



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 sustainable energy access for rural communities in South-Eastern Angola		
Country(ies):	Angola	GEF Project ID: ¹	
GEF Agency(ies):	UNDP	GEF Agency Project ID:	5989
Other Executing Partner(s):	Ministry of the Environment (MINAMB)	Submission Date:	March 3, 2017
GEF Focal Area(s):	Climate Change	Project Duration (Months)	60
Integrated Approach Pilot	IAP-Cities <input type="checkbox"/> IAP-Commodities <input type="checkbox"/> IAP-Food Security <input type="checkbox"/> Corporate Program: SGP <input type="checkbox"/>		
Name of parent program:	n/a	Agency Fee (\$)	336,344

A. INDICATIVE FOCAL AREA STRATEGY FRAMEWORK AND OTHER PROGRAM STRATEGIES²

Objectives/Programs (Focal Areas, Integrated Approach Pilot, Corporate Programs)	Trust Fund	(in \$)	
		GEF Project Financing	Co-financing
CCM-1 Program 1	GEFTF	3,540,468	18,000,000
Total Project Cost		3,540,468	18,000,000

B. INDICATIVE PROJECT DESCRIPTION SUMMARY

Project Objective: To catalyse investments in decentralised renewable energy systems to expand energy access for base-of-the-pyramid consumers and to reduce GHG emissions						
Project Components	Financing Type ³	Project Outcomes	Project Outputs	Trust Fund	(in \$)	
					GEF Project Financing	Co-financing
1. Policy derisking and finance for decentralised renewable energy	TA	Enabling environment created for private sector investment in decentralised renewable energy	1.1 Assessment of successful RET diffusion in the region 1.2 Business case for clean energy supply chain developed 1.3 MFIs provide micro-credit to rural communities for the purchase of advanced cook stoves, solar home systems and solar lanterns 1.4 Mobile payment system expanded to Moxico Province and mobile-based PAYG models established in South-Eastern Angola	GEFTF	500,000	1,759,971

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](#) and [CBIT guidelines](#).

³ Financing type can be either investment or technical assistance.

2. Market for off-grid renewable energy systems developed, including solar home systems, advanced cook stoves and solar lanterns	TA	Successful establishment of a household-level energy service delivery model for replication nationally. 50,000 beneficiaries have access to sustainable cooking and lighting technologies.	2.1 Local private companies along the value chain supported, including business development, connection to suppliers and access to finance 2.2 Five solar-powered kiosks procured, providing clean energy products to communities in South-Eastern Angola 2.3 Technology transfer of decentralised renewable energy systems facilitated 2.4 Training provided to technicians on installation of solar home systems 2.5 Training and technical support provided to communities on how to use the clean energy products	GEFTF	821,874	2,778,600
	Inv				1,750,000	11,900,000
3. Outreach programme and dissemination of results	TA	Lessons learned and experience from project interventions support replication and scaling-up of project results	3.1 Lessons learned report produced based on project experience 3.2 Cooperation with technical institutes and universities established 3.3 Project results incorporated into vocational schools' curriculum	GEFTF	300,000	940,000
Subtotal					3,371,874	17,378,571
Project Management Cost (PMC) ⁴				GEFTF	168,594	621,429
Total Project Cost					3,540,468	18,000,000

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 (\$)
Recipient Government	Ministry of Energy (solar village programme)	Loans	12,000,000
Recipient Government	Ministry of Environment	Grants	1,000,000

⁴ For GEF Project Financing up to \$2 million, PMC could be up to 10% 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.

Recipient Government	Ministry of Environment	In-kind	700,000
GEF Agency	UNDP	Grants	300,000
Private Sector	BAI Microfinance	Loans	2,000,000
GEF Agency	African Development Bank	Loans	2,000,000
Total Co-financing			18,000,000

D. INDICATIVE TRUST FUND RESOURCES REQUESTED BY AGENCY(IES), COUNTRY(IES), FOCAL AREA 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	Angola	Climate Change	n/a	3,540,468	336,344	3,876,812
Total GEF Resources					3,540,468	336,344	3,876,812

a) Refer to the [Fee Policy for GEF Partner Agencies](#).

E. PROJECT PREPARATION GRANT (PPG)⁵

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: \$150,000					PPG Agency Fee: 14,250		
GEF Agency	Trust Fund	Country/ Regional/Global	Focal Area	Programming of Funds	(in \$)		
					PPG (a)	Agency Fee ⁶ (b)	Total c = a + b
UNDP	GEF TF	Angola	Climate Change	n/a	150,000	14,250	164,250
Total PPG Amount					150,000	14,250	164,250

F. PROJECT'S TARGET CONTRIBUTIONS TO GLOBAL ENVIRONMENTAL BENEFITS⁷

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)	119,600 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 area⁸ 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,

⁵ 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.

⁶ PPG fee percentage follows the percentage of the Agency fee over the GEF Project Financing amount requested.

⁷ 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, SCCF or CBIT.

⁸ 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.

SCCF, CBIT and [co-financing](#); 5) [global environmental benefits](#) (GEFTF) and/or [adaptation benefits](#) (LDCF/SCCF); and 6) innovation, sustainability and potential for scaling up.

Although Angola is classified as an upper middle income country⁹, its human development index, which takes into account socio-economic development such as health and education, places it in the Low Human Development category. The poverty headcount ratio stands at 36.6%. More than 15 million Angolans, or nearly 60% of the population, do not have access to electricity. In rural areas, only 18% of the population have access to electricity. The need to diversify the economy is often cited as one of the country's main development challenges. Oil production and related activities contribute about 50% of GDP, more than 70% of Government revenue and more than 90% of the country's exports.¹⁰

Much of Angola's electricity infrastructure was damaged during the 27-year civil war that ended in 2002 when population growth expanded and demand for electricity services increased significantly. Demand for electricity has been growing by as much as 15% per year.¹¹ As a result, blackouts and energy shortages are a common occurrence where the grid is able to provide. Two-thirds of Angolan businesses are estimated to rely on their own stand-by generators, which greatly increases production costs.¹² Those households that can afford to also run their own backup generation supplied by diesel, to make up for unreliable or in some cases non-existent public electricity services. Improving access to modern, reliable and affordable energy services is essential for Angola's economic and human development.

