor guide. Support will also be provided to an assigned national entity to ensure regular updates and wide dissemination of this information. The project will also promote investment opportunities among local and foreign partners, financial institutions, developers and social impact investors via targeted PR campaigns, conferences and other marketing and communication tools.

Component 3: RE-based mini-grids and low-carbon bioenergy technologies roll-out

The expected outcome from this component is the improved confidence of communities, developers and potential investors in the technical and economic viability of RE-based mini-grids for rural electrification, local socio-economic development as an alternative solution to centralized grid-expansion schemes, and low-carbon bioenergy technology dissemination.

Through the implementation of the investment projects under this component, the appropriateness of proposed policy and financing de-risking instruments will be demonstrated (Component 1). The showcase will also be used as a testing ground for developing a domestic technology supply chain (Component 2) and the investment projects will demonstrate the financial viability of the proposed business models. Furthermore, the projects are expected to generate valuable information on the suitability of, and the practical implementation of, the O&M&M models that will be developed.

The project will focus on forests areas in Cantanhez (south-west), Lagoas de Cufada (centre), Tarrafes do Rio Cacheu (north) and Gabu (east). Priority will be given to sites where mini-grids are already operational and running with either fossil fuel or other sources, to reduce the high upfront investment cost. The PPG phase will help to better define the site selection criteria.

The project will aim at facilitating the roll-out (preparation and implementation) of staggered batches of 4 commercial RE-based mini-grid systems for a total of up to 2 MW of RE-based capacity. The average size of each mini-grid will be between 100 to 500 kW. The project will also facilitate the dissemination of 5,000 improved cookstoves and 50 improved kilns.

4) Incremental/additional cost reasoning and expected contributions from the baseline, the GEFTF, LDCF, SCCF, and co-financing

Baseline practices	Alternative to be put in place by the project	Expected Global Benefits
Component 1: Policy and financial instruments and incentive schemes for renewable energy mini-grids and low-carbon bioenergy technologies		
- Only 1 pilot mini-grid functioning in the country. - Government planning only large-scale renewable energy investments.	A defined and adopted comprehensive policy framework for the promotion of renewable energy-based electrification. The policy framework will establish a cornerstone policy instrument (e.g. a financially viable tariff structure for RE-based mini-grids) and supporting policies and regulations, including, but not limited to, harmonized and simplified concession regimes and licensing rules for mini-grids, standardized PPAs, and land and water use rights for SHP projects. A new business model will be established, blending the utility and private sector models.	The electricity generated from SHP and PV facilitated by the project will result in a reduction of 137,680 tCO_2 over the 20-year technology lifetime. The deployment of 50 energy efficient charcoal kilns (Casamance model) and the dissemination of improved cookstoves by the project will result in a reduction of 52,608 tCO2 over the technology lifetime.
- Traditional methods used for charcoal production. - Traditional cookstoves used for cooking. - Experience in improved cookstoves are mainly donor-driven, with free distribution or high rate of subsidies.	The project will develop market-oriented policy measures and demand-side management for improved kilns and cookstoves prototypes. The project will also put in place financial incentives and market mechanisms (microfinance and loan guarantee schemes) to secure supply and stimulate demand for energy-efficient stoves, fuelwood and charcoal.	The establishment of new frameworks, instruments and incentives will apply to all future investments in mini-grids and in clean cooking and thus can be estimated to indirectly contribute to additional emission reductions post-project (this will be defined in the PPG phase).
Component 2: Capacity Building for RE-based mini-grid and low-carbon bioenergy system management		
- Institutional and human capacities at all levels (sub-regional, national and local) are insufficient (if at all existent) to support rural and provincial electrification based on decentralized mini-grid systems. - There is lack of adequate capacity among bioenergy technology value chain stakeholders (farmers, craftsmen, retailers and end-users).	The GEF-funded activities will provide technical assistance to local manufacturers and service providers to upgrade their capacity for delivering turn-key solutions for sustainable mini-grid technologies. An international technology transfer partner (an experienced SHP manufacturer) will be sub-contracted to deliver such assistance. The project will also build the capacities of key actors of the bioenergy technology value chai:, i.e farmers, craftsmen, retailers and end-users.	Total estimated direct emission reductions from the project are 137,680 tCO_2 (electricity generation) + 52,608 tCO_2 (low-carbon bioenergy) = 190,288 tCO_2.
Component 3: RE-based mini-grids and low carbon bioenergy technologies roll-out		
- There are a very few off-grid operators, most of which sell only individual solar kits. Only one is operating a mini-grid. - No adequate bioenergy technology promotion programme.	The project will aim at facilitating the roll-out (preparation and implementation) of staggered batches of commercial RE-based mini-grid systems for a total of up to 1.5 MW of SHP and 0.5 MW of solar PV-based capacity. The project will also facilitate the dissemination of 5,000 cookstoves and 50 improved kilns.	Total estimated direct emission reductions from the project are 137,680 tCO_2 (electricity generation) + 52,608 tCO_2 (low-carbon bioenergy) = 190,288 tCO_2.

