



REQUEST FOR CEO ENDORSEMENT

PROJECT TYPE: FULL-SIZED PROJECT

TYPE OF TRUST FUND: THE GEF TRUST FUND

PART I: PROJECT INFORMATION

Project Title: Promotion of environmentally sustainable and climate-resilient grid/isolated grid-based hydroelectric electricity through an integrated approach in Sao Tome and Principe.			
Country:	Sao Tome and Principe	GEF Project ID:	5334
GEF Agency:	UNDP	GEF Agency Project ID:	4602
Other Executing Partner(s):	Ministry of Public Works, Infrastructure, Natural Resources and Environment (MPWINRE), Empresa da Agua e Electricidade (EMAE – Water and Electricity Company), Ministry of Agriculture, Fisheries and Rural Development, Central Bank of Sao Tome and Principe.	Submission Date: Resubmission Date:	18 February 2015 26 May 2015
GEF Focal Area(s)	Multifocal Area	Project Duration (Months)	60
Name of Parent Program (if applicable):		Project Agency Fee (\$):	501,081

A. FOCAL AREA STRATEGY FRAMEWORK

Focal Area Objectives	Expected FA Outcomes	Expected FA Outputs	Trust Fund	Grant Amount (\$)	Cofinancing (\$)
CCM-3	Increased investment in renewable energy technologies.	Renewable energy capacity installed.	GEF TF	1,776,484	10,890,000
LD-3	Reduced pressures on natural resources from competing land uses in the wider landscape.	Government departments collaborating on SLM. Large scale of good management practices based on integrated land use planning and sustained by a financing instrument.	GEF TF	2,443,151	6,115,704
SFM-1	Reduce pressures on forest resources and generate sustainable flows of forest ecosystem services.	Water supply services is sustainably generated by forests. At least 6,000 ha under sustainable management.	GEF TF	1,054,909	3,700,000
Total project cost				5,274,544	20,705,704

B. PROJECT FRAMEWORK

Project Objective: To introduce an integrated energy and ecosystems-based approach to grid/isolated-grid-based mini/small hydro-electricity generation in Sao Tome and Principe.						
Project Components	Grant Type	Expected Outcomes	Expected Outputs	Trust Fund	Grant Amount (\$)	Confirmed Co-financing
1. Policy, institutional, legal and regulatory framework for on-grid mini-hydro established.	TA	Streamlined and comprehensive market-oriented energy policy and legal/regulatory framework for on-grid, mini-hydro electricity generation by Independent Power Producers (IPPs)	<p>1.1 Appropriate policy and legal/regulatory framework established and operational, including development of updated integrated resource and forestry/watershed management master plan¹ and environmental safeguards for site applications</p> <p>1.2 Technical report on grid capacity requirements to enable feed-in for grid/isolated-grid-connected hydro systems followed by development of an updated grid code.</p> <p>1.3 Established procedures and standardized PPAs for the introduction of a transparent procurement process in the selection/award of hydro sites by private developers.</p> <p>1.4 One-stop shop for issuance of construction licenses and permits to private mini-hydro developers.</p> <p>1.5 Methodology developed for a joint environmental (including climate resilience), economic</p>	GEF TF	<p>330,000 (CCM)</p> <p>142,500 (SFM)</p> <p>Total = 472,500</p>	2,745,704

¹ This will include support for updating and finalizing the National Forestry Management Master Plan, which has been in draft form for several years.

			<p>and financial evaluation of on-grid hydro plants in line with government regulations and policies².</p> <p>1.6 Capacity developed within EMAE, local banks and key national actors such as Ministries of Energy and Finance to appraise mini-hydro projects for PPAs and lending.</p> <p>1.7 Increased national and local capacity to coordinate institutions for inter-sectoral SLM approach and to implement integrated resources management at the watershed level.</p>			
2. Promoting investment in mini/small-hydro through appropriate catalytic financial incentives for project investors.	TA & INV	Increased mini/small - hydro capacity of at least 5 MW installed by private developers leading to 16,000 MWh of electricity generated per year from mini/small-hydro plants on the grid by end of project (reduction of 168,780t CO ₂ over their lifetime)	<p>2.1 Financial Support Mechanism (FSM) established and capitalized to support private investment in grid connected mini-hydro to EMAE.</p> <p>2.2 MOU signed with Central Bank of Sao Tome to set out the objective, funding mechanism and administration rules governing the FSM.</p> <p>2.3 Financial and other incentives to be provided to project developers.</p> <p>2.5 Signed Agreements between private investors and EMAE covering the obligations and rights of the partners regarding construction,</p>	GEF	<p>326,660 (TA)</p> <p>1,000,000 (INV)</p> <p>Total = 1,326,660 (CCM)</p>	8,250,000

² Climate resilience analysis will include measures to mitigate the possible impacts of CC-induced increased sediment loading (along with other factors such as changed composition of water) in hydropower plants which can lead to greater exposure to turbine erosion and generator efficiency, resulting in a decline in energy generated (and less envisioned GHG reductions).

			operation and maintenance of at least 4 MW of mini/small-hydro systems supported under the project.			
3. Sustainable land and forest management at the integrated watershed level.	TA & INV	Integrated land use, sustainable forest management and natural resource management provide social benefits and sustain environmental services at the watershed level.	<p>3.1 Each specific IWMP includes a water & carbon monitoring scheme which provides information on carbon stocks and on the water flows upstream the hydroelectricity production.</p> <p>3.2 Integrated managed lands in watersheds include a CF managed effectively for sustainable resource conservation.</p> <p>3.3 New methods and techniques of agroecology (conservation farming practices) reduce lands degradation in watershed.</p> <p>3.4 Watershed lands function to provide resources, alternative incomes and sustainable environmental services.</p> <p>3.5 A PES mechanism for re-investment of energy proceeds into community lands conservation is established and implemented.</p>	GEF	<p>2,170,994 (LD)</p> <p>966.788 (SFM)</p> <p>Total = 3,137,782</p>	8,660,000
4. Increased investor and consumer awareness.	TA	Outreach programme and dissemination of project experience/best practices/lessons learned for replication throughout the country/region.	<p>4.1. National plan to implement outreach/promotional activities to support on-grid mini-hydro projects targeting domestic (and international) investors.</p> <p>4.2. Capacity developed within MPWINRE /EMAE and MAPRD to</p>	GEF TF	<p>50,000 (CCM)</p> <p>50,000 (LD)</p> <p>Total = 100,000</p>	300,000

			monitor and document project experience. Comprehensive and reliable data compiled and available for future activities. 4.3 Published materials and website on project experience/best practices and lessons learned.			
Subtotal					5,036,942	19,955,704
Project Management Cost				GEF TF	237,602	750,000
Total Project Cost					5,274,544	20,705,704

C. SOURCES OF CONFIRMED CO-FINANCING FOR THE PROJECT BY SOURCE AND BY NAME (\$)

Please include letters confirming co-financing for the project with this form.

Sources of Co-financing	Name of Co-financier (source)	Type of Co-financing	Co-financing Amount (\$)
National Government	Ministry of Agriculture, Fisheries and Rural Development	In-kind	4,882,704
National Government	DG Agriculture	In-kind	6,000,000
National Government	Ministry of Public Works	In-kind	4,500,000
GEF Agency	UNDP	Cash	300,000
		In-Kind	700,000
Non-Governmental Organization	AgriSud International	In-kind	123,000
Private sector	IPPs (Hydro electrica, Renergia)	Equity	3,400,000
Private sector	Afriland First Bank and EcoBank	Cash	800,000
Total Co-financing			20,705,704

D. Trust Fund Resources Requested by Agency, Focal Area and Country

GEF Agency	Type of Trust Fund	Focal Area	Country Name/Global	Grant Amount (\$ (a)	Agency Fee (\$) (b)	Total (\$) c=a+b
UNDP	GEF TF	Climate Change	Sao Tome and Principe	1,776,484	168,766	1,945,250
UNDP	GEF TF	Land Degradation	Sao Tome and Principe	2,443,151	232,099	2,675,250
UNDP	GEF TF	SFM	Sao Tome and Principe	1,054,909	100,216	1,155,125
Total Grant Resources				5,274,544	501,081	5,775,625

E. DOES THE PROJECT INCLUDE A “NON-GRANT” INSTRUMENT? yes ☐ no ☒

PART II: PROJECT JUSTIFICATION:

A: DESCRIBE ANY CHANGES IN ALIGNMENT WITH THE PROJECT DESIGN OF THE ORIGINAL PIF

The project concept and design during the PIF formulation were based on the best information available at that point in time regarding the barriers to a market-oriented approach for grid-connected hydro-electricity generation. However, during implementation of the PPG, it was noticed that while the project design was still sound and the barriers to be addressed still relevant, some minor changes were needed to be made in the RCE to reinforce the project’s achievement of its outputs and outcomes. These changes have been made in the text of the RCE that follows and, for ease of reference, are summarised in the Table below:

PIF	RCE
Standardized baseline developed for hydro sector leading to reduced carbon finance transaction costs.	When the PIF was formulated, the carbon market was doing well, enabling developing countries to capitalise on additional financial resources to advance their development agenda. However, the carbon market has since then almost “crashed”, with the result that it does not make any economic and financial sense to focus on this issue at the present time. If the carbon market happens to recover during implementation of the project, this issue will get re-visited under UNDP’s adaptive management procedures.
Absence of an outcome related to outreach and dissemination of project experience/lessons learned for replication throughout the region/among SIDS countries, in addition to Sao Tome and Principe itself.	Inclusion of Outcome No. 4: Outreach programme and dissemination of project experience/best practices/lessons learned for replication throughout the region/among SIDS countries. This outcome is especially relevant as it will make information on best practices/lessons learned available to a large number of countries, both within the region and outside/SIDS countries that have very good potential to develop small hydropower to provide their rural population with access to modern energy services.
Focus of project only on grid-based hydro-electricity generation.	In addition to the main grid that partially covers Sao Tome Island, EMAE (the Electric Utility) also operates isolated mini-grids on that island and on Principe Island. And the potential is very good for other isolated mini-grids to be developed to serve those communities living in these areas. Hence, the addition of isolated mini-grids for coverage under the project. Hence, the project title was changed from “Promotion of environmentally sustainable and climate-resilient grid-based hydroelectric electricity through an integrated approach in Sao Tome and Principe” to include isolated grids and this is reflected on the first page.
Allocation of an estimated “initial investment of \$1 million” to capitalise a Renewable Energy Guarantee Scheme (REGS)”.	REGS has been re-named as “Financial Support Mechanism FSM” as it makes it clearer that its objective is to support investment in mini/small hydropower. In addition, the \$ 1 million from GEF is supplemented with \$ 200,000 from UNDP.
Absence of output related to capacity development to coordinate institutions	The PPG process highlighted the need for capacities improvement, especially capacities to coordinate institutions involved in the watershed. With the implantation of new stakeholders (IPP, EMAE, etc.) in the watershed, there is a need to increase capacities for a better coordination and for the development of working relation between stakeholders.
The project targets only 3,000 ha of reforestation.	Whereas the overall objective for sustainable management of lands and forests has been kept at 23,000 ha (component 3), the objective of reforestation has been increased at 7,000 ha. During the PPG, the potential of land uses in each watershed has been assessed. It results a larger need for reforestation / shade forest rehabilitation

	<p>and less secondary forests within the identified watersheds. Then the following actions will be carried out during the project implementation:</p> <ul style="list-style-type: none"> • 10,000 ha of sustainable agricultural land management, • 6,000 ha of Sustainable Management of forests, • 7,000 ha of forests rehabilitation and reforestation.
--	---

A.1 NATIONAL STRATEGIES AND PLANS:

The Democratic Republic of Sao Tome and Principe is located in the Gulf of Guinea, off the north-western coast of Gabon. It consists of the two main islands of Sao Tome and Principe located about 140 km apart. It has a population of 187,356 inhabitants (2012 Census) and the country's economy revolves around agriculture and fishing, sectors which are highly vulnerable to climate change.