More than 8 out of 10 households in rural areas live in energy poverty without access to modern energy services. Grid extension will be focused until 2025 on powering the capitals of all Municipalities¹³ in Angola.¹⁴ For most areas of South-Eastern Angola, grid extension is unlikely even in the medium to long-term because the villages are so remote and the population density is so low. The provinces of Cuando Cubango and Moxico in South-Eastern Angola have the lowest population density, with 3 and 4 inhabitants per square kilometre, respectively.¹⁵

Deforestation of tropical rain forest represents a major challenge, due to both international demand for tropical timber and to domestic use as fuel, resulting in loss of biodiversity. According to FAO's Global Forest Resources Assessment¹⁶, over the past 25 years, Angola has lost nearly 125,000 hectares of forest per year, representing a deforestation rate of 0.2%. Angola's indigenous forests and biomass stocks face significant pressure due to a number of factors: (i) the need for biomass stocks for energy, both in the rural and urban areas; (ii) forest clearing for expanding agriculture and to compensate for infertile soils; (iii) forest fires, partly for clearing land for cultivation and partly for creating grazing lands to compensate for the overgrazing in pasturelands; and logging for timber or NTFPs (in selected areas).

In 2012, Angola's total GHG emissions, including land-use change and forestry, reached nearly 200 million tonnes, placing it within the top 25 GHG emitters among non-Annex I countries.¹⁷ Energy-related GHG emissions stand at 119 million tonnes, the vast majority of which are fugitive emissions from oil and gas. Approximately 85% of Angola's energy emissions are due to fugitive emissions, which account for 48% of the country's total emissions.¹⁸ As can be seen in Figure 1 below, total GHG emissions have doubled since 1990.

⁹ As of 1 July 2016, the World Bank defines upper middle income economies as those with a Gross National Income (GNI) per capita between \$4,036 and \$12,475. Source: <http://blogs.worldbank.org/opendata/category/tags/news>

¹⁰ World Bank. Source: <http://www.worldbank.org/en/country/angola/overview>

¹¹ Angola Energy 2025: Power Sector Long Term Vision

¹² African Development Bank Private Sector Country Profile, September 2012

¹³ Angola has three levels of administrative units: provinces, municipalities and communes. The 18 provinces are divided into 162 municipalities, which are further sub-divided into 559 communes.

¹⁴ SE4ALL Rapid Assessment and Gap Analysis, September 2015

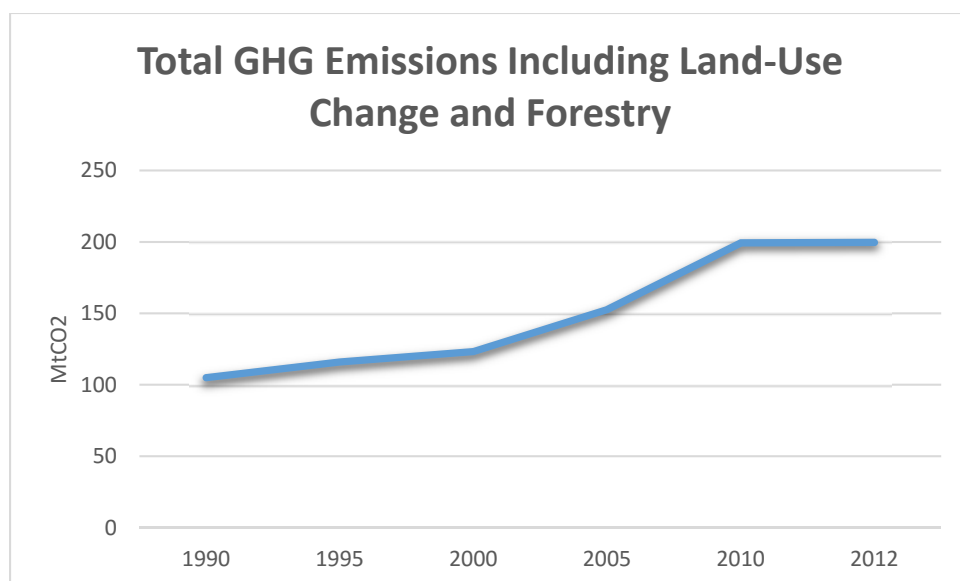
¹⁵ SE4ALL Rapid Assessment and Gap Analysis, September 2015.

¹⁶ FAO Global Forest Resources Assessment 2015, Rome.

¹⁷ World Resources Institute Climate Analysis Indicator Tool

¹⁸ USAID Greenhouse Gas Emissions in Southern Africa, 2015. Source: https://www.climatelinks.org/sites/default/files/asset/document/GHG%20Emissions%20Factsheet%20Southern%20Africa_11_17_15%20v2_edited_rev08-18-2016_Clean.pdf

Figure 1: Total GHG Emissions Including Land-Use Change and Forestry



Source: WRI Climate Analysis Indicator Tool

The global environmental problem that the project seeks to address is the GHG emissions from the unsustainable harvesting of fuelwood for cooking and the use of kerosene for lighting. According to the Global Alliance for Clean Cookstoves¹⁹, 92% of the rural population uses solid fuels for cooking, especially fuelwood, with nearly 12 million Angolans affected by hazardous air pollutants. It is estimated that more than 7,800 people die per year due to indoor air pollution. With 1,073 deaths of children under 5 per 100,000 children including due to indoor air pollution, Angola has one of the highest rates of child mortality, surpassed only by Afghanistan and Sierra Leone.²⁰

Angola is endowed with substantial renewable energy resource potential. Solar energy constitutes the largest and most uniformly distributed renewable resource of the country. Annual average global horizontal radiation has been measured at between 1,350 and 2,070 kWh/m²/year.²¹ The country also has good hydropower, biomass and wind energy resource potential. One of the key objectives of Angola's Renewable Energy Strategy is to improve access to energy services in rural areas based on renewables. Table 1 below shows some of the key goals for off-grid renewables.