5) Global environmental benefits (GEFTF) and/or adaptation benefits (LDCF/SCCF)

A preliminary and conservative estimate indicates that the total direct project CO_2 emissions reduction from the deployment of an additional 2 MW of installed capacity from the SHP and PV facilitated by this project, as well as the dissemination of improved cookstoves and kilns, is **190,288 tCO_2**, which translates into an abatement ratio of $17.7 of GEF funds per tCO_2 reduced. Please see the Annex for further details. The PPG phase will help to better define the emission reductions, including the substantial indirect emission reduction benefits that are anticipated.

6) Innovation, sustainability and potential for scaling up

Innovativeness: The project has several distinctive features, which makes it highly innovative in the context of Guinea-Bissau. First, it creates a strong link between the forest and basic energy needs: by promoting the use of sustainable charcoal and firewood the project will not only reduce the pressure on biomass resources but will also serve to facilitate hydro-power through more sustained and even water flow. Second, the project will pilot a combination of 2 business models (the utility business model and the private sector business model), combining the advantages of both models to support decentralized mini-grids. Third, it will focus on identifying and supporting private sector-led RE projects (as opposed to the traditional pubic/donor-driven approach), thus maximizing long-term financial and operational sustainability. Finally, as opposed to traditional approach of delivering readily-available turn-key solutions for rural electrification, the project will work with the entire domestic value chain for SHP, solar PV and bioenergy, starting with design through construction and commissioning and up to operation, maintenance and management.

Sustainability: By addressing the underlying policy and financing barriers that impede the development of RE-based mini-grids and low carbon bioenergy technologies in Guinea-Bissau, the creation of a sustainable niche for an integrated development will be realized. The financial sustainability of mini-grids and bioenergy technologies will be ensured via the introduction of financially - and socially - viable tariffs. The project will also remove barriers for sustainable operating and maintenance costs, by specifically putting in place the missing elements for a sustainable O&M&M model (as described in the barrier section). Component 1 will put in place a sustainable and viable business model for the operation and maintenance of the system, Component 2 will focus on the capacity building. Given the low literacy rate and the lack of technical capacity among rural communities, maintenance issues represent a significant risk for mini-grid system operations. Minor repairs have to be done by locally-trained staff to prevent equipment from being idled for long periods. Spare parts have to be standard among sites, locally manufactured if possible, readily available for transport and installed at minimal cost. Component 3 will demonstrate the effective functionality of the two first components.

Potential for scaling-up: Guinea-Bissau's unexploited potential for hydro-power development and solar PV means there is a substantial scope for replication and scaling-up investment in sustainable mini-grids, especially for rural electrification where almost 100% of customers are yet to be served. The policy, financial instruments and business model developed under the project, coupled with a sound awareness/outreach programme, will generate interest beyond the targeted sites for replication and scaling-up by connecting the various stakeholders (rural households, small farmers, the private sector, financial institutions, technical training and local organisations) to promote the establishment of distribution channels to develop sustainable renewable energy based mini-grids for the provision of electricity services. The scaling-up will benefit not only small hydro or solar PV based mini-grids, but mini-grids with any type of renewable energy source, as some aspects of the business model will be applicable. The approaches piloted in this project (the linkage between modern energy access and forest) can also be applied in many localities in the country and, indeed, the region. Output 3.7 aims to develop a scale-up plan for replicating the project's financing and business models to other parts of the country. Both the Secretariat of State of Environment and the Ministry of Energy are committed to implementing this scale-up plan.

2. Stakeholders. Will project design include the participation of relevant stakeholders from civil society organizations (yes ☒ /no☐) and indigenous peoples (yes ☐ /no☒)? If yes, identify key stakeholders and briefly describe how they will be engaged in project preparation.