With a per capita GDP of US\$ 1,486 (World Bank, 2012), Sao Tome and Principe (STP) is considered a lower middle income country; however, almost half of the population lives in poverty. It is heavily dependent on resources from the IMF, via its Extended Credit Facility, and other donors. Like several other SIDS (Small Island Development States) with small populations, the country is exposed to the enduring challenges that arise from lack of economies of scale, high oil prices, high transportation and communication costs, expensive public administration and infrastructure, and lack of skilled human capital. As per the African Economic Outlook (2011), growth of the São Tomé and Príncipe economy was expected to be 5.2% in 2013 compared to 4.9% in 2011. This growth was to be driven by the service, transport, construction and retail sectors. In 2012 the government reported a slight decrease in the growth rate to 4.0%, the result of a reduction in foreign direct investment (FDI) and private and public consumption. Real gross domestic product (GDP) growth was projected to be 5.8% in 2014, thanks to an increase in FDI, an oil exploration signature bonus and the inception of the country's major infrastructure projects, notably the deep-water seaport.



In the power sector, the bulk of electricity generation is based on imported diesel, despite the fact that the country possesses several rivers that can be tapped to generate electricity from hydropower. Electricity generation in the country has been steadily increasing over the years (Table 1) to meet the growing needs of the economy and, unfortunately, this increase in demand has been systematically met by increasing the thermal generation capacity, despite the availability of an extensive network of rivers. For example, for the latest electricity generation figures available (2013), the share of hydro in the generation mix constituted only 8 % of the total electricity produced.

Table 1: Electricity Generation 2003 – 2013

Year	Hydro Generation (kWh)	Thermal Generation (kWh)	Total (kWh)
2003	7,858,894	26,649,854	34,508,748
2004	6,172,604	31,098,320	37,270,924
2005	4,247,586	37,196,606	41,444,192
2006	3,767,757	39,058,192	42,825,949
2007	7,629,989	41,415,508	49,045,497
2008	7,668,107	43,040,443	50,708,550

2009	7,260,660	41,658,785	48,919,445
2010	4,788,615	52,416,117	57,204,732
2011	6,001,697	61,224,620	67,226,317
2012	6,386,000	70,470,869	76,856,869
2013	5,890,472	64,862,759	70,753,261

Source: EMAE

The need to shift electricity generation from utilising less imported fuel to relying more on locally-available resources (mainly mini (100 kW to 1 MW) and small hydropower (≤ 10 MW)) has recently become a cornerstone of the country's domestic and foreign policy; consequently, its energy policy (despite the absence of one at the present time, but what the country wishes were in place already) is being developed in such a manner so as to help support it in moving in this direction. Thus, the transformation of the energy sector to an economically viable and environmentally friendly system requires a comprehensive and multi-faceted approach in the design of the appropriate policy and planning frameworks, and incentives to fully integrate renewable energy technologies in way that is climate resilient and minimizes negative impacts on ecosystems that supply its rivers.

Empresa de Agua e Electricidade (EMAE)

Electrical power in the country is provided by the Empresa de Agua e Electricidade (EMAE), a public-private company that is 51% owned by the Government of Sao Tome and Principe, and the remaining 41% is jointly owned by the private sector, with Sonangol holding 40% and a local anonymous enterprise owning the remaining 9%. As per Decree n° 40/2008 of 31 October 2008, the Government approved the new legal status of EMAE, empowering it with the objective to render public services related to the generation, transmission and distribution of electricity (and similar services related to potable water supply). EMAE's total installed generation capacity (Table 2) on the islands of Sao Tome and Principe is 22.5 MW, consisting of 20.6 MW from diesel plants and 1.92 MW from hydro plants.

Table 2: Installed and available generating capacities in Sao Tome and Principe, January 2014

Type / Ownership	Location	Installed Capacity (kW)	Available Capacity (Jan 2014, kW)	Present Status (Jan 2014)
Diesel/EMAE	Sao Tome	9,680 (grid-connected)	7,430	2 generators (1,000 and 1,250 kW) under maintenance.
Diesel/EMAE	Santo Amaro	8,505 (grid connected)	6,804	1 generator (1,701 kW) under maintenance.
Diesel/Private	Bobo Forro	7,000 (grid-connected)	7,000	Operational.
Hydro/EMAE	Contador (Rio Contador)	1,920 (grid-connected)	1,920	Operational
Hydro/Private	Guegue (Rio Manuel Jorge)	320 (grid-connected)	0	Stopped operation in early 2012. New turbine and generator required.
Diesel/EMAE	Porto Alegre	80 (isolated grid)	80	Operational
Diesel/EMAE	Angolares	216 (isolated grid)	216	Operational
Diesel/EMAE	Santa Catarina	108, isolated grid	108	Operational
Diesel/EMAE	Santa Luzia	64 (isolated grid)	64	Operational
Diesel/EMAE	Various	1,944 (mini-	1,120	2 generators (328 and 496 kW) not in operation

	locations, Principe	grids)		and are scheduled for replacement.
Hydro/Private	Rio Papagayo, Principe	80 (mini- grid)	0	Operated for only 2 weeks in 1999 due to over-dimensioned 400 kW turbine-generator set. Replaced by an 80 kW unit and operated for a few weeks when the transformer was relocated to a diesel power station on Principe Island.
Total	Diesel/EMAE	20,597	15,822	
	Diesel/Private	7,000	7,000	
	Hydro/EMAE	1,920	1,920	
	Hydro/Private	400	0	

Source: EMAE

In January 2014, the available EMAE diesel generating capacity was 15.8 MW, with the remaining approx. 5 MW of installed capacity either under maintenance or awaiting replacement. The private diesel generating capacity of 7 MW at Bobo Forro owned by Renergia Ltd. operates at approx. 50% capacity because of outstanding payments from EMAE; under this scenario, the power station owner-operator manages to cover its costs in terms of equipment wear and tear, lubricants, spare parts, maintenance costs, etc. Under its leasing agreement with Renergia (Bobbo Forro), EMAE supplies the fuel and reimburses the former for the energy supplied to the grid.

EMAE's main distribution system includes the 30 kV and 6 kV lines over the north-western section of Sao Tome Island from near Neves to Ribeira Afonso. It also operates isolated diesel-powered mini-grids in Angolares, Santa Catarina and Santa Luzia on Sao Tome Island and diesel-based mini-grids on Principe (Table 2). It has a client base that comprises 26,000 households and 5,000 industrial/commercial users and has sole responsibility for transmitting electricity and its distribution to consumers. However, the private sector is permitted to generate and supply the EMAE grid. Also, the private sector is allowed to generate electricity for its own consumption, but not for operating a mini-grid, for example, to supply customers. In this connection, discussions will be held with the Government to further liberalise the electricity market by allowing IPPs to also have the option of setting up hydropower-based mini-grids to supply the "captive consumers" who may otherwise wait a long time before EMAE builds its own mini-grid to service them. These "captive consumers" can be for example agro-industries, small factories, hotels, etc. Finally, to generate electricity and supply the EMAE grid, the private sector needs a license from the Government to build a hydropower station and operate as an IPP, as well as a PPA with EMAE to supply the grid in accordance with the regulations spelled out in the grid code.

Table 2 a: Electricity Tariff Structure (December 2013)

Consumer Type	Tariff (US Cents/kWh)
Domestic ≤ 100 kWh	8.3
Domestic 100 kWh - ≤ 300 kWh	12.3
Domestic ≥ 300 kWh	19.2
Commercial and Industrial	19.2
Public Administration	49.3
State Enterprises and Institutions	30.1
EMAE Employees ≤ 100 kWh	2.5*
EMAE Employees 100 kWh - ≤ 300 kWh	3.7
EMAE Employees ≥ 300 kWh	5.8
Embassies and International Organisations	35.1
State Autonomous Regions	49.3
Financial Institutions	35.1
Telecom Enterprises	35.1
Travel Agencies	35.1

*The 215 EMAE Employees benefit from a very low subsidised tariff.

As of December 2013, EMAE had a client base of 30,781 customers (comprising 25,971 households and 4,810 in other categories) sub-divided into 14 different tariff categories (Table 2 a), ranging from a subsidized rate of 8.3 US Cents/kWh (social tariff for those consuming ≤ 100 kWh/month) to 19.2 US Cents/kWh (also subsidised) for commercial services and industries to the highest tariff of 49.3 US Cents/kWh for the 463 customers labelled as “Public Administration” and 80 customers labelled as “State Autonomous Regions”. The cost of thermal generation at the busbars of EMAE power stations was 23 US Cents/kWh in 2013 (the cost of delivery to consumer premises is not available), while the cost of generation at the 1.92 MW Contador hydropower station that was refurbished in 2006 was estimated at 2 - 3 US Cents/kWh by EMAE. In summary, the tariffs are subsidized for certain categories of consumers, while others pay full price. With regard to losses, technical losses are estimated to have come down to 10 % after rehabilitation and reinforcement of the distribution system by the African Development Bank/African Development Fund in 2002, while non-technical losses remain high at 16%, thus providing insights into the capacity of certain consumers to pay their electricity bills.

In addition, The Voice of America (VOA) operates a radio broadcasting station that relays programmes produced in Washington, D.C. in several languages, including English, French and Portuguese at Pinheira some 5 km from Sao Tome. VOA utilises a dedicated (and isolated from the EMAE grid) 5 MW diesel power station to meet its needs for electricity. In addition, there is a hydropower station on Rio d’Ouro at Agustino Neto that was originally built during the colonial days to provide electricity associated with cocoa production; it was later refurbished with 1x307 kW and 1x 37 kW turbine-generator sets. Both these sets experienced electro-mechanical problems around 2006/2007, were dismantled and the power station has not been in operation since. The civil engineering works are in still in very good condition, including the machine room and the penstock. The power station infrastructure is owned by the Government, but a private company (Rio Douro Investment Management Company) has a lease with the Ministry of Finance to operate it; however, it is reported that the management company has not exercised any management functions since 2007.

Electricity from renewable sources of energy, including hydro, photovoltaics and wind, represent even today a tiny less than 10% fraction of the total energy supplied in the country; the share of hydropower, as computed from Table 1, was 8% in 2013. Just over half the population (57%, World Bank, 2012) of Sao Tome and Principe have access to electricity; even then, the country has to resort to occasional load shedding. Those without electricity rely on candlelight and kerosene for lighting, and on biomass (firewood and charcoal) for cooking. The issue of connecting new households to the grid remains a great challenge for EMAE due to insufficient generating capacity. Hence, the Government’s interest to create the necessary and conducive environment to enable the private sector, both local and foreign, to invest in the hydropower electricity generation sector.