Table 1: Selected Goals for Off-grid Renewables

Strategic Goal	Specific Goals
1. Improve access to energy services in rural areas based on renewable sources	▪ Establishment of the National Institute for Rural Electrification
	▪ Establishment of 500 “solar villages”, involving the installation of solar panels in rural areas, mainly in public buildings
	▪ Private domestic market of 1 MW/year in individual solar systems
	▪ Distribution of 100,000 improved stoves and 500,000 solar lanterns in remote areas where purchasing power is limited

While renewable energy can play an important role in rural energy access and in providing basic services, essential for the socio-economic development of remote areas, the following barriers have been identified:

¹⁹ Global Alliance for Clean Cookstoves Country Profile for Angola, accessible at: <http://cleancookstoves.org/country-profiles/1-angola.html>

²⁰ UNDP Human Development Report 2016

²¹ SE4ALL Rapid Assessment and Gap Analysis, September, 2015.

- **Barriers to entry for private sector participation remain high**

It remains difficult for the private sector to operate in Angola and the economy remains heavily dependent on public investment. In the World Bank's 2017 Doing Business Survey, which measures the ease of operating in the private sector, Angola ranks 182nd out of the 190 economies surveyed. Some of the key challenges identified include starting a business, access to credit and contract enforcement. To address these issues and attract private investment to the local economy, the Angolan Government enacted the New Angolan Private Investment Law ("NPIL") with the approval of Law 14/15, of 11 August 2015, and more recently the Procedural Regulation for Implementation of Private Investments ("Investment Regulation") with the publication of Presidential Decree 182/15, of 30 September 2015. It also established the Angolan Agency for the Promotion of Investments and Exports (APIEX) in 2016, which is responsible for the promotion of potential investments, the legal framework and existing business opportunities in Angola.

- **Inadequate institutional framework for rural energy access**

In its long-term vision, the Government of Angola has set a target for rural electrification of 60% by 2025. While Angola has a robust policy framework in place to promote renewable energy, there are still some gaps in the regulatory and institutional framework. In particular, once the recently approved Rural Electrification Agency has been established, it can play an important role in implementing the solar village programme, as well as the programmes on solar lamps and efficient cook stoves.

- **Insufficient public investments in small-scale decentralised renewable energy**

Public investments in renewable energy tend to prioritise large-scale projects above 10 MW. These large projects aim at improving energy services for urban and the most active economic areas. Until now, there have been few investments in small-scale renewable energy for rural, remote and low population density areas.

- **Last mile distribution challenge**

In Moxico Province, the last mile distribution challenge – the challenge of reaching dispersed consumers at the base of the income pyramid who have limited product awareness – is especially pronounced and represents one of the main reasons that the private sector has not yet come in.

- **Limited awareness of clean cooking and lighting alternatives**

By and large, consumers in Moxico Province have limited awareness and knowledge of the clean cooking and lighting solutions that are available in the international market. In many cases, they are subsistence farmers who have come to accept and endure indoor smoke and fumes as part of their daily reality, unaware that clean energy alternatives exist.

- **Limited human resource capacity in the sector**

Given Angola's fairly limited experience thus far with small-scale renewables, there is limited human resource capacity in the sector and therefore significant training and capacity building needs. For example, there is a limited supply of technicians who are able to adequately operate and maintain renewable energy systems.

Baseline scenario

Economic growth in Angola – now Africa's largest oil producer and third-largest economy in Sub-Saharan Africa – is expected to rebound in the coming years.²² At the same time, Angola has one of the highest population growth rates in the world, with an annual population growth rate of 2.72%.²³ As a result, in the space of a little over a decade, demand for electricity is expected to climb by a factor of four. Until 2025, the overall system load is expected to reach 7.2 GW – more than four times the current level. An average annual growth in electricity consumption of 15% is expected until 2017, slightly decreasing to 12.5% between 2017 and 2025.²⁴

In urban areas, demand for electricity will likely be met by large-scale hydropower plants, natural gas-fired power plants, and in some cases, diesel generators. In rural areas, rural electrification efforts in the medium term will focus on Provincial capitals and Municipalities. Under the Government's grid extension plans, it is envisaged that the grid

²² Economist Intelligence Unit Country Report, November 2016

²³ Resultados definitivos do recenseamento geral da população e da habitação de Angola 2014, Março 2016.

²⁴ Angola Energy 2025: Power Sector Long Term Vision.

will only reach a small area of South-Eastern Angola, since the remote villages and dispersed households that characterise the region mean that it is not economic to extend the grid to those areas. In more remote communities such as those found in South-Eastern Angola, rural electrification will centre around two options: isolated systems such as micro-hydro and solar PV mini-grids, and, more likely, individual, household-level solutions such as solar home systems and solar lanterns.

In terms of cooking energy, rural households mainly use fuelwood in traditional three-stone fires, with adverse effects both on forest ecosystems and the health of household members, especially women and girls, who are traditionally responsible for cooking and other household chores, which involve spending hours by the cooking fire exposed to smoke. It has been estimated that rural households in Angola consume an average of 4,320 kilograms of fuelwood per year to meet their cooking needs.²⁵ While more recent data are not available, the SE4All report²⁶ mentions an increase in country-wide fuelwood consumption by 39% since 1990. The demand for wood is a significant driver of forest degradation and, subsequently, the release of GHG emissions.²⁷ While the Government plans to introduce LPG in rural areas as an alternative, cleaner cooking fuel, LPG will effectively only be available to communities that have access to the LPG distribution network, notably urban centres near the railway in the northern part of Moxico Province. The central and southern parts of Moxico province are remote, also because of the location of the province near the frontier with Zambia, and unlikely to be reached by public electricity services until 2025. On the other hand, it is in these relatively remote locations, where the networks of fossil fuel distribution (e.g. LPG) are weakly developed or non-existent, that renewable energy solutions have the greatest competitive advantage in the Angolan context.