Stakeholders	Expected role
Secretariat of State of Environment	• Leading Executing Partner for the project • Coordination of the overall project preparation and activities • Ensure consistency of the project • Co-participate in the identification of pilot sites • Environmental and social impacts assessment • Resources assessment for pilot projects • Ensure the Monitoring GHG emission reductions • Investment support and promotion, including from international climate finance • Monitoring and evaluation
Ministry of Energy	• Ensure the integration of proposed mini-grid related policies in the national policy and institutional framework for power sector reform • Co-participate in the identification of pilot sites • Plan activities related to transfer and development of domestic supply chain and O&M&M models • Facilitating investment promotion, support for mini-grids, and issuance of co-financing letters
Ministry of Finance	• Provide guidance on the design of appropriate financial mechanisms and to ensure the programming and the disbursement of the co-financing (cash) committed by the Government
National Institute for Research and Applied Technology (INITA)	• Conduct of required project researches and developments (R&D) • Conduct of tailor-made learning programs on low carbon technologies • Assist the project in the creation and production of informative material about low carbon technologies
Institute of Biodiversity and Protected Areas (IBAP)	• Identification of forest communities and resources in the project pilot sites within Protected Areas • Organization and conduct of awareness raising campaigns • Ensure good buy-in from direct beneficiaries of the project
Direction General of Forests and Fauna (DGFF)	• Ensure the integration of proposed low-carbon bioenergy technologies related policies in the national policy and institutional framework prescribed in the Domestic Energy Action Plan • Identification of forest communities and resources in the project pilot sites outside the Protected Areas • Organization and conduct of awareness raising campaigns • Ensure the inclusiveness and good buy-in from farmers, charcoal and fuelwood producers
Private sector: mini-grid operators, installers of RE systems	• Provide equity investment for pilot projects • Technology needs assessment for SHP and PV supply chain • Design of O&M&M models
Farmers, charcoal and fuelwood producers and other cooking value-chain stakeholders	• Ensure initiative sustainability • Participate in the design of the financial mechanisms
Local communities and CSOs (such as the local NGOs GDVER and ADPP- Guinea-Bissau)	• Organization and conduct of awareness-raising campaigns • Ensure strong support and buy-in from direct beneficiaries of the project
Local and international finance institutions	• Provision of loan financing models for pilot projects

3. Gender Equality and Women's Empowerment. Are issues on gender equality and women's empowerment taken into account? (yes ☒ /no☐). If yes, briefly describe how it will be mainstreamed into project preparation (e.g. gender analysis), taking into account the differences, needs, roles and priorities of women and men.

The majority of the beneficiaries of better access to energy needs in rural areas are women and children. Providing energy access to these most often poor households adds value to agricultural production and to micro, small and medium enterprises. It generates high positive impacts on women as consumers of electricity. While electrification will benefit both women and men by enhancing their engagement in more productive activities, gender gains are derived mainly from reducing the workload of women and girls.

Fuelwood use for domestic purposes is synonymous with women in Guinea-Bissau. Although women may share the task of collecting fuel wood with children, they are entirely responsible for cooking in the households. Therefore, this project will directly impact women. It is estimated that the time spent for wood collection varies between 2 to 3 hours per woman per day in the country. With adequate management of firewood and improved cookstoves, this can be reduced to only 2 or 3 hours per week.

The project will have specific gender goal indicators, which will include the collection of gender-disaggregated data and a strong monitoring and evaluation mechanism to operate and advance gender mainstreaming and social equity. During the PPG phase, surveys will be conducted and consultation workshops will be organized to specifically reflect the participation of women, youth and socially marginalized groups.

4 Risks. Indicate risks, including climate change, potential social and environmental risks that might prevent the project objectives from being achieved, and, if possible, propose measures that address these risks to be further developed during the project design (table format acceptable).