Table 3: Imported diesel/lubricants used for thermal electricity generation

Diesel/Lubricants	2009	2010	2011	2012	2013
Diesel (litres)	11,743,334	9,473,229	13,315,861	18,101,521	19,095,025
Lubricants (litres)	51,558	35,761	34,541	46,617	59,428
Total Cost (x 10 ³ Dobras)	137,176,456	113,291,764	193,367,754	267,024,011	289,494,914
Total Cost (\$)	7,838,655	6,473,815	11,049,586	15,258,515	16,542,567

Source: EMAE

The country’s use of imported diesel fuel/lubricants for electricity generation and the associated expenditures in terms of foreign currency have been on an increasing trend over the few years. For example (Table 3), in 2009, the expenditures related diesel fuel/lubricants for electricity generation were approx. \$ 8 million and increased to over \$ 16 million in 2013, representing an increase of 100% over a period of 5 years.

Sao Tome and Principe has not yet developed a National Energy Policy. However, with every change in Government, the incoming Government formulates its development plan; the last one entitled “Grandes Opções do Plano para 2014” (Major Options of the Plan for 2014) was prepared in October 2013. As per the section of this Plan for the energy sector, the Government will make efforts to “increase supply to the national grid, both in terms of quantity and quality (of energy) to meet the demand from consumers”. Towards this, the Plan will:

- Extend the distribution network in cities and villages;
- Develop a rigorous client management system to ensure better coverage
- Establish an energy efficiency programme; and
- Formulate an Electrical Energy Master Plan.

Strong support for renewable energy is an integral part of the country's energy "strategy" (despite the fact that there is no formal strategy yet) aimed at enabling the country to diversify and secure its energy supply. The Government's "Second National Strategy to Reduce Poverty, 2012 – 2016" articulates the need to "ensure that the whole population has (easy and improved) access to basic services", and this includes electricity services, and "to promote favourable conditions to attract Foreign Direct Investment". The GEF-funded National Adaptation Plan of Action (December 2006) prepared by the World Bank for the Government identifies, as priority activities, the utilisation of renewable energy and proposes the "construction of hydropower stations by more accessible technologies and national knowledge" as one of the solutions to climate change mitigation and specifically recommends the construction of 2 hydropower stations at Bernardo Faro and Claudino Faro. Finally, the scoping study undertaken by IRENA in 2012 under the United Nations Initiative "Sustainable Energy for All" (SE4ALL) recommends small hydropower development as part of the country's strategy for poverty reduction.

Sao Tome and Principe, as a member of ECCAS (Economic Community of Central African States) subscribes to the Vision/White Paper adopted at the 2012 Conference of Ministers on a green economy. This Vision/White Paper consists of several programmes that aim to contribute to the SE4ALL, including hydropower for economic development.

In addition, the Parliament approved the "Lei de Bases do Sector Electrico" (Basic Electricity Sector Law) in October 2013 (its signature by the President is still awaited before it becomes official) that establishes the basis for the organisation and functioning of the National Electricity Sector (NES). The objectives of this law are as follows:

- To guarantee the supply of electricity to meet the needs of consumers, as well as its rationalisation, efficiency and optimisation, taking into consideration the basic principles of NES;
- To ensure the increase in service coverage to all consumers, at a reasonable, just and non-discriminatory price;
- To promote an increase in the utilisation of renewable energy and co-generation for electricity production; and
- To attract national and foreign investors for NES through conditions that are stable, equitable, favourable and transparent for investors.

Finally, the Government decided in late 2013 to establish a Special Unit within EMAE that is tasked into looking at options to substantially increasing the country's reliance on renewable sources of energy, including hydropower, for electricity generation; this Unit is presently manned by only 2 persons. This decision was made in line with the "Lei do Base do Ambiente No. 10/99" approved by the Parliament that articulates the formulation of a National Environmental Plan for Sustainable Development.

With regard to GHG emissions, the First National Communication to UNFCCC prepared in December 2004 indicated that the energy sector was the one producing the main emission of greenhouse gases in the country, i.e. 79,080 tCO₂ in 1998, with the total for the country being 230,000 tCO₂, as per corrected figures provided in the Second National Communication in 2012. The Second National Communication submitted in October 2012 showed that GHG emissions from the energy sector had increased to 101,480 tCO₂ in 2005, but the total for the country had decreased to 196,630 tCO₂. GHG emission figures in STP are available only for these 2 referential years, viz. 1998 and 2005, as agreed to with UNFCCC; emission figures for other years have not been computed or released by the Government.

In the absence of mitigation measures and with the increase in diesel use for electricity generation, it is expected that emissions from the energy sector will increase further over the coming years; however, no forecast has yet been made for these years. Hence, increased use of hydropower is one of the options in a basket of measures that the Government wants to pursue to reverse the increasing trend in GHG emissions related to the electricity sector.

As stated by the Government³ and highlighted by several technical reports⁴, the country's water resources are highly vulnerable to climate change, and water flows in the watersheds depend on a sustainable forest cover and on proper agricultural practices. STP's ecosystems are rich and diverse and capable of providing multiple services and resources but they are also being significantly degraded. Ecosystem functions, especially water resources regulation, are threatened across the country due to land conversion for agriculture, forests degradation, over-exploitation of wildlife and other natural resources, erosion and bushfires, exacerbated by climate change and droughts. Therefore, the development of new hydropower plants must be integrated with an approach to land-use planning and sustainable land and forestry management practices. Such an integrated landscape approach does not exist yet in STP, although it has been strongly recommended by the program for Conservation and Rational Utilization of Forest Ecosystems in Central Africa (ECOFAC). The Integrated Watershed Management (IWM) approach promoted by the project includes Community Forests Management and support to livelihood improvement. Involvement of communities in secondary forest management has been highlighted as a priority in the Forestry Master Plan, but without real concretisation yet. This approach will be established and implemented by the project in line with the national strategies and priorities:

- The National report on Forests Status (2012) prioritizes actions for the development of (i) sustainable forestry management plans, (ii) sustainable alternative income generating activities (fruits, honey, ecotourism), and (iii) support to local agents of the MAFRD for efficient surveillance and control of the forests.
- The National Adaptation Programmes of Action on Climate Change (NAPA, 2006) listed "sustainable management of forestry resources" as a priority project.
- The Second National Strategy to Reduce Poverty (PRSP-2 - Poverty Reduction Strategy Paper), 2012 – 2016, establishes priority to promote agriculture and tourism as key sectors for growth and employment.
- The national report on Desertification and Land degradation states national priorities for (i) monitoring and evaluation of the effects of desertification and drought, (ii) prevention of soil erosion through the extension and protection of forests.
- The National Ecological Management Plan for STP (2009) prepared by ECOFAC for the Government states the need of an overall land policy and management plan based on the principles of integrated watershed management.

In 1998, the Government of STP ratified the Convention to Combat Desertification, and commissioned the production of a National Action Plan. Experts recommended the implementation of urgent measures to stop/reverse soil erosion, including (i) promote scientific research on the issue, (ii) build capacity of farmers and concerned authorities, (iii) implement urgent measures to combat desertification in the most affected parts of the country (northern region of Sao Tomé island).

The project will also support and implement aspects of the Basic Environmental Law ("Lei 10/99"), the Law of Conservation of Fauna, Flora and Protected Areas ("Lei 11/99") and the recent law regulating the natural park of Obo and its buffer zone ("Lei 6/2006" and "Lei 7/2006"), as well as the decree regulating Environmental Impact. The project will put into practice elements of the Forestry Law ("Lei 5/2001"), which gives basic rules on the management of forests in the country. Finally, the project will also support the finalization, validation and implementation of the Integrated Water Resource Management Law.

A.2 GEF FOCAL AREA AND/OR FUND(S) STRATEGIES, ELIGIBILITY CRITERIA AND PRIORITIES:

This project has been designed with the express intention of responding to GEF's overall strategic vision, under GEF-5, of helping countries meet their sustainable development needs and achieve multiple environmental benefits through an integrated approach. The project is consistent with CCM-3, LD-3 and SFM-1 strategies of assisting countries in the deployment and diffusion of low-carbon, renewable energy technologies through investment, capacity building, and technology cooperation and addressing management of competing land uses and, resulting

³ in the national Strategy and Action Plan for Biodiversity Conservation (2014) and in the Secondary National Communication on Mitigation to Climate Change (2010).

⁴ such as the Global Water Partnership (2010), Taiwanese cooperation (2012), National Ecological Management Plan for STP (2009) and National Report on Biodiversity in STP (2007)

changes in land-ecosystem dynamics. The project will promote an integrated approach towards fostering sustainable land management that balances environmental management with energy and development needs. Emphasis will be upon developing policies and regulatory frameworks that provide targeted incremental support to strategically important investments, such as investment in utilising a renewable energy source (hydropower) that will allow the country to cope with meeting the growing demand for electricity services in an environmentally and climate-friendly way.

The project has also been designed in line with GEF Investment Guidelines for Sustainable Forest Management (SFM-1) and REDD+ Programme and supports the development of policies and regulations to rollout and implement SFM interventions that complement existing REDD activities in the country. The islands' natural forests possess a wealth of endemic flora and fauna of high scientific value, which means access to biological resources and equitable distribution, are of the utmost importance in the country.

A.3 THE GEF AGENCY'S COMPARATIVE ADVANTAGE:

The proposed project is clearly within the comparative advantages of UNDP as stated in the GEF Council Paper C.31.5 "Comparative Advantages of GEF Agencies". UNDP is one of the few GEF agencies present in the country. It has the ability to mobilize and make available quality technical expertise to develop policies and strategies, particularly in climate mitigation and adaptation, social sectors, governance and environmental management and risk disasters. UNDP has also developed and implemented several projects in STP related to Energy and Environment, among them 4 GEF projects dealing with adaptation and bio-diversity.

UNDP has implemented over 230 GEF clean energy projects in close to 100 developing countries, and has acquired a unique base of institutional knowledge on transforming renewable energy markets in developing countries. This project feeds under the UNDP-GEF EITT Signature program number 1 "SP1 – Clean Energy" Promoting access to clean and affordable energy systems and services and under the UNDP-GEF Ecosystem and Biodiversity Signature program number 3 "SP3 – Ecosystem based adaptation and mitigation" Managing and promoting ecosystems for adaptation to and mitigation of climate change.

In Sao Tome, the project is in line with the United Nations Development Assistance Framework (UNDAF 2012-2016). UNDAF aims at reducing poverty, reversing the degradation of basic social indicators and setting the country on a pathway to sustainable development. UNDAF Outcome 4 states that "By 2016, the Government, districts and people adopt techniques and behaviour conducive to a sustainable environment and ensure a better prevention and management of risks and natural disasters".