For lighting energy, most rural households in Angola use kerosene lamps, exposing household members to dangerous fumes and high levels of particulate matter.²⁸ Kerosene lamps also emit both carbon dioxide and black carbon. It has been estimated that rural households in Angola consume an average of 48 litres of kerosene per year to meet their lighting needs.²⁹ Under the baseline scenario, in the absence of targeted interventions, most rural households will continue to use fuelwood for cooking and kerosene lamps for lighting, with negative environmental and health consequences.

The population of Moxico Province in South-Eastern Angola is about 725,000 people, with 55% living in towns and 45% in rural areas. Towns in Moxico have grown very rapidly over the past decade.³⁰ Increasing numbers of people, especially young male adults, are moving to towns where employment opportunities are greater than in rural areas. People in small, isolated villages typically depend on food from crops and harvests of meat and plants from the surrounding miombo woodland. Limited sources of cash income for rural people include the selling of fish, traditional liquor, charcoal and bush meat, and some trade in manufactured goods.

In the business-as-usual scenario, biomass usage is predicted to increase exponentially up to 2030. Meanwhile, little is being done at present to promote the use of agricultural and forestry residues for energy production. The INDC projects that, in the absence of mitigation measures, the level of GHG emissions will triple by 2030 compared to the level of emissions in 2005. Per capita carbon dioxide emissions, which already exceed the world average, are growing by an annual rate of 2.9%.³¹

Baseline projects

The main baseline project that the GEF initiative will build upon and complement is the “Aldeia Solar” (solar village) programme. Spain has provided a €60 million³² credit line for phase 3 of the solar village programme, which will extend from 2016-18. Thus far, the focus of the programme has been on installing solar PV panels for health clinics

²⁵ Energy and Development in Southern Africa, SADCC Country Studies, 1984.

²⁶ SE4ALL Rapid Assessment and Gap Analysis, September, 2015.

²⁷ UNEP Risoe Emissions Reduction Profile, 2013.

²⁸ UNEP Risoe Emissions Reduction Profile, 2013.

²⁹ Energy and Development in Southern Africa, SADCC Country Studies, 1984.

³⁰ An Atlas and Profile of Moxico, Angola, John Mendelsohn and Beat Weber, RAISON, Windhoek, 2015.

³¹ UNDP Human Development Report 2016

³² Equivalent to approximately \$63,600,000 at the current UN exchange rate of 1 Euro = 1.06 US dollars.

and schools in rural areas of the country. Outside of the Provincial Capitals, health and education facilities still have limited access to energy services. In terms of operations and maintenance (O&M) of the solar PV systems, the company that installs the systems performs the O&M for the first two years, following which the Provincial Directorate of Energy takes over O&M responsibilities. The Government has set a target of establishing 500 solar villages. During the first two phases of the programme, 125 solar photovoltaic systems and 230 solar-powered public street lights were installed in eight provinces. Another 686 solar systems and 4,785 street lights are expected to be installed in the 3rd phase.

Alternative scenario

The GEF-financed project will complement the Government's rural electrification efforts by focusing on smaller, household-level RE systems. The project will target base-of-pyramid consumers in rural areas of Moxico Province to meet both cooking energy and lighting energy needs. The project will focus in particular on small-scale decentralised renewable energy systems, such as solar home systems, solar lanterns, and advanced cook stoves. While up until now, the solar village programme has focused on health clinics and schools and public street lighting, the GEF project will build upon this government programme by targeting rural households, which would complete the concept of a solar village. In discussions with government counterparts, household-level energy access was one of the main entry points identified for GEF support.

Component 1: Policy derisking and finance for decentralised renewable energy

GEF budget: \$500,000

Co-finance: \$1,759,971

Component 1 centres on creating conducive conditions for private sector participation and engagement in the small-scale renewables sector by derisking the investment environment. The following outputs will contribute to that outcome. It should be noted that UNDP is currently developing a derisking renewable energy investment (DREI) methodology for small-scale renewable energy, including solar home kits. During project preparation, efforts will be made to align the GEF project with the small-scale DREI methodology.

Output 1.1 Assessment of successful RET diffusion in the region

There are many examples of successful diffusion of household-level renewable energy technologies in the region, most notably solar home systems in East Africa. Thus far, M-KOPA has installed 400,000 solar home systems on a purely commercial basis and may add another 200,000 over the next year. There are also a number of innovations coming to the market, such as advanced cook stoves that can meet cooking, heating, lighting and cell phone charging needs in one device³³ and solar-powered kiosks where sustainable products are sold that can serve as a hub in the community and promote local economic development.³⁴ The project will review these examples and identify the key success factors and the potential to introduce the technologies in Angola.

Output 1.2 Business case for clean energy supply chain developed

The project will conduct market intelligence and market research to establish a clear business case for the various technology options (e.g. solar lanterns, cookstoves, solar home systems). The market research will focus on potential demand and market size, willingness to pay based on current household expenditure for cooking and lighting energy, and the potential technology options, outlining which products will be imported, which products can be produced locally, and how the products will reach the end-users. The distribution model will focus in particular on the solar-powered kiosks.

Output 1.3 MFIs provide micro-credit to rural communities for the purchase of advanced cook stoves, solar home systems and solar lanterns

³³ See for example the African Clean Energy advanced cook stove at <http://www.africancleanenergy.com/>

³⁴ See for example the SOLARKIOSK at <http://www.solarkiosk.eu/>

Although the microfinance sector in Angola is still in its infancy, it is growing rapidly.³⁵ The African Development Bank contends that the development of the national microfinance industry can play a key role by helping to increase the supply of credit to the local economy.³⁶ The project will collaborate with BAI Micro Finanças (BMF) and other MFIs to set up a microfinance programme specifically designed to support rural households to purchase small-scale renewable energy systems. GEF funds will not be used for lending, but will support programme design, outreach activities, community organization and monitoring of the microfinance programme. Since women have the principal responsibility for the household and will benefit the most, women will be provided priority access to microfinance, and special attention will be given to female-headed households.