Risk	Level of Risk	Mitigation Action
Political risk Guinea-Bissau faces regular political instability. Several coups d'état have taken place in the past, with the last being in 2012. A new elected Government has been ruling since 2014. If a sudden and new political instability occurs again, it will certainly negatively impact on the overall investment climate and cause delays in project implementation.	P=4 I=4	The project will work as much as possible with decentralized authorities in provinces and rural areas. The political will to support this project in these regions is strong. The impact of political instability at national level is seen more in the capital, Bissau. The project will also build a wide coalition of partners and stakeholders whose interest in rural development will likely sustain, even in case of regime change. They include local businesses and communities, NGOs and international development agencies.
Technology risk Insufficient quality of locally-produced equipment, leading to early break-down of SHP, PV or mini-grid systems and dwindling consumer confidence in the technology.	P=2 I=2	Given the low literacy rate and the lack of technical capacity among rural communities, maintenance issues represent a significant risk for mini-grid system operations. Minor repairs have to be done by locally-trained staff to prevent equipment from being idled for long periods. Spare parts have to be standard among sites, locally manufactured if possible, readily available for transport and installed at minimal cost. The building of technical and operational capacities among rural communities will be critical to mitigate these technical risks. This will be done by providing basic technical training jobs in rural areas and sponsoring local institutions that take on maintenance tasks.
Financial risk Widespread poverty and lack of sustainable sources of income, resulting in low ability to pay for modern energy services. Households may not be able to purchase improved cookstoves; and	P=2 I=3	The project will conduct assessments of the capacity and willingness to pay of end-users. In addition, the combination of the power utility business model and private sector business model through PPPs (public private partnerships) will reduce the financial risk on both sides (utility and private sector). The role of

Risk	Level of Risk	Mitigation Action
improved kilns may not be affordable to charcoal producers.		microfinance (tailored to the low-income market) and loan guarantees (financial de-risking) will also help reduce the risk.
Market risk In Guinea-Bissau, RE systems will have to compete with subsidized and locally available diesel alternatives. Without additional incentives, sustainable mini-grids plants may remain uncompetitive.	P=3 I=3	Introduction of financially- and socially-viable tariffs for RE-based mini-grids will be a cornerstone instrument of the proposed policy package, aimed specifically at addressing this market risk by leveling the playing field for RE against other available alternatives.
Social risk There will be limited social and/or cultural acceptance (this applies in particular to the improved cookstoves, as people will have to adjust their behaviours, which is notoriously difficult to achieve). Although the project plans to address this directly, there might still be aspects that will be out of the project's control.	P=2 I=3	The PPG phase will develop a detailed analysis of the socio-economic aspects of using improved cookstoves. However, if a particular community/village does not want to change its cooking habits, the project will emphasize the benefits of improved cookstoves and bring examples of communities/villages that have adopted them.
Climate risk Climate change is predicted to cause changes in, and increase the variability of, Guinea-Bissau's hydrological regime and precipitation patterns, which will pose additional challenges and risk to RE (especially SHP) development.	P=1 I=3	Results of climate models for Guinea-Bissau will be incorporated in the design and selection of pilot sites. The existing and projected climatic data will be used to ensure that the chosen sites are not highly affected by irregular rain trends and are least vulnerable to projected changes in hydrological regime. In addition, policy recommendations for SHP promotion will include regulations to protect watersheds in order to maintain the necessary vegetation forest cover.

5. Coordination. Outline the coordination with other relevant GEF-financed and other initiatives.

During the PPG phase, in-depth consultations will be undertaken to establish partnerships and practical modalities for linking and collaborating with several ongoing and planned modern energy access related projects/programmes in Guinea-Bissau. This is not only to avoid unnecessary duplication but also to ensure that GEF resources build on the progress and achievements made to date through such initiatives. A strategy and plan for collaboration with relevant ongoing and planned initiatives such as those stated below will be prepared during the preparatory phase, including defining the roles and responsibilities of critical stakeholders.

The proposed project is one of a series of similar UNDP-GEF initiatives aimed at promoting renewable energy-based mini-grids in Africa (such as small hydro-based mini-grids in Congo-Brazzaville, DR Congo and Central African Republic; wind-based mini-grids in Mauritania, solar PV mini-grids in Mali and biomass-based mini-grids in Benin). These projects share the same market transformation approach and model for RE-based rural electrification. The portfolio will be coordinated by the UNDP-GEF Regional Hub for Africa (based in Addis Ababa), including analysis and presentation of lessons learned, organization of regular face-to-face and virtual networking, knowledge-sharing and outreach activities and events.

The project will also liaise with various GEF-funded projects in Guinea-Bissau, such as the GEF-UNIDO project, "*Promoting Investments in Small to Medium Scale Renewable Energy Technologies in the Electricity Sector*"; and the GEF-UNDP project, *"Strengthening the financial and operational framework of the national PA system in Guinea-Bissau"*.