A.4 THE BASELINE PROJECT AND THE PROBLEM THAT IT SEEKS TO ADDRESS:

This project aims to pioneer an integrated energy and ecosystems-based approach to "grid-based hydroelectric electricity generation in the country" via four interrelated components: 1) development of an appropriate regulatory framework; 2) catalytic de-risking instruments for investors; 3) sustainable land and forest management at the watershed level; and 4) dissemination of project experience and best practices. Such an approach will help to deliver multiple global environmental benefits in synergy in key sectors of the economy. This will lead to the direct reduction in GHG emissions from the electricity generation and land use sectors and ensure that all new mini-hydro plants that come online are sufficiently climate-proofed, as well as alleviate land degradation and maintain ecosystem services in the country's inland water basins and forests. The broader aim of this project is to pioneer a new paradigm for sustainable development of mini-hydroelectric plants in ecologically-vulnerable landscapes in SIDS.

While the PIF specifically mentions addressing "grid-based hydroelectric electricity generation" in the country, EMAE also operates isolated grids on Sao Tome Island, as indicated in Table 2 above. Hence, the project is slightly modified to focus not only on grid-connected electricity, but also to encompass isolated grids on that island, in addition to the mini-grids on Principe Island.

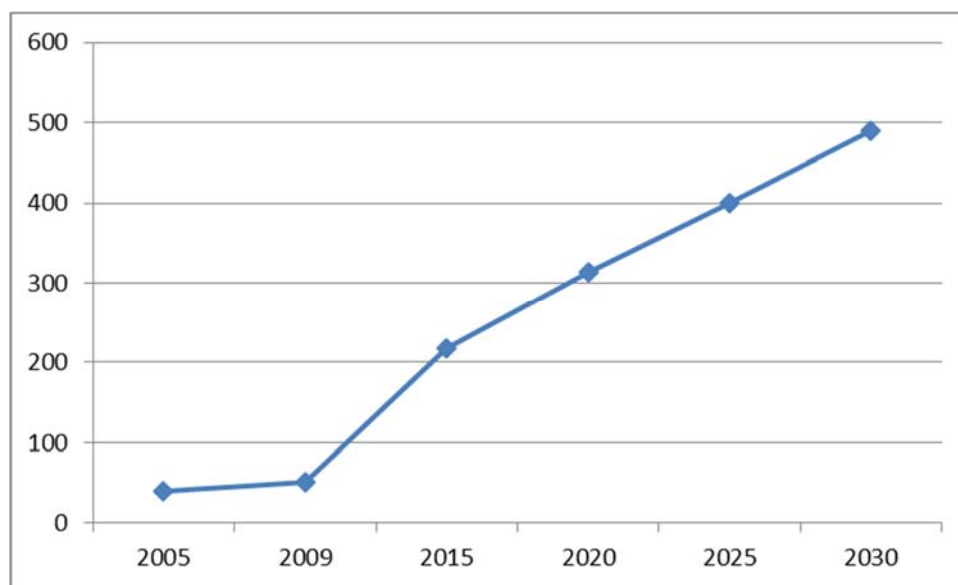
Electricity Generation

As indicated above, electricity produced from hydropower constitutes at the present time approx. 8% of the total generated in the country, with the balance produced by diesel generators. As per a study undertaken by CECI Consultants of Taiwan in 2008 (Report entitled “Master Plan for the Development of Water Resources in the Democratic Republic of Sao Tome and Principe, December 2008), electrical energy demand in the country would increase from 39,000 MWh in 2005 to 490,000 MWh by 2030 (Fig. 1). In 2013, the demand was projected to be approx. 175,000 MWh; however, EMAE was able to supply only 77,000 MWh, representing only 44% of what the country was reasonably expected to need as per the projection. This is an indication that electricity demand in the country is highly suppressed due to EMAE’s inability to build additional capacity to meet the increasing demand. It also points to the private sector’s reluctance to enter the electricity generation market due to the absence of a proper policy framework, and a secure and conducive environment for private investment.

Moreover, as per the same study by the Taiwanese consultants, it was expected that, in order to meet the needs of the country in terms of economic growth, investments in hydropower would increase the country’s hydrogenation capacity to 39.7 MW in the short term (5-7 years) and reaching a total of 63.6 MW in the long term (15 years). Unfortunately, no investment in hydropower has been made since 1999. The hydrological data for the rivers determined by the CECI consultants in 2008 were validated 2 years later when the Ministry of Public Works undertook formulation of the country’s Water Resources Master Plan. Regarding the emission reduction potential through the harnessing of hydropower, a UNEP RISO (June 2013) study entitled “Emission Reduction Profile – Sao Tome and Principe” indicates that the country “has an overall abatement potential of 111,630 tCO₂” per year, 78% of which could be provided by mini/small hydropower stations.

Hidroelectrica STP, Ltd. - a Spanish company, did propose the development of a 4 MW, 280-m head, run-of-the-river project at Bombaim on Rio Abade under the CDM modality and financing for the project was secured from a Netherlands-based Bank. Hidroelectrica, which was later purchased by Soares da Costa of Portugal, commenced construction on some components of the power station in 2008, viz. it installed 1 km of pressure conduit (out of a required 1.8 km) and partially built and strung the 12 km, 30 KV line from Bombaim to Agua Ize to connect the power station to the existing EMAE grid. It was reported that it had also ordered the 2 turbine-generator sets that were to be installed at the power station. However, when Hidroeléctrica/Soares da Costa was unable to conclude a firm power purchase agreement (PPA) with EMAE, the Bank stopped further disbursements in 2009. Since then, construction has stopped and vegetation has taken over whatever land had been cleared for building the machine hall. This example underscores the types of policy barriers facing potential investors in the hydropower sector in the country and which the present project will work with the Government to address within the context of the “Lei de Bases do Sector Electrico”.

Fig. 1: Projected electricity demand until 2030 (10³ MWh)



Source: Etudes de la CECI Consultants, Inc., Taiwan, Juin 2009.

Sao Tome and Principe's First National Communication submitted to UNFCCC in December 2004 estimated that the hydropower could theoretically provide 247 GWh of electricity per year, 70% of which could be tapped to annually produce 170 GWh. However, electricity generation from hydropower provided only 6 GWh in 2013. The energy sector development plan prepared in 2004 estimated that the country's hydropower potential could be tapped to provide 170 GWh/year, i.e. up to 70% of the theoretical potential. For comparison purposes (Table 1), hydropower provided only 6 GWh in 2013, while the total EMAE electricity generation for the same year was 71 GWh. Hence, if hydropower in the country were developed to the extent of even 30% of its available potential, it would have met the totality of EMAE's electricity generation in 2013. However, it is recognised that it would not be possible for the country to rely solely on hydropower generation for its total electricity supply; the variance in river flows during the dry season (June-August) and wet season can be substantial. Hence, diesel power generation will always remain part of the electricity supply equation, but its annual share can be substantially reduced.

The Economics of Electricity Generation from Mini/Small Hydropower in Sao Tome and Principe

As per Table 4 below, most of the identified sites, if developed, would have individual installed capacities under 4 MW, except for the site at Dona Eugénia on Ió Grande which is planned to have a 9.6 MW installed capacity. Mini (100 kW to 1 MW) and small (≤ 10 MW) hydropower plants have higher specific costs (per kW installed); therefore, investment costs (civil engineering, electro-mechanical costs, connection to existing grid, etc.) can be quite high. Preliminary costs provided by CECI Engineering Consultants, Inc., Taiwan in December 2008 indicate a range from \$ 3,000 to 5,000/kW, while the Brazilian company TECNIC proposed a cost of \$ 3,865/kW in March 2013 for the construction of a 11.5 MW hydro plant on Rio Grande. These cost figures are similar to data available in a wide range of capacities for mini/small hydropower stations that have been built in other developing countries in the region and throughout the world. Furthermore, they are in line with cost figures per kW installed provided in the June 2012 report on "Hydropower" published by the International Renewable Energy Agency (IRENA).

The cost of electricity generated by hydropower is very site-specific. For the 16 mini/small hydropower sites investigated by the CECI consultants, the levelised cost (the price at which electricity must be generated from a specific source to break even over the lifetime of the installation, typically 25 years) varies between 2 and 10 US Cents/kWh. Compared to this low cost of electricity generation from mini/small hydropower, the cost of thermal generation at the busbars of EMAE power stations, excluding costs related to spare parts, salaries and wages, was 23 US Cents/kWh in 2013 (Total Cost of \$ 16,542,567 (from Table 3)/Total Thermal Generation of 70,753,261 kWh (from Table 1). Again, as indicated earlier, the cost of generation at 1.92 MW Contador hydropower station that was refurbished in 2006 was estimated at 2 - 3 US Cents/kWh by EMAE.

Land use and Forest management

As indicated above, poorly managed shifting agriculture and the absence of forests management plan degrade soils and ecosystems. Major pressures on the ecosystems are driven by demand for wood and for charcoal as a domestic fuel in the capital, and by illegal trees cutting.

The latest FAO Forest Resources Assessment (FRA 2010) estimates that the lands under trees cover is approximatively 90% (90,900 ha), with high heterogeneity in quality and with various land uses:

- 40% of the country is natural forest, called "Ôbô". The Ôbo Natural Park covers 29,500 ha, and its management plan was validated in 2010 through the EU funded programme ECOFAC. Although the higher lands are not under pressure because of their difficult access, pressure is growing in the lowland forests in the buffer zone (which is not yet well defined) of the national park, as human penetration for natural resources extraction are more and more frequently observed.
- 21% of the country is secondary forest, called "Capoeira". These lands are abandoned cocoa and coffee plantations. There are no management plans of these lands. These forests are place for illegal wood extraction,

agricultural conversion and land use conflicts. Raising crops in these sloping lands, without application of measures against erosion, lead to soil degradation.

- 29% of the country is shade forest. These are productive lands (cacao and coffee) under trees cover. Many of them need to be rehabilitated with high quality trees plantation to have a better production.

The forest degradation rate at the national level has not been estimated yet because of the absence of a complete forestry inventory. However, data consulted and analysed during the PPG implementation shows that some forests in STP (a sample of about 46,000 ha outside the protected areas) are threatened by degradation at an annual rate of 1.27%. This is very high compared to the regional mean and then highlights the need for sustainable forest management implementation in STP.

Although no official data exist in STP to quantify soil erosion and no research process are in place, all stakeholders agreed that soil loss is amongst the most serious environmental problem threatening the fragile ecological balance of the country.