Output 1.4 Mobile payment system expanded to Moxico Province and mobile-based PAYG models established in South-Eastern Angola

Successful examples of PAYG models for solar products in the region have relied on mobile payment. While there is an existing mobile payment platform in Angola, operated by a single commercial bank and that requires an interface with a branch, e-Kwanza, the coverage is fairly limited. The project will work with BAI Micro Finanças (BMF), which has developed e-Kwanza, to expand the system to Moxico Province and develop the necessary mobile payment tools to enable mobile PAYG schemes to be used in the region.

Component 2: Market for off-grid renewable energy systems developed, including solar home systems, advanced cook stoves and solar lanterns

GEF budget: \$2,571,874

Co-finance: \$14,678,600

Following on from the policy derisking component, which will help to create the enabling conditions for private sector investment, the second project component will focus on the technology transfer and dissemination of decentralised renewable energy systems to rural households in Moxico Province. GEF funds would be used to establish private sector partnerships for the commercial adoption and dissemination of these technologies, to support business plans for companies willing to engage in the commercialisation of these technologies, and to support training of company technicians, Government officials and community members. GEF funds will also be used to procure five solar-powered kiosks, which would serve as distribution and payment points for the renewable energy systems. The products will be disseminated on a commercial basis to ensure sustainability. The solar-powered kiosks will play an important role in distributing the products to end-users. Training will also be an important aspect of this component. Training will be provided to technicians on the installation of solar home systems and to communities on the use of the clean energy products. The target audience for the community training will put particular emphasis on women, especially for energy technologies for cooking. The aim is to establish a household-level energy service delivery model that can be replicated nationally.

The second component will address the barriers related to last mile distribution, limited awareness of clean energy technologies and limited human resource capacity. It is expected that, as a result of the project activities, which are designed to create a favourable environment for the commercial dissemination of small-scale renewable technologies, 10,000 households, or 50,000 beneficiaries, will have access to sustainable cooking and lighting technologies. Women will be the target audience due to their role in the household and due to the increasing number of young male adults moving to towns. The following outputs will contribute to that outcome:

Output 2.1 Local private companies along the value chain supported, including business development, connection to suppliers and access to finance

The project will support the preparation of business plans by private companies interested in the commercialisation of these technologies and the provision of technical support (installation, maintenance etc.) for the clean energy supply chain. The project will also facilitate partnerships between the local private sector and suppliers and facilitate access to finance from Angolan banks.

³⁵ African Development Bank, Angola Private Sector Country Profile, September 2012.

³⁶ Ibid.

Output 2.2 Five solar-powered kiosks procured, providing clean energy products to communities in South-Eastern Angola

As rural communities in Moxico are dispersed across a large geographical area, five solar-powered kiosks will be procured, which will distribute the clean energy products to communities in the province. The products sold at the kiosks will reduce the need for households, especially women, to travel long distances to collect fuelwood or purchase kerosene, as they are currently doing. Among the products that will be sold will be solar home systems, solar lanterns, advanced cook stoves, and wood pellets for use as cooking fuel. The kiosks will serve as payment points, allowing customers to pay “off-line,” while the money can then be sent to the private companies via e-Kwanza from the kiosks.

Output 2.3 Technology transfer of decentralised renewable energy systems facilitated

The project will facilitate technology transfer of innovative and promising small-scale renewable energy technologies by connecting the private sector in Angola to information about products available in the international market and to technology providers. Two technology solutions that show promise and could be relevant to the Angolan context are advanced cook stoves that can meet multiple energy needs such as cooking, heating, lighting and cell phone charging, and solar-powered kiosks that provide access to clean energy services and solar lighting products, while promoting local entrepreneurship and serving as a hub and meeting point for communities. Output 1.1 will identify additional technologies that could be transferred.

Output 2.4 Training provided to technicians on installation of solar home systems

An extensive training course will be provided to technicians on the installation of solar home systems to ensure quality installation and after-sales service. The aim is to have at least 25% of trained technicians be women.

Output 2.5 Training and technical support provided to communities on how to use the clean energy products

Extensive sensitisation and training efforts will be required to expand awareness of rural communities of the benefits of renewable energy and how to use the pico solar systems and advanced cook stoves. Since women are the most affected by the lack of energy access, at least 50% of trained people in the community will be women.

Component 3: Outreach programme and dissemination of results

GEF budget: \$300,000

Co-finance: \$940,000

The third component addresses outreach and dissemination of results. This GEF-financed project will work with training and vocational centres to incorporate renewable energy in their curriculum to help build the future cadre of renewable energy manufacturers, installers and technicians in the country. The expected outcome is that the lessons learned and experience from project interventions support replication and scaling-up of project results. The following outputs will contribute to that outcome:

Output 3.1 Lessons learned report produced based on project experience

The project will prepare a lessons learned report based on the experience gained. The report will be shared with relevant ministries and provincial authorities, and a workshop will be organized to discuss key findings and recommendations to inform the subsequent deployment of renewable energy technologies.

Output 3.2 Cooperation with technical institutes and universities established

The project will cooperate with technical institutes and universities regarding research and development of sustainable energy solutions for rural households.

Output 3.3 Project results incorporated into vocational schools' curriculum

Project results will be incorporated into the curriculum of vocational schools in Angola, in order to build the human resource capacity in the renewable energy sector and to stimulate the local production of clean energy products. Under this Output, the project will collaborate with Angolan NGOs.