The GEF-UNIDO project is primarily focused on small-scale to medium-scale energy platforms in the electricity sector (peri-urban areas) while the UNDP project will focus on the promotion of micro-scale systems providing both electricity and sustainable biomass applications in forest-dependent communities.

The project will also liaise with the Small Grants Programme (SGP), which has developed a number of projects in the fields of bioenergy and ecosystem conservation.

6. Consistency with National Priorities. Is the project consistent with the National strategies and plans or reports and assessements under relevant conventions? (yes ☒ /no☐). If yes, which ones and how: NAPAs, NAPs, ASGM NAPs, MIAs, NBSAPs, NCs, TNAs, NCSAs, NIPs, PRSPs, NPFE, BURs, etc.

The proposed project is in line with the following national strategies and plans:

- **TERRA RANKA** - Strategic and operational plan for 2015-2020: Terra Ranka is an ambitious development plan, designed after the general elections in 2014. It has several pillars, for which the following are relevant to this project: sustainable management of ecosystems; boosting human capital; and building a strong private sector.
- **PANER** (renewable energy development plan) and **PANEE** (energy efficiency development plan) for 2015-2030: The two plans were developed in the context of Sustainable Energy for All, with support from ECREEE (ECOWAS Regional Centre for Renewable Energy and Energy Efficiency).
- **Second National Communication to the UNFCCC** (2011): The SNC highlights that the main sources of GHG emissions are land-use change and forestry (96%) and energy (4%). The report identifies 4 priority mitigation measures: (i) promotion of improved cookstoves and kilns; (ii) promotion of hydropower; (iii) solar PV-based rural electrification; and (iv) large-scale renewable energy connected to the grid. The first three measures are in accordance with this proposed project.
- The **Intended Nationally Determined Contribution** (2015) of Guinea-Bissau specifies a target of increasing the country's energy supply up to a level of 80% renewable energy by 2030 and 80% access to electricity by 2030. GHG reductions will come mainly from the energy, agriculture and forestry sectors. With the additional 2 MW to be installed by this GEF-funded project, it will contribute to 6% of the renewable energy target of the country by 2030. In addition, the project will put in place an enabling legal environment and market transformation that will indirectly contribute to achievement of the INDC target capacity.

7. Knowledge Management. Outline the knowledge management approach for the project, including, if any, plans for the project to learn from other relevant projects and initiatives, to assess and document in a user-friendly form, and share these experiences and expertise with relevant stakeholders.

Knowledge management is very important for this project, due to its innovativeness. Outputs 3.6 and 3.7 will specifically deal with knowledge management. Through this component, the project will help to collect and present all essential information in project sites. The information will be presented online and published as an investor guide. Support will be provided to relevant ministries to ensure regular information updates and wide dissemination.

PART III: APPROVAL/ENDORSEMENT BY GEF OPERATIONAL FOCAL POINT(S) AND GEF AGENCY(IES)

A. RECORD OF ENDORSEMENT[15] OF GEF OPERATIONAL FOCAL POINT (S) ON BEHALF OF THE GOVERNMENT(S):

(Please attach the **Operational Focal Point endorsement letter**(s) with this template. For SGP, use this **SGP OFP endorsement letter**).

NAME	POSITION	MINISTRY	DATE *(MM/dd/yyyy)*
João Raimundo Lopes	GEF Operational Focal Point, Technical Advisor	Secretariat of State for Environment	**04/27/2016**

B. GEF AGENCY(IES) CERTIFICATION

This request has been prepared in accordance with GEF policies[16] and procedures and meets the GEF criteria for project identification and preparation under GEF-6.

Agency Coordinator, Agency name	Signature	Date *(MM/dd/yyyy)*	Project Contact Person	Telephone	Email
Adriana Dinu Executive Coordinator, UNDP GEF		07/29/2016	Saliou Toure Technical Advisor EITT	+251 912 503 320	Saliou.toure@undp.org

C. ADDITIONAL GEF PROJECT AGENCY CERTIFICATION (APPLICABLE ONLY TO NEWLY ACCREDITED GEF PROJECT AGENCIES)

For newly accredited GEF Project Agencies, please download and fill up the required **GEF Project Agency Certification of Ceiling Information Template** to be attached as an annex to the PIF.