The principal underlying causes of land and forest degradation and deforestation can be organized in three categories:

- Illegal cutting of trees for wood construction (house, furniture, pirogue, pontoon, etc.) and for firewood and charcoal production:
Although the law states that no tree in STP can be cut without the authorisation the Ministry, the Department of Forests estimates that about 80% of the wood exploitation in the country is illegal. Some species are particularly threatened: *Milicia excelsa*, *Carapa procera*, *Fagara macrophylla*, *Manilkara multinervis*, etc. As there is no management plan of forests (except for the protected area), forests are largely overharvested in some parts of the country. This unsustainable practice led to a depletion of timber stock in the forests of STP (between 1989 and 1999, the forestry inventory shows a decrease of 6% of the volume of wood of the commercial species). The North and North East of the country (savannah ecosystem) have been dramatically deforested from charcoal production, even in the protected area Praia das Conchas. This has a severe impact on the agro-ecological production system in this area. For instance, cacao cannot be produced any more because of more frequent and dramatic droughts.
- Extension of agricultural lands and land uses changes, especially in or close to the buffer zone of Obo National Park:
Following the land reform initiated in 1993, extraction of high yielding timber trees for wood has been very widespread by those who have been assigned land under reforma fundiaria (land reform). This land reform has had an important effect on the forest cover in the country. Moreover, many of the landholding remains unused and unoccupied, with the preference of many people to live in larger towns or at least adjoining main roads. Today, land privatization is leading to an increase in the number of small farms and the clearance of trees. This mainly affects secondary forests and areas surrounding the Obo National Park. This does not currently affect primary forest but may be a threat in the future. Signs of palm-wine harvesting, hunting and other extractive activities are now becoming evident in the core of the Monte Carmo area (Olmos and Turshak 2010). Penetrations of poor families in the buffer zone and in the national park are more and more common. They collect wood and non-forest products, which increase pressure on the ecosystems. Several large-scale agribusinesses are also likely to result in the loss of forest and its flows of ecosystem services if no measures are taken. Road developments along the east and west coasts are increasing access to previously remote areas (A. Gascoigne *in litt.* 2000).
- Non-adequate agricultural practices such as slash and burn farming, very little crops rotation, non-adapted techniques in sloping fields:
The main cause of soil loss is to be found also in the shift in agriculture policies and land use over the past couple of decades, and from the land reform. Persistent inadequate soil management practices such as land burning and charcoal production and significantly reducing the fertility of agriculture soil. Every year in June, smallholder farmers are clearing lands with fire before seeding maize. This practice seriously affects land ecosystems and causes soil erosion. According to the Ministry of Agriculture, about 1,000

ha are burned each year for that purpose, mostly in the Lobata district. Besides, many crop fields are located in steep areas in the country. Interviews carried out during the PPG revealed that farmers noticed a decreased of yield year after year but didn't know of any solution to stabilize yield. Soil erosion is observed, as farmers usually don't use adequate cultivation techniques such as terrace and trees plantation.

In production areas, there is an excessive and non-appropriate use of chemical fertilizers, which contribute to the impoverishment of the country's arable lands. In a general case, farmers do not use basic agro-ecology techniques such as compost in order to manage the fertility of their soil.

In a context of extreme poverty and economic degradation in the rural areas of STP, many communities tend to rely on natural resources for their subsistence. Unsustainable activities in the rural areas includes logging, charcoal burning, wildlife hunting and poaching, palm wine farming, collection of medicinal plants, intensive vegetable growing under slash and burn deforestation process⁵.

Water resources

Forests in STP bring however major ecosystem services (such as provisioning food and fuel, regulating erosion and climate, supporting soil formation and protection, and regulating water flows and quality), which are threatened by land and forest degradation. Although the water resources potential in the country is not well defined (due to notably the very recent adoption of the water resource Master Plan which is not yet implemented), several studies range the total volume of water flows from 2.1 billion m³ per year (DRNE, 2010) to 6.4 billion m³ per year, which are high rates per inhabitant compared to the mean in other parts of the world⁶. There are 12 main watersheds in STP, which are divided in 116 sub river basins. Water flow is coming from rainfall, and then regulated by the vegetation cover, which supports the rivers supply in quantity and quality, but also the soil humidity and the underground water refill. The National Institute of Meteorology (NIM) states that the precipitations have already severely decreased from an annual mean of 913 mm between 1951 and 1976, to an annual mean of 816 mm between 1977 and 2000. Projections from the NIM show another decrease in precipitation of 85 mm until 2040. Recent scientific research highlights the impact of land use and land cover changes on west and central African monsoon⁷. Moreover, there are huge spatial differences in rainfall in the country: the south-eastern watersheds have significantly higher flow rates than the north-western watersheds. For instance, Rio Xufexufe watershed, which represents 1,741 ha, has a total annual volume equal to 282 million m³ of water, whereas Agua Grande watershed (1,572 ha) has a total of 57 million m³ of water. The threat on water availability due to land degradation, and that affects hydropower plant investment⁸, and the spatial heterogeneity of water resources in the country call for an integrated watershed planning and management. This landscape approach needs to include ecosystems protection measures, land uses planning and forests management, and involve the commitment of several stakeholders (different governmental institutions, water users, farmers and communities, hydro-electricity producers, etc.).

Other environmental services generated by the STP's ecosystems: Energy supply, GHG sink and Biodiversity conservation

50% of the population still doesn't have access to a modern source of energy. Firewood and charcoal remains the main source of energy (in addition to oil lamp used by households). The charcoal consumption is growing very fast: according to estimation of the draft Forestry Development Plan, 10.5 tons of charcoal (about 15 m³) were consumed in 1988 whereas 210 tons (300 m³) were consumed in 2000. The firewood consumption, after a decrease in the 80's (108,500 tons per year), has had been growing up to 136,600 tons per year since 2000. These trends show the growing needs of biomass for energy, as well as the need for renewable energy development.

National GHG (greenhouse gas) inventories for STP carried out in connection with communications to the UNFCCC show that 'Land-Use Change and Forestry' (LUCF) are actually removing GHG from the atmosphere at a

⁵ Report of the Monte Pico Association prepared in 2007 for the FFEM (French Fund for Global Environment).

⁶ Global Water Partnership (2010), Development of a financial strategy for the water sector in Central Africa, National report for Sao Tomé and Principe.

⁷ Past and present biogeophysical impacts of land use and land cover changes on West African monsoon, Sy and al., 2013, European Geosciences Union General Assembly.

⁸ The CECI Consultants report indicates an average plant load factor of 33% - a low figure related to the variance in river flow.

ratio of ~600% of total GHG emissions. STP is then a net sink of global emissions, of about 530,200 tons of CO₂ equivalent each year. Achieving carbon sequestration at the watershed level depends on a number of conditions: e.g. the watershed's climatic, edaphic and floristic characteristics, but also the size of the watershed, population, the size of the livestock herds (if any) and access to the national grid. The implementation of the Project strategy, both with sustainable land and forest management, at significant scale (about 23,000 ha in total) can generate global environmental benefits by strengthening carbon capture capacities and mitigating climate change uncertainties.

Due to the remoteness and the small dimension of the country, STP has a very diverse and specific biodiversity, which is directly linked to the quality of natural habitats. The country is rich in endemic fauna and flora including 28 birds species, 81 butterflies species, 60 snails species, 3 mammals species, 15 herptiles species and 148 plants species (14% of the country's flora).

As regards the flora, there is a total of 1,260 vegetal species in the country (933 indigenous and 297 introduced), out of them 148 are endemics⁹. Bridges (2013) estimates that 14.9% of endemic species in STP are vulnerable, and 12.2% are near threatened. The variety of Orchids is notably high (Vaz & Oliveira, 2007).

As regards the fauna, there is a total of 10 species of small mammals, 49 species of birds, 89 species of butterflies, 14 of reptiles, and 5 amphibians¹⁰. The level of bird endemism is globally unique : STP houses 28 species of endemic land birds, a very high concentration for a country of 1,001 sq km. For example, the famous Galapagos Islands house 22 endemic species in 8,000 sq km (13 islands). The country were recently added to the Important Bird Area (IBA) in Africa.

The gradual degradation and loss of natural habitats inevitably result in declines in habitat quality and extent as well as numbers and distribution of wildlife, both within Obo National Park and in the wider landscape. Despite their importance, the species on the islands are at risk. Four are listed in the IUCN red list as Critically Endangered, one is endangered, eight are Vulnerable and a further three Near Threatened. Recently, BirdLife alerted the government about 3 key flagship endemic birds which are critically endangered : *Neospiza concolor*, *Lanius newtoni* and *Bostrychia bocagei*¹¹.

While there are many challenges facing STP with respect to energy and management of natural resources, the long-term solution involves two inter-related axes of action. First, it implies STP embracing a renewable hydropower development path that supports the country to become much more self-sufficient in cleaner energy, while also supporting human and economic development. This is bound to have a positive impact on forests that are currently suffering from unsustainable and inefficient use of biomass. This is possible through the promotion of renewable energy production. Increasing the locally available energy will undoubtedly contribute to the country's development, while having a very positive impact on people's livelihoods. Together with an intensification of agricultural practices, this will open up a number of possibilities for income generation and improved quality of life. Secondly, these same local communities are to be empowered as key agents of change with respect to the good stewardship of land, water and forest. This is possible, if people are given a stake in conserving forests and associated resources, and if people derive benefits from it. The Integrated Watershed Management model embraces these two axes of action, while also catering for the social aspects that permeate community relations.

The integrated landscape approach at the watershed level

The concept of Integrated Watershed Management (IWM) in STP provides a framework to integrate natural resource management with community livelihoods improvement and hydro-energy production in a sustainable way. The watershed-based approach is a relevant strategy in STP to develop a landscape approach integrating conservation of ecosystems and local development of communities. The highest and steepest sub-catchments support cloud forest and dense primary forest ecosystems, while those less steep are used for agroforestry and food crops. IPPs will establish the hydroelectricity plants in watershed so that upstream land use changes might affect their energy production. Downstream fishermen observed a significant decrease in fish population in the coastwaters due to soil erosion upstream¹².

⁹ Report on the state of biodiversity in Sao Tomé and Príncipe, 2014.

¹⁰ Report on the state of biodiversity in Sao Tomé and Príncipe, 2014.

¹¹ BirdLife International (2014) IUCN Red List for birds. Downloaded from <http://www.birdlife.org> on 22/03/2014.

¹² Source: NGO MARAPA, interview with Manuel Jorge Carvalho Do Rio, March 2014.

Through the IWM, the project will address the issues of degradation of natural resources, soil erosion, landslides, floods, frequent droughts and desertification, low agricultural productivity, poor water quantity and quality and poor access to land. This will be achieved through watershed level land use planning and implementation of Community-based natural resources management (CBNRM) methods and innovative agroecological techniques. IWM involves better coordination of land, water and energy management and a watershed-scale approach to achieving sustainable development of communities, land and forest conservation, low carbon development and adaptation to climate change. Watershed stakeholders will use and manage their available land to maximize production from hydroenergy, agriculture, livestock and forestry on land allocated for these purposes. This IWM approach will be sustained through a sharing benefit mechanism.

A key tool to achieve effective IWM in STP will be the Integrated Watershed Management Plan (IWMP) which is a document developed cooperatively by government and stakeholders (communities, IPPs, agribusiness, tourism operators, etc.). It states suitable strategy for ecosystems conservation and local community development, and shared goal and outlines actions to manage land, forest and water on the watershed basis. It will be developed for each watershed at the beginning of the project with the support of consultants. The IWMP will detail the solutions for improving lands management through implementation of the following concepts in the appropriate areas of each watershed:

- An innovative participative method of forest management will be implemented for upstream lands (output 3.1). Owned by the State, secondary forests have no management plans yet and are not controlled due to the weak institutional capacity. The project will introduce Community Forests (CFs) concept in the country (at least over 6,000 ha). As this community based approach of natural resource management is new in the country, an appropriate legal text and framework will be drafted by a consultant and validated by the government. Management rights and responsibilities are transferred to the communities and CFs are managed by and for the benefit of communities, with advice from administrations (MAFRD) and local authorities (namely the “Camara”).

An initial mapping of the project zones will be carried out by a team of local experts. A detailed assessment for each area will include: a clear delimitation of the upstream forests, identification of the biodiversity and the ecosystems services, identification of the uses and the users and the stakeholders to the natural resources (forest dweller communities but also private sector, civil society, institutions and decision-makers), and an assessment of potential income generating activities. The data collected will support the design of participatory management plans. As a constitutive part of the IWMP, the CF management plans will be developed for each forest with operational guidance for sustainable forest management. They will include (i) the situation description (reference assessment), (ii) the measures required to conserve lands and to sustainably manage natural resource, (iii) the responsibilities of each stakeholders, (iv) a detailed workplan and budget. Each plan will be validated by stakeholders during meetings, before its official approval by authorities. Together with this process, a co-management convention will be negotiated at the local level, and agreed upon and signed by each local authority (“Camara”) and Community Committee to clarify roles, responsibilities and benefits in relation to management of the forests.

Community Forests establishment also includes organisationnal support and capacity building for communities. A committee will be established in each village in order to manage the forest. It will be formed by community leaders during the development of the participatory plans. The committee will benefit from a learning and capacity building process including environmental, development, organizational and economic topics. It is expected that each community leader will act as a multiplier of knowledge within his own community, disseminating the principles for the sustainable management of productive landscapes and the maintenance of the ecosystems services in each watershed.

CFs will contribute to maintain ecosystem services through sustainable management of forests (for example, reducing the frequency and impact of bushfire by creation and maintenance of firebreaks and fire management systems - surveillance and fire-fighting teams), to reduce erosion in the watershed, and to improve communities livelihoods on a sustainable basis.

- In order to address soil erosion in the watershed, the project will support the introduction of sustainable Agricultural Land Management (SALM) practices among the farmers through a capacity building process including pilot land plots, training, technical assistance to the farmers and investments for the adoption and

dissemination of sustainable farming techniques (output 3.2). These measures will be described and illustrated in the IWMP.

With the support of international expertise, a training programme will be organized for at least 4,000 farmers in SALM practices for reducing soil erosion. The training plan will be developed in collaboration with the CIAT, farmer's organisation and the international expertise. It will go into depth the efficient SALM techniques adapted in the context of each watershed: (i) Agronomic practices (crop rotation, cover crops and green manure), (ii) soil fertility management (mulching, improved fallows and composting), (iii) water management (river bank protection) and (iv) mechanical land management (terraces, stone lines and anti-erosion small dams). The learning cycle will be sustained by monitoring in the field both by local agent of the MAFRD and by a local NGO that will be also trained by the international expertise.

The learning cycle in agro-ecology seeks to improve the capacity of participants to promote agro-ecological practices, by reinforcing both their knowledge (technical aspect) and their skills (methodological aspect). It will consist of both theoretical and practical sessions, in planetary and working groups' sessions. Efforts will be made to organize participative and dynamic training sessions. Very comprehensive documents (with illustration and simple texts) will be given to the participants for dissemination in the communities.

Pilot demonstrative land plots will be established for two purposes: (i) organising practical training in field and (ii) producing scientific knowledge for capitalisation on SALM techniques in the country.

Based on first results of these pilot plots, investments for material and equipment for the implementation of soil management techniques at large scale will be done on plots of group of farmers. Criteria for selection of farmers will include: motivation to take a leadership role in the process of dissemination of SALM techniques in his community, availability of time, geographic and social representation, focus on the weakest segments of the population (women, unemployed groups).

- In order to reduce pressure on the natural resources, activities will be developed in communities to meet their needs for food, wood and other natural resources, harvested sustainably, and to provide alternative income-generation (output 3.3).

These income-generating activities include (i) new agricultural products such as mushrooms, medicinal plants and vanilla/spices grown on cocoa trees, (ii) non timber forest products, (iii) production of organic compost, (iv) eco-tourism.

The project proposes to organise the implementation of these income-generating activities around the Ecological Perimeters (EP) concept. EPs are established on about 2 to 5 hectares in each communities and provide food (vegetables, fruits), wood (fuel wood and other purposes), non-wood products, fruits, medicinal plants, vegetables and orchards, mushrooms production, water supply, saplings for replanting degraded CFs, fishes in basins, etc. A pilot experimentation of aquaculture in the watershed will be performed and recommendations for dissemination will be formulated in case of promising results.

- A financial mechanism will be set up by the project in order to sustain the Integrated Management of the Watershed (outputs 3.4 and 3.5). This mechanism will be based on Payment for Environmental Services (PES) – payment from the IPPs based on sharing benefit scheme of the energy proceeds. A Community Trust (CT) is fuelled by IPPs and will finance every year micro-projects which contribute to sustainable land and forest management in the watershed. The full mechanism is described below in the following paragraph (Financing Support Mechanism).

The PES scheme must include a monitoring system which (i) assess the link between sustainable activities implemented in the upstream lands and the environmental services (namely water flows and quality) and (ii) measure the maintenance or improvement of water availability in the watershed. There is thus an obvious need for: (i) qualitative and quantitative data on the water resource in each watershed, (ii) an information tool where such information and data on water resource (but also on land use, forestry and agriculture data) can be fed, and that can be available to all concerned stakeholders (communities, IPPs, agribusiness, scientists, agribusiness,

NGO, decision-makers, etc.). This water monitoring scheme will provide information on the water flows upstream the hydropower installation, and it is expected that it will support the water users to progressively include to the CTs mechanism more criteria based on additional water flow that the SLFM will bring.

The barriers to achieving the integrated solution

The Project will address the following specific barriers and groups of barriers which currently constrain positive changes towards the development of an integrated, sustainable and widely replicated IWM model in STP:

Barrier 1) Policy and legal instruments relating to community management and benefit-sharing in secondary forest (“Capoeira”) are inexistent. An appropriate policy and legal framework is required to support effective implementation of the IWM model.

At national level, a Forestry Master Plan was designed in 2002 with the support of ECOFAC, AGRECO and CIRAD. It describes the situation in the forestry sector and defines main priorities and actions plan for the sector.

The Forestry Master Plan gives the following orientations:

- To develop information and knowledge about the forestry sector (mapping, database, capacities building, etc.)
- To support farmers and private sector for sustainable management of forests and agroforestry systems (support for trees plantation, improve the productivity of forests, promote the valorisation of trees, etc.)
- To promote a better planning, management and valorisation of forests (promote the participation of local population for the management of secondary forests, reduce illegal exploitation of forests, increase incomes from forests and improve livelihoods of local population).

However the GoSTP has never validated it because of lack of advocacy capacities in the MAFRD. During the last 12 years, the situation and main policy priorities has been evolving. Whereas the natural forests (“Obo”) are under a protection area management plan (“Obo Natural Park”), the secondary forests have been the poor relation that has been ignored. One of the main recommendations of the past projects is to introduce and develop Community Forest Management for the secondary forest in STP (about 21,000 ha). Thus the Forestry Master Plan needs to be updated with both recent data and strategic priorities for the forestry sector in STP.

Besides, some legal codes and texts relating to natural resource management (forestry, environment, conservation of fauna, flora and protected areas,) include incentive for community involvement, but no specific law does exist for community management of the secondary forest. Then the legal framework needs to be designed in order to clarify and facilitate community management and benefit sharing of the secondary forests as part of the IWM model.

Barrier 2) Poor understanding of the natural resource base, ecosystems and ecosystems services flows and the impacts of land management, natural resource and energy use inhibit development of integrated and sustainable management at the watershed level.

Traditional approaches to forest management, sustainable farming and energy projects are compartmentalized and fail to understand the overall needs of populations at the scale of a village, its community lands and the landscape level (watershed). Also, rural communities have little awareness about the impacts of their activities on natural resources and ecosystems, and in particular how their management of land and resources affect GHG emissions and carbon sequestration. A few ad hoc successful approaches exist, but the emergence of a more visionary approach to generating global benefits with focus on the watershed level will meet constraints linked to rural poverty, low levels of education, significant gender imbalance and run-down or inexistent social infrastructure (access roads, rural clinics, grid connectivity, etc.).

The main purpose of IWM is to integrate natural resource management (and the related ecosystems services flows) and hydropower production with community livelihoods improvement through a landscape conservation approach.

However, information on water and carbon in watershed is very limited and there are very few examples of systematic collection of natural resources and water flows information on which to base management. Communities need simple, repeatable survey and monitoring methods to obtain baseline information and to monitor trends in natural resources (habitats and species) to ensure that community management achieves sustainable management objectives and that natural resource exploitation is carried out sustainably. Adaptive management requires this information to allow for changes in management if conservation or other objectives are not being met. Moreover,

the sustainable financing of IWM through the Community Trust (see full explanation below in Financial Support Mechanism chapter) needs information on ecosystems services maintenance and improvement in the long term.

Barrier 3) Poverty, cultural habits and lack of alternatives, innovation and investment (private sector and public finance) at village level make it hard for communities to break out of a cycle of unsustainable land, resource and energy use and rural exodus.

As evidenced by several previous development interventions at the village level, the principles of participative land uses planning and management can be introduced. However, bringing about lasting change will depend on communities having a positive stake in it. Poverty, tradition and lack of alternatives drive communities and individuals to continue to carry out unsustainable practices of resource exploitation both legal and illegal (e.g. cutting trees without permits from the MARFRD). The lack of jobs and alternative options for income generation drive the rural exodus – many villages lose young people who emigrate either seasonally/ temporarily to look for work or permanently to find work in the capital or countries. During village interviews at the PPG stage, all communities expressed the need for social benefits in villages (health, education, income-generating activities and employment) as well as improved natural resource management, sustainable use and more efficient energy use.

Farming practices are among the hardest to change and this creates a barrier to the introduction of Sustainable Agricultural Land Management (SALM) alternatives (e.g. mulching, improved fallows, agroforestry and tree planting). Lack of knowledge of the environmental impacts of their practices and the inability of farmers to invest in equipment over the medium to long term are barriers to implement alternative techniques (typically intercropping, river banks protection, anti-erosion dams, terraces, etc.). There are challenges in term of appropriate economic incentives to make these technologies accessible, popular and progressively systematic in rural areas. The Community Trust (CT) will be a long-term solution to finance these innovation upstream the watershed.

Examples of alternative income-generating activities (IGAs) exist in rural villages in STP but these are limited and usually initiated under the umbrella of donor-funded development projects. Village activities with linked social / financial and environmental benefits seen at the PPG research stage include ecotourism, mushroom production, medicinal plants and revolving credit funds providing social benefits (start-up funds for household and community enterprises) and a percentage of profits to environmental funds to support management of Community Forests. Similar approaches need to be widely replicated as part of the IMW model, to lead to sustainable and lasting village level development

Barrier 4) Poor understanding of the IWM model and of conservation farming, ecosystems and potential carbon benefits, coupled with poor communication and working relationships and limited capacity of national administrations and local communities inhibit the development, promotion and widespread replication of an effective and sustainable IWM model

Through the UNDP UNEP GEF project “Integrated Management of the Rio Provaz Hydrographic Basin”, a river basin management plan is under implementation with the objective to enabling equitable water resources allocation and protection. This is a first step toward the IWM approach proposed in the present project, which also included participative land uses planning, Community Forest Management, Conservation Farming, Afforestation, etc. Yet, the idea of IWM is very new and not well understood in rural STP.

The MAFRD lacks the necessary working relationships with other administrations at both national and local levels. It has limited experience and human resources (appropriately trained staff) for the coordination and management of a national programme.

At local level, some farmers structures has been recently supported by projects (PAPAFPA for example) but there is a need for more training, better networking so that ideas can be shared, and more resources to finance activities and to ensure replication of an effective IWM model across STP.

At the community level, there is a perception of decrease in crops yield ; but there is no understanding of their real causes, of the link with the current un-adapted agricultural practices (crops in sloppy field without soil management techniques such as terraces or anti-erosion dams). There is a need to promote effective community involvement in improving their agricultural practices, and also in management, decision-making and benefit sharing from CF.

The capacity of institutions at the local and district levels is limited due to high levels of staff turnover, low salaries and poor motivation. Capacity at the level of districts (“camara”) and villages is also weak in terms of human and financial resources. Communities lack adequate skills and training for land management and forest management (e.g. financial management, habitat improvement, ecoguards and ecoguides training). The needs include transport,

materials for habitat management, fire control and replanting, mechanisms and training for ensuring longer-term sustainable funding for environmental management.

Financial Support Mechanism

The Financial Support Mechanism (FSM) proposed in the project will have two distinct components:

1. A guarantee fund, related to the energy component of the project, which aims at providing more security to the IPPs as it protects them against the risk of payment default by EMAE;
2. A community development fund, called Community Trust (CT), which aims at financing sustainable forestry and conservation agriculture in the long term through a Payment for Environmental Services (PES) mechanism between the IPPs and the communities living within the watershed.

When IPPs will negotiate with the government for the PPA, they will sign for both the guarantee fund and the community development fund, according to the modalities explained below.

The energy component of the FSM

Investment in renewable energy projects often requires to be supported with financial incentives, at least initially, because such projects are not only typically more expensive on a cost per installed capacity basis than the traditional methods of electricity generation, but that they are also, in some cases, considered to be riskier investments due to technology or resource uncertainties. The degree to which cost and risk factors apply varies according to technology and geographical location and investors expect to get a higher return on their investment to compensate them for taking on additional financial risks, or the financial risks need to be reduced through providing more revenue certainty.

Hydropower has historically been more expensive to harness for a number of reasons, including the fact that hydro resources may often be located in remote areas that require costly infrastructure to access the market (grid). This additional cost varies significantly across geographical locations and means that the level of support required to incentivise investment varies also.

In the case of STP, financial support to mini/small hydropower development can take the form of either an upfront grant or a buy-down in the level of certainty that project developers will get paid for electrical energy supplied to EMAE. In the WB/IFC “Doing Business 2014” data, STP ranks 157 out of 189 economies on protecting investors and 183 out of 189 on enforcing contracts. In discussions with private project developers during the PPG, it was clear that this concern is very much present in their minds. In their view, as mini/small hydropower development is fairly well-known among lending institutions throughout the world, securing loans in the international finance market for investment in this area does not pose much of a problem. However, of real concern is the potential that investors may not get paid for the energy they supply to the EMAE grid. Investments in mini/small hydropower are made for a minimum of 25 years and any doubt in the minds of developers regarding the business climate in a particular country will make them reluctant to invest. Specifically in the case of STP, there has been a precedent, as mentioned above, when Hidroelectrica, the developer of the Bombaim hydro power station had to stop work in the absence of a Power Purchase Agreement. It is not clear why it decided to even initiate investment in the project in the absence of a signed PPA.

Hence, private sector developers would like to see a signed PPA before they make any investment. In addition, they would like to see in place a financial support mechanism that would “protect” them in case of payment default by EMAE for energy already supplied. Consequently, in order to mitigate any investor payment-default risk, the project will establish a Financial Support Mechanism (FSM - referred to as Renewable Energy Guarantee Scheme in the PIF) and allocate a joint GEF-UNDP risk-sharing capital of \$ 1,200,000, viz. \$ 1,000,000 from GEF funds and \$ 200,000 from UNDP. This amount will fully cover one year of electricity generation from 5.51 MW of installed capacity (generation of almost 16,000 MWh/year at an average feed-in tariff of 7.5 US Cents/kWh) in the unlikely circumstance that EMAE does not reimburse the private developers anything at all for electricity supplied to the grid during that whole year.

What is the basis for assuming an average feed-in tariff of 7.5 US Cents/kWh? As indicated above, the CECI consultants determined that the levelised cost of electricity generation for the 16 mini/small hydropower sites they investigated varied between 2 and 10 US Cents/kWh. In addition, in March 2013, a private investor made a proposal to the Government to develop 3 “cascading” hydropower sites totalling 11.51 MW and sell electricity to the grid, subject to negotiations, at 9 US Cents/kWh; hence, it is safe to assume an average feed-in tariff of 7.5 US Cents/kWh for electricity sale to EMAE.

The probability that the total amount of the FSM will get depleted in just 1 year is very low, as remedial measures will kick-in as soon as EMAE starts falling behind on payments to IPPs. Still, in addition to the FSM, IPPs will be encouraged to develop their own financial instruments with private insurance providers and in case of default of payment by EMAE, the FSM will step in as “subordinated insurance” to reimburse that portion of default not covered by the IPPs’ own insurance companies. Still, the situation may arise when capital markets, after evaluating EMAE’s financial reports, may not willing to finance a developer’s project at a reasonable cost without State support. To minimise this from arising, the project will, during its initial stages of implementation, discuss with the Government the option of providing a sovereign guarantee that will serve as an added financial incentive for the capital market to provide debt financing to the developer at a reasonable cost.

The purpose of this guarantee scheme will be two-fold:

- First, to support the request of project developers vis-à-vis their potential lending institutions. A commitment from the Government that the chances of a payment default on the part of EMAE for energy already supplied to the grid is minimised would reduce the overall risk profile of the investment, making it easier and less expensive for the developer to raise the necessary debt financing. In addition and aimed at providing further assurance to the capital market, the project will solicit the support of other donors to increase the volume of FSM funds that will allow, if need be, to partially cover the debt portion of a developer.
- Second, it will provide assurance to project developers that there is a mechanism in place to shield them from default on the part of EMAE, should it happen.

There is, of course, a fundamental question of sustainability of resources available under the FSM for this financial support to grid-connected mini/small hydropower to continue beyond the projects’ lifetime of 5 years. Neither the project nor the Government wants such an important modality for reducing the country’s import of diesel fuel through substitution with locally available hydropower resources not to be sustainable. In fact, the project expects that the experience gained through the operation of the FSM will act as a magnet to other donors (and the Government) to further capitalise it beyond the initial \$ 1.2 million, so that the country can benefit from investment in the hydropower sector for capacities exceeding the minimum 4 MW planned to be constructed during the project lifetime; in fact, during the project’s lifetime, the installed capacity will be 5.1 MW. Hence, for all practical purposes, the FSM is not expected to be a short-lived mechanism; in fact, it will have to be operational for at least 20 years, equivalent to the duration of the PPAs signed by the IPPs. The FSM is meant to be in operation until such time that investors gain sufficient confidence that the risk of EMAE in defaulting on its payments has been minimised through the project.

It has been clarified above that the purpose of the FSM is to reduce the overall risk profile of the private investment and to shield investors from default on the part of EMAE. In discussions with project developers, this issue will be highlighted and the website will also make clear the purpose for setting up the FSM. This, it is hoped, will sensitise project developers to the fact that the FSM is expected to decrease gradually over time and eventually be phased out when the private sector has developed sufficient confidence that the risk of EMAE defaulting on payments for energy supplied has been considerably minimised. Still, during implementation of the project, discussions will be held with the Government to consider the options for putting in place its own FSM, in unlikely circumstance that it should still be necessary beyond the project time-frame to support project developers.

Operationalising the FSM

The FSM will be a non-grant mechanism that will be operational, as indicated above, for at least 20 years, equivalent to the duration of the PPAs signed by the IPPs. The funds will be deposited with the Central Bank; its concurrence was secured during implementation of the PPG. The funds themselves will be under the joint

management of the Ministry of Finance and UNDP and will cover IPPs against the risk of EMAE not fulfilling its financial obligations, as outlined in the Power Purchase Agreements, towards developers for electricity already supplied to the EMAE grid. The FSM will not be used for investment.

Under the circumstance that EMAE does not credit the IPP for energy already provided, the latter solicits the support of Ministry of Finance (MoF) with a view to resolving the issue with EMAE. Hopefully, a satisfactory resolution of the issue will be found through an acceptable payment schedule. If, however, EMAE is unable to pay the IPP, then the latter solicits the fund managers to step in and make payment under the FSM, based on the non-performance of contractual obligations under the PPA. In order not to deplete the funds under the FSM, its management will enter into an agreement with EMAE on a repayment schedule. Only when all avenues for reaching a payment schedule acceptable to the concerned parties (developer and EMAE) cannot be reached, the fund managers (Ministry of Finance and UNDP) will determine the amount of payment that needs to be made to the developer and request the Central Bank, in writing, to release the funds.

Upon completion of the project, management of the FSM will continue with the Ministry of Finance acting as fund manager. Prior to the expiry of the last PPA, the Ministry of Finance will hold discussions with the donors to determine how the remaining funds would be disposed of; for example, whether these funds should revert back to the donors or, with their concurrence, be utilised for other development projects or a combination thereof.

Box 1 below provides a snapshot of how the energy component of the FSM will be set up and operate:

Box 1: FSM Snapshot

Financial Support Mechanism

Purpose: (1) To support project developers vis-à-vis lending institutions by minimising financial risks.

(2) Provide assurance of payment to developers for energy supplied in case of default by EMAE.

Initial Capitalisation: \$ 1.2 million (\$ 1 million from GEF and \$ 0.2 million from UNDP). Additional capitalisation will be sought from donors to expand the programme and to, if required, partially cover the debt portion of a developer.

Funds Host: Central Bank of Sao Tome and Principe.

Funds Managers: Ministry of Finance and UNDP.

Lifetime: Minimum duration of 20 years, equivalent to duration of PPAs signed between EMAE and IPPs.

Disbursements, whenever required: Initial contribution ratio to be maintained, i.e. 83% from GEF and 17% from UNDP.

Operationalising FSM: Recruitment of a consultant with financial engineering background and experience towards the beginning of Year 2 of project to draft regulations.

Worst case scenario: Initial capitalisation can cover one full year of default by EMAE; however, this is highly unlikely to happen, as EMAE is a Government-owned Utility and its failure by going bankrupt will prove disastrous to the national economy. In addition, the probability that the total amount of the FSM will get depleted in just 1 year is very low, as remedial measures will kick-in as soon as EMAE starts falling behind on payments to IPPs. In addition to the FSM, IPPs will be encouraged to develop their own financial instruments with private insurance providers and in case of default of payment by EMAE, the FSM will step in to reimburse that portion of default not covered by the IPPs' own insurance companies. Finally, during initial implementation of the project, discussions will be held with the Government regarding the option of providing a sovereign guarantee that will serve as an added financial incentive for the capital market to provide debt financing to the developer at a reasonable cost.

Generating capacity to be installed under project: 5.51 MW (Table 4)

Expected annual generation: 16,000 MWh

Average feed-in-tariff: 7.5 US Cents/kWh (the levelised cost of mini/small hydropower generation for the 16 sites investigated by the CECI consultants varies between 2 and 10 US Cents/kWh).

Cost of default for 1 full year of energy supply from IPPs: 16,000,000 kWh x 7.5 US Cents/kWh = \$ 1.2 million.

The Community Trust of the FSM

Community-based natural resources management (CBNRM) often requires to be supported with external financial incentives, in order to introduce new techniques and management methods, to design streamlined legal framework, and to accompany behaviour changes in the communities. Many CBNRM projects have been funded by donor agencies in several African countries. These efforts can produce tangible benefits for the communities while maintaining the flow of environmental services from the ecosystems on which they depend. However, in many projects, a long-term financial mechanism is needed in order to guarantee the sustainability of CBNRM¹³.

In STP, the Ministry of Agriculture, Fisheries and Rural Development (MAFRD) is largely dependent of external funding to implement its sustainable resources management policy, and thus the farmers are involved only on a “short term dynamic” for the duration of a project. The director of forestry department states that the lack of recurrent funding is one of the main obstacles that the administration faces for sustainable forest management.

In line with the integrated approach promoted by the project, the financial support mechanism to sustain CBNRM in STP will be a Payment for Environmental Services (PES) scheme at the watershed level based on the water regulation services provided by the upstream ecosystems. The IPPs, who are downstream users of the water resource, will finance the communities upstream who are maintaining water availability and quality thanks to the implementation of CBNRM.

Several options of PES scheme were discussed during the PPG. On one hand, the payment can be done directly to the communities in cash or in kind. Whereas this option is experimented in several Latin American countries, it is often limited to one micro-watershed, and an experienced NGO is needed to actively manage this scheme. Moreover, transaction costs might be high in case of individual payments.

In STP the objective is to replicate the PES scheme to all hydroelectricity production sites. Moreover there is no stakeholder, neither private project developers nor NGO, with large PES experience in the country. Besides, the PES scheme must include a control system to assess whether providers and users are complying the agreement.

Thus the other option discussed during the PPG is more effective and preferred in the case of STP. The IPPs will contribute to a specific fund, called Community Trust (CT), each year at a rate of 10% of their income received from EMAE. The rate of 10% is acceptable for the private projects developers (it is equivalent of other PES initiatives in the world) and it generates an appropriate sum of 120,000 USD per year¹⁴. The aim of the CT is to co-finance concrete actions (micro-projects proposed by the communities) that would participate to the watershed management (sustainable land and forest management): reforestation, equipment for fire protection, income generating activities, etc. Actions collectively proposed by at least 3 actors could be 70% co-financed and individual actions could be 50% co-financed. Thus, every year, total budget of the implemented thanks to this mechanism will range from 170,000 to 238,000 USD. This amount will sustain the management of forests (annual operations¹⁵ such as trees plantation, firebreaks maintenance, training, etc.) and the investments in Income Generating Activities and reforestation activities. Local agents of the MAFRD will support the communities to formulate the micro-projects. Local NGOs can also support communities to propose innovative projects. The FSM board will manage the CT, and will organise once a year a call for micro-projects. A committee, composed by the Ministry of Finance, EMAE, MAFRD, UNDP, local authorities, FONG and communities representatives, will meet once a year in order to select the most appropriate to be financed by the CT.

The micro-project will be checked against the following criteria: (i) location within the watershed concerned by the PES scheme, (ii) actions that can be carried out in a sustainable way and without causing any environmental

¹³ Roe D., Nelson F., Sandbrook C., 2009. Community management of natural resources in Africa: Impacts, experiences and future directions. Natural Issues No 18, International Institute for Environment and Development, London, UK.

¹⁴ The project targets the installation of hydroelectricity plants, which will produce 15,871 MWh per year. Assumption is made for a kWh price at 0,075 USD (as a conservative price – see Box 1). IPPs will generate 1,190,325 USD of income. Hence, if the IPPs re-invest 10% of their energy proceeds, the CT will be fuelled each year by 119,033 USD.

¹⁵ According to Financial instruments for the implementation of regional forestry strategies (February 2013), ECO estimates the minimum costs of maintenance of the Sambandé Community Forest (1,000 ha) at 3,000 USD per year. Thus, to maintain the protection of 6,000 ha of Community Forests, a minimum amount of 18,000 USD is needed every year.

degradation or biodiversity loss, (iii) actions in line with the Integrated Watershed Management Plan (assessment performed at the initial stage of the project) and the related Community Forest management plan, (iv) income-generating activities that are viable and environmental friendly. Social actions can be proposed if they have a positive impact on the environment (ex: environmental education support for children).

During project implementation, a specific manual of procedures for the disbursement of the CT for micro-projects will be drafted before the launching of this activity.

Project Components

The Ministry of Public Works, Infrastructure, Natural Resources and Environment is the central body responsible for formulating and implementing the Government's policy in the field of energy. It also entrusted with the responsibility of putting in place policy, plans and programmes that govern the promotion and utilisation of renewable energy, including hydropower. The Regulatory Authority is also under the same Ministry and, although it has responsibility for Energy, Postal Services, Telecommunications and Water, it is presently focused only on the Telecommunications Sector. The Ministry of Agriculture, Fisheries and Rural Development (MAFRD), on the other hand, is responsible, among others, for sustainable forest and land management.

This project aims to pioneer an integrated energy and ecosystems-based approach to grid-based hydroelectric electricity generation in the country via four interrelated components: 1) development of an appropriate regulatory framework; 2) catalytic de-risking instruments for investors; 3) sustainable land and forest management at the watershed level; and 4) dissemination of project experience and best practices. It will focus on mini/small hydropower development to substitute for the electricity generated from diesel power stations that burn imported fuel and to provide additional capacity to enable EMAE to meet the needs of the approx. 50% of the population who has no access to electricity services. This is proposed to be achieved through the participation of the private sector.

In order to ensure the long term functioning of the hydro-electricity production in STP and thus to secure the investment of the private sector, the development of this new hydropower potential must be integrated with an approach to land-use planning and sustainable land and forestry management practices. The country's water resources are threatened due to ecosystems degradation (land conversion for agriculture, deforestation, forests degradation, erosion, bushfires, unsustainable agricultural practices), exacerbated by droughts caused by climate change. The project will achieve this sustainable land and forest management through the establishment of Integrated Watershed Management Plans (IWMP), which states suitable strategy for ecosystems conservation and local communities' development. It will include reference studies and assessment of the watershed and the dwelling population, capacity building plans for the communities' leaders and for the farmers, the identification and management plan of Community Forest, the dissemination of new techniques of conservation farming and large-scale forests rehabilitation.

The project will also establish a Financial Support Mechanism (FSM) with the Central Bank to support private investors in case of default of payments due to them from EMAE for electrical energy already supplied. Disbursements from the FSM, whenever required, will be made according to the criteria developed during project implementation. The FSM will also have a Community Trust (CT) component to sustain the funding of the sustainable land and forest management upstream. This CT will be funded by IPPs re-investment from their energy proceeds. Disbursements from the CT will take place each year to finance concrete micro-projects proposed by communities.

The Ministry of Public Works, Infrastructure, Natural Resources and Environment (MPWINRE), as the Government Agency directly responsible for mini/small hydropower development, will be entrusted with implementation of the present project. In doing so, it will work very closely with MAFRD to ensure that the watershed feeding the rivers is preserved and protected.

During the PPG phase, preparation activities faced a severe lack of data and/or adequate studies. In this regard, the project will, during its initial stages of implementation, conduct a large consultation with key stakeholders in view to agree on undertaking the necessary studies to fill in the blanks.

The project consists of four components as outlined below. It is recognised that on-the-job training will be provided by the recruited consultants, both local and international, during the normal course of their support to the relevant project activities and a communication strategy formulated to inform stakeholders on project implementation. This will be in addition to Components 2 and 4 that, respectively, deal with capacity development on financial and technical issues required by key Government and Financial institutions. Moreover, the project will seek to achieve gender equality through the empowerment of women to fully participate in all project activities and specifically those related to capacity development under the various components. This will be achieved through working, for example, with NGOs like FENAPA, MARAPA, NAPAD, etc.

Outcome 1: To formulate and introduce a streamlined and comprehensive policy and legal/regulatory framework for private sector investment in on-grid/isolated-grid mini/small hydro electricity generation and for integrated watershed management.

The expected outputs under this component are:

- Streamlined policy and legal/regulatory framework for private sector electricity generation established and operationalised. In the absence of a National Energy Policy, the project will review the Government's latest development plan entitled "Grandes Opções do Plano para 2014" of October 2013 to determine the issues that act as barriers to the private sector playing a role in electricity generation from hydropower in the country. Following this, the project will develop a policy document outlining the remedial measures that are necessary and propose a legal/regulatory framework that will guide private sector investment in hydropower. The project will then seek the Government's approval to operationalise this whole set of documents.

The Project will build an appropriate policy and legal framework for participatory Integrated watershed planning and management with an overall vision for management and use of lands, incorporating community based sustainable natural resource management, agricultural production, livestock breeding, ecotourism and renewable energy production. More specifically, the global benefits concerned under this output pertain to policy and legal barriers to land use planning, natural resources co-management and community-based forestry.

Activities will be (see details in the UNDP PRODOC): (i) update and validate the Forestry Management Master Plan, (ii) Design legal texts for Community-based Forest Management development and for SLFM, (iii) Finalize, validate and promote an Integrated Water Resource Management Law, (iv) Develop a generic framework for the Integrated Watershed Management Plan (IWMP) and establish specific IWMPs for potential hydro-production sites, (v) Produce specific environmental safeguards framework for the hydropower site installation.

- Technical report on grid capacity requirements to enable system stability feed-in for grid-connected mini-hydro systems followed by development of an updated grid code. This report will define the parameters that the hydropower stations connected to the grid/mini-grid have to meet to ensure safe, secure and proper functioning (stability) of the system, whenever they get connected/disconnected either due to operational requirements or in cases of electro-mechanical faults. Should it be required, the project will undertake any additional studies to clarify pending issues in relation to the sites to be developed.
- Established procedures and standardized PPAs for the introduction of a transparent procurement process in the selection/award of hydro sites to private developers. Procedures and regulations will be developed regarding a transparent and competitive process on how sites will be awarded to developers and a standardised PPA will be formulated for use for sale of energy contracts between the developer and EMAE.
- One-stop shop set up within EMAE for issuance of construction licenses and permits to developers. At the present time, a one-stop-shop staffed by legal staff exists under the Ministry of Justice. However, its functions are limited to reviewing the legal constitution of companies prior to registering them and issuing a license for operation. The one-stop-shop will be the custodian of all information that a potential developer will need prior to making an application, all applications forms and required documentation that need to be

submitted in support of an application, any fees to be paid, advise developers if any additional documentation is required and provide a final decision on the outcome of an application. This will obviate the need for the developer to personally visit several Government offices for necessary clearances and speed up the approval process.

- Standard environmental methodology developed for evaluating hydropower projects and financial evaluation methodology for calculating small hydropower tariffs to be paid to IPPs. This will take into consideration the benefit-sharing scheme based on the additional water flow that the SFM will bring. Criteria and guidelines will be formulated for technical evaluation of projects and an excel programme will be developed to undertake economic and financial analyses, and to determine feed-in tariffs that would be the subject of discussions with developers.
- Capacity developed within EMAE, local banks and key national actors such as the Ministry