Global environmental benefits

For the purposes of estimating the GHG mitigation impacts of the project, it is assumed that 2,000 solar home systems, 10,000 solar lanterns, and 10,000 improved cook stoves will be disseminated through private sector adoption of renewable energy options that the project is going to introduce and promote with communities, local Government and private sector. Under the assumption that each cook stove has an emissions reduction potential of 2 tCO_{2e}/year,³⁷ the distribution of cook stoves will result in 100,000 tCO_{2e} avoided over the expected useful lifetimes of the stoves. Replacing 10,000 kerosene lamps with micro PV LED systems will avoid 1,600 tCO_{2e} over the two-year lifetime of the solar lamps.³⁸ Assuming that a 50 Wp solar home system avoids around 9 tCO_{2e} over a 20 year period (when compared to the baseline case of traditional lighting with kerosene lamps and the use of dry cell batteries to operate small devices), the dissemination of 2,000 solar home systems will result in GHG savings of 18,000 tCO_{2e}.³⁹ Altogether, the total direct GHG benefits from the project interventions will be 119,600 tCO_{2e}. It is estimated that the consequential GHG benefits during the 10-year influence period following project implementation will be 358,800 tCO_{2e}. The unit abatement cost is about \$7.4/tCO_{2e}.

Innovation

The innovative nature of the project stems from both the business and delivery model and the proposed technologies. The project will facilitate a private sector-driven model whereby private companies will sell pico solar PV systems and other household-level clean energy products to rural households on a commercial basis. This would represent the first time that a private sector model has been employed for small-scale renewables in Angola. Private companies have so far not invested at significant scale in decentralised sustainable energy options in Angola because larger companies tend to focus on urban areas with their larger markets and small, local companies that could form themselves and develop local markets in remote areas have not had the necessary access to information and technology and support for developing their business plans and local market access. The use of mobile energy centres would help overcome the challenge of last mile distribution in remote rural areas, by bringing the products to the communities. The project will also assess the applicability of innovative payment models, such as the pay-as-you-go business model where payments are made through mobile phones. On the technology side, the project will seek to bring to the market innovative technology solutions such as advanced cook stoves that can meet several different needs of rural consumers and solar-powered kiosks that foster local entrepreneurship at the base of the pyramid.

Sustainability

The factors that will contribute to the sustainability of the initiative include the following: the decentralised renewable energy systems will be sold to end-users on a commercial basis without any subsidy; there will be a strong emphasis on quality equipment and installation; the suppliers will provide after-sales service for a specified period in case of any technical issues; and communities will be trained on how to use the systems. If Banco BAI expands its existing mobile payment platform e-Kwanza, this will help facilitate payments and collection, also contributing to the sustainable growth of the market. The fact that rural electrification is a priority of the Government and significant resources have been allocated to the Solar Village Programme demonstrates the Government's commitment to expanding energy access to underserved areas of the country. If the project can successfully lower the barriers to market development as intended and demonstrate an energy service delivery model for rural communities, the market for small-scale renewables will become self-sustaining.

Potential for scaling-up

Under the Government's grid extension plans until 2025, priority will be given to major urban areas such as provincial capitals and municipality capitals, meaning that many rural communes and villages will remain off-grid, particularly in the eastern provinces of Lunda Norte, Lunda Sul, Moxico, and Cuando Cubango. The power sector long-term vision states that localities that do not meet the grid expansion criteria will be considered for off-grid electrification through

³⁷ UNEP Risoe Emissions Reduction Profile, 2013. Source: <http://www.unepdtu.org/PUBLICATIONS/Emissions-Reduction-Potential-Country-Profiles>

³⁸ UNEP Risoe Emissions Reduction Profile, 2013. Source: <http://www.unepdtu.org/PUBLICATIONS/Emissions-Reduction-Potential-Country-Profiles>

³⁹ "Does the use of Solar Home Systems (SHS) contribute to climate protection?" R. Posorski, M. Bussman, C. Menke, Renewable Energy 28 (2003)

decentralised generation. Therefore, there will be significant potential to scale-up and replicate project activities in rural areas in other provinces, to which the Government has shown its commitment. The presence of many dispersed rural settlements in Angola means that there is a large market for decentralised renewable energy in the country. It is worth noting that Angola is one of the 'High Impact Countries' under SE4ALL, which signifies that it is among the countries with the highest electricity access deficits. Once the business model has been demonstrated and proven under the GEF-financed project, the model can then be replicated nationally in order to reduce the access deficit.

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.

Stakeholder	Role
Ministry of Environment (MINAMB)	The Ministry of Environment will serve as the lead implementing partner for the project. Its mission is to propose, formulate, manage and execute the Government's environment policy, with a view to protecting and preserving environmental quality, protected areas, as well as the conservation and rational use of natural resources. MINAMB will play a coordinating role in the PPG and the implementation of the project and be the point of contact for all other stakeholders. It will contribute to the identification and promotion of sustainable energy technologies with focus on the environmental benefits of available technologies, and will contribute to the communications and advertisement of sustainable energy with stakeholders. It will also be an important interface with the provincial and local Governments.
Ministry of Energy and Water (MINEA)	The Ministry of Energy and Water is responsible for energy sector policy development, coordination and oversight. Its objective is to propose, formulate, manage and execute the Government's policy in the areas of energy, water and sanitation. Among its responsibilities, the Ministry plans and promotes the national policy on electrification. Within MINEA, there are three national directorates to implement and supervise the Ministry's policy: the National Directorate of Electric Energy, the National Directorate of Renewable Energy, and the National Directorate of Rural and Local Electrification. MINEA will play a key role in the PPG and project especially through its departments of sustainable and decentralised energy in Luanda that will contribute to project design and technology selection. MINEA will take the lead on component 2. Its provincial department in Moxico will be a key contact to the Provincial Government and local stakeholders. MINEA will also approve all technologies to be imported into the country by the project.
Ministry of Family and the Promotion of Women (MINFAMU)	The Ministry, which works towards the improvement of the conditions of women and Angolan families in general, is responsible for the National Support Programme for Rural Women and the National Strategy to Fight Poverty. The National Support Programme empowers rural women in small business management, combating illiteracy, and strengthening local initiatives for generating income. MINFAMU will advise the project on how to involve women and girls in the project activities and will help with the monitoring of gender impacts.
Provincial Government of Moxico	The Provincial Government carries out actions that promote the economic, social and cultural well-being of the population residing in its jurisdiction. The Provincial Government of Moxico will play an important role in coordinating activities at the provincial level. It will help in the selection of project sites for the solar-powered kiosks and will play a role of interface with the municipal and communal Governments and the communities themselves, as well as traditional authorities.
BAI Microfinance	The bank is specialised in microfinance, with activities started in 2004 and currently with more than 84,000 clients. The bank has 15 agencies, distributed in the provinces of Luanda, Bengo, Benguela, Malange, Uige, Cabinda, Huambo and Huíla. The project

	will work with BAI on setting up a microfinance scheme for sustainable energy solutions for rural areas in Moxico.
Private sector	The private sector will be actively engaged in the distribution of pico solar products and clean cook stoves, as well as in running the mobile energy centres. Private companies will be selected for technical support, including in the development of business plans, and training on the basis of a competitive bidding process.
Development Workshop	Development Workshop has considerable experience with microfinance. In fact, DW pioneered microfinance in Angola in 1995. In 2006, KixiCredito was launched by DW as Angola's first non-bank microfinance institution built on a modified Grameen Bank model. The project will work with DW as an alternative provider of microfinance to BAI.
Angolan Agency for the Promotion of Investments and Exports (APIEX)	This agency was created in 2016 and is responsible for the promotion of potential investments, the legal framework and existing business opportunities in Angola. The project will work closely with this new agency on the creation of private sector opportunities in the renewable energy sector.
Industrial Association of Angola (AIA)	Some of the key services that the Industrial Association of Angola provides include: vocational training, legal and commercial support, and identifying business opportunities for its members. The project will work with AIA on the inclusion of sustainable energy topics in vocational training programmes in the country.
Angolan Federation of Women Entrepreneurs (FEMEA)	The Federation of Women Entrepreneurs, founded in 2001, counts 2,500 members. It brings together all of the national associations of women entrepreneurs. The Federation fosters dialogue and an exchange of ideas among women entrepreneurs in the country. The project will work with FEMEA to identify and support women-led small enterprises that could sell and provide technical support to local users of technologies promoted by the project.
Action for Rural and Environment Development (ADRA)	ADRA, which was set up in 1992 and is one of the oldest NGOs in Angola, aims to improve the socio-economic status of rural families. Its mandate is to build the capacity of civil society. ADRA will be involved in stakeholder consultations during the PPG to provide advice on community engagement.
Local universities	Agostinho Neto and Angolan Catholic Universities are doing research in the area of energy. In 2016, Catholic University introduced a Master's programme in Economy and Management of Energy. The project will work with these universities on baseline and monitoring, feasibility studies and outreach activities, among others.
Communities	Community engagement will be a key principle of the project to ensure community ownership and acceptance of the clean technologies and products. Output 2.5 centres on providing training to communities on the use of the clean energy technologies.

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.

This project includes women's empowerment as one of its design elements. As deforestation accelerates, collecting firewood requires travelling longer distances. This activity is normally undertaken by women, limiting available time and gender equality. Collection time has a significant opportunity cost, limiting the opportunity for women and girls to improve their education and engage in income-generating activities. Many children, especially girls, are withdrawn from school to attend to domestic chores related to biomass use, reducing their literacy and restricting their economic opportunities.

Transitioning from traditional three-stone fires to improved cook stoves and from kerosene lamps to modern lighting alternatives not only offers a climate change mitigation measure, but also provides significant and well-documented health, socioeconomic and gender benefits. Women will be involved in determining household cooking habits and

technical needs for cooking stoves. Women's groups and associations will be trained as the main users of thermal energy applications for the dissemination of improved cook stoves in rural areas.

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 Description	Risk Rating	Mitigation Measures
Policy Risk arising from limitations and uncertainties in the off-grid energy market regarding market outlook, market access and competition. Although the Government has developed electrification and renewable energy targets, there is to some extent uncertainty regarding the feasibility of achieving these targets.	Moderate	By focusing on small-scale, household-level systems, the project can benefit from "light touch" regulation, rather than the more complex and still-to-be-elaborated tariff and licensing regime required for village-level mini-grids.
Technical The domestic supply and value chain and capacities of sustainable energy service providers in Angola are very limited. The global threat of generic products to the sector exacerbates this problem nationally. As a result, this may cause an inadequate implementation of sustainable energy products leading to sub-optimal performance, malfunctioning, etc.	Moderate	Component 1 of the proposed project is designed to address this risk and will identify and implement a range of measures that are required for mitigating this risk, such as through the support to adoption of quality standards for sustainable energy products. In preparing the request for proposals for the selection of suppliers, special attention will be paid to technical specifications and the quality of the products.
Social Risk arising from lack of awareness and resistance in communities to sustainable energy products, including solar-powered lanterns and kits. Among the Angolan population, there is a low level of awareness of solar energy.	Moderate	Community engagement will be a key principle of the project to ensure community ownership and acceptance of the clean technologies and products. Under Output 1.2, a market study will be carried out to establish market demand and select appropriate technologies. Community members, especially women, will be involved in determining household cooking habits and technical needs for cooking stoves. Output 2.5 entails training and providing technical support to communities on how to use the clean energy products.
Financial There is a risk that customers may not have the willingness or ability to pay for the products or have access to an appropriate method of payment.	High	The project will gather market intelligence on willingness and ability to pay. Preliminary data suggests that households in the bottom quintile spend about \$2.26 per month on energy. If paid in monthly installments, solar lanterns should be within reach of BOP households, while the cook stoves should be affordable with microfinance. Solar home systems would be sold to lower middle income families.

		Regarding the method of payment, the solar-powered kiosks will serve as payment points, allowing customers to pay “off-line,” while the money can then be sent to the private companies via e-Kwanza from the kiosks.
Financial Co-financing for sustainable energy products and businesses does not materialise due to a lack of private sector interest and/or Government commitment.	High	Government and private sector co-financing and investment for sustainable off-grid energy businesses and products will be confirmed through signed co-financing letters during the PPG stage, including expressions of interest by the private sector and financial institutions. Preliminary discussions with the African Development Bank have been positive to date.
Climate Change Prolonged droughts or intense floods, which are expected to occur with greater frequency due to climate change according to the NAPA, will adversely affect communities in Moxico, who are heavily dependent on natural resources and agriculture for their livelihoods. This in turn could affect their willingness to pay for more advanced cooking and lighting technologies. At the same time, more extreme weather events could negatively impact infrastructure, including sustainable off-grid cooking and lighting products and distribution channels.	Moderate	The design of the microfinance programme and the payment schedule required by suppliers will take into account the effects of climate change and the potential for climate shocks since the project targets base of the pyramid households who in most cases do not have much savings. At the same time, pico solar PV systems are less likely to be affected by climate change and therefore represent a viable climate adaptation alternative to the Angolan power sector, which depends heavily on hydropower generation.
Market Decreasing prices for fossil fuel based energies including LPG could make renewables less competitive.	Moderate	This has been an important problem in the past when energy prices in Angola have been very low but currently energy prices in Angola are increasing as a result of Government policy and it is unlikely that this policy would be reverted.

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

The project will explore a potential partnership with the African Development Bank regarding its clean cooking flagship and mobile payment flagship programmes, both of which are highly relevant to this GEF initiative. AfDB recently launched the New Deal on Energy for Africa, with a goal of Africa achieving universal access to energy by 2025, leveraging on and off-grid solutions, and providing 150 million households with clean and efficient cooking solutions. Under the New Deal, the Flagship Programme on Clean and Efficient Cooking Solutions seeks to promote market development for clean and efficient cooking. The Mobile Money Programme seeks to catalyze innovation and scaling up of “pay-as-you-go” (PayGo) solar energy enterprises, with the aim of powering and lighting up over 100 million off-grid households.

The UNDP-supported, GEF-financed project on “Promotion of Sustainable Charcoal in Angola through a Value Chain Approach” addresses both the supply-side (carbonisation) as well as the demand-side (efficient stoves) of the charcoal value chain in Angola. As in other countries in Africa, charcoal is predominantly an urban fuel in Angola, while the proposed GEF-financed project targets sustainable cooking and lighting solutions in rural areas. Thus, the GEF project will complement the charcoal initiative, which started implementation in September 2016. For example, the charcoal

project will identify fuel-efficient stoves that would be acceptable in the Angolan context and will test them among urban and rural consumers. Lessons learned could be directly adopted by the new project.

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

The project is consistent with, and closely aligned to, national priorities and strategies. The promotion of decentralisation and diversification of energy sources such as small hydroelectric plants, solar, wind and biomass features as one of the planned activities in the 2013-2017 National Development Plan, the first medium-term plan drafted within the framework of the new Constitution. Angola's Power Sector Long Term Vision 2025 highlights rural electrification as a key policy measure. In Angola, three implementation models are envisaged for rural electrification:

1. Rural electrification through grid extension
2. Electrification through isolated systems
3. Electrification through individual systems

This GEF-financed project targets the third implementation model. In addition, the Government has recently approved a Renewable Energy Strategy, which sets an overall target of 800 MW. Some of the key specific goals for off-grid renewables, which are outlined in Table 1 above, are closely aligned with the proposed interventions.

Angola's National Implementation Strategy for the UNFCCC calls for the preparation of GHG inventories and reports, the adoption of mitigation programmes, promotion of awareness, knowledge and experience sharing through international cooperation, and promotion of clean technologies. Angola's Initial National Communication to the UNFCCC identifies several mitigation measures that are relevant to and consistent with the GEF project, notably greater use of renewable energy resources, the promotion of more efficient domestic appliances particularly for cooking and lighting, and the reduction of deforestation. The Ministry of Environment, with support from UNDP, is currently working on the Second National GHG Inventory and on the preparation of the Second National Communication.

Under its INDC, Angola made an unconditional commitment to reduce GHG emissions by up to 35% relative to the business-as-usual scenario and a conditional commitment to reduce emissions by an additional 15% below the BAU scenario by 2030. The sectors for mitigation and enhanced removals include power generation from renewable sources and reforestation.

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.

Component 3 focuses on outreach and dissemination of results. Under Output 3.1, a lessons learned report will be produced based on project experience. The report will be shared with relevant ministries and provincial authorities in order to inform subsequent market development of decentralised renewable energy. It should also be noted that UNDP is developing a derisking renewable energy investment (DREI) methodology for small-scale renewable energy, including solar home kits. In consultation with key partners, the project preparation team will explore the possibility of applying the small-scale DREI methodology to this GEF-financed project.

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

A. RECORD OF ENDORSEMENT⁴⁰ OF GEF OPERATIONAL FOCAL POINT (S) ON BEHALF OF THE GOVERNMENT(S):

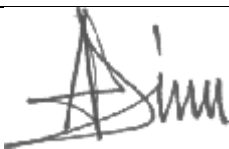
⁴⁰ For regional and/or global projects in which participating countries are identified, OFP endorsement letters from these countries are required even though there may not be a STAR allocation associated with the project.

(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)
Kamia Cristina Victor de Carvalho	Director of the Department of Planning, Statistics and Studies	MINISTRY OF ENVIRONMENT	12/07/2016

B. GEF AGENCY(IES) CERTIFICATION

This request has been prepared in accordance with GEF policies⁴¹ and procedures and meets the GEF criteria for project identification and preparation under GEF-6.
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Agency Coordinator, Agency name	Signature	Date (MM/dd/yyyy)	Project Contact Person	Telephone	Email
Adriana Dinu, UNDP-GEF Executive Coordinator		March 3, 2017	Faris Khader, Regional Technical Advisor	+251 91 250 3307	faris.khader@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.

⁴¹ GEF policies encompass all managed trust funds, namely: GEFTF, LDCF, SCCF and CBIT