N/A

[15] For regional and/or global projects in which participating countries are identified, OFP endorsement letters from these countries are required even though there may not be a STAR allocation associated with the project.

[16] GEF policies encompass all managed trust funds, namely: GEFTF, LDCF, and SCCF

Annex: CO_2 emission reduction calculations

Direct emissions from electricity generation: CO_2 emission reduction attributed to cumulative 1.5 MW from SHP and 0.5 MW solar PV.

For SHP:
Assumptions: (1) Hydropower system capacity factor = 60%; (2) Useful life of hydro power systems = 20 years; (3) Average emission factor from diesel generators = 0.786 tCO_2/MWh

Calculations:
Annual power generation from SHP systems = 1.5 x 0.6 x 8760 = 7,884 MWh
Annual CO_2 emission reduction = 0.786 x 7,884 = 6,196 tonnes/year
Lifetime CO_2 emission reduction = 6,196 x 20 = 123,920 tonnes

For solar PV:
Assumptions: (1) PV system capacity factor = 20%; (2) Useful life of hydro power systems = 20 years; (3) Average emission factor from diesel generators = 0.786 tCO_2/MWh

Calculations:
Annual power generation from SHP systems = 0.5 x 0.2 x 8760 = 876 MWh
Annual CO_2 emission reduction = 0.786 x 876 = 688 tonnes/year
Lifetime CO_2 emission reduction = 688 x 20 = 13,760 tonnes

Total direct emission reductions: 123,920 + 13,760 = 137,680 tonnes CO_2 eq.

Direct emissions from low-carbon bioenergy technologies: CO_2 emission reduction attributed to the deployment of 50 energy-efficient charcoal kilns (Casamance model) and the dissemination of 5,000 improved cook stoves.

IMPROVED COOK STOVES							
Parameter	**Year**						
	1	**2**	**3**	**4**	**5**	**6**	**7**
Number of improved cook stoves disseminated (units)	100	400	1,000	1,500	2,000		
Total number of improved cook stoves in use (units)	100	500	1,500	3,000	5,000	4,600	3,600
Total reduction of CO_2 equivalent per improved cook stove (in tonnes)	0	750	2,250	4,500	7,500	6,900	5,400

Lifetime of the improved cook stove (ICS), years	**3**
CO_2 emission reduction per ICS, tonnes/year[17]	**1.5**
Total CO_2 emission reduction from the ICSs, tonnes	**27,300**

SUSTAINABLE CHARCOAL PRODUCTION

Type of Charcoal Kilns	Number of Units Installed	Annual Production, tonnes	Useful Life, Years	Total Lifetime Production, tonnes	No. of Replacements
Casamance Kiln	50	9.6	5	7,200	2

NOTES:	**Charcoal to Wood Ratio**	**Useful Life, years**
Traditional Kilns	0.208	3
Casamance Kiln	0.25	5

[17] Stockholm Environment Institute, Working Paper (2013), *Assessing the Climate Impacts of Cookstove Projects: Issues in Emissions Accounting.*

	CO_2 Emission Reduction, tonnes			Charcoal Production and Operational Losses, tonnes	Net CO_2 Emission Reductions, tonnes
	Pyrolytic CH_4 avoidance	Use of non-renewable biomass	Total		
Casamance Kiln	0	26,640	26,640	1,332	25,308

- Traditional Kilns have a minimum charcoal yield of 250 kg from 1,200 kg wood.
- Retorts kilns have an average yield of 250 kg of charcoal from 650 kg of wood (dry basis)
- Average annual production from Retort kilns is 24 tonnes of charcoal; for Casamance, it is 9.6 tonnes of charcoal
- Based on data from a leading study[18], with a conservative estimate of the percentage carbon content in wood, the CO_2 reduction conversion factor savings from avoiding the use of non-renewable biomass represents an emission reduction of roughly 3.7 tCO_2e per tonne of charcoal produced.
- Total losses (i.e. production facility, charcoal transport and distribution to consumers) do not exceed 5%.

Total CO_2 emission reduced from improved kilns and cookstoves: 27,300 + 25,308 = **52,608 tCO_2**

Total estimated CO_2 reductions from the project: 137,680 + 52,608 = **190,288 tCO_2**.

[18] Bailis (2009), *Modeling Climate Change Mitigation from Alternative Methods of Charcoal Production in Kenya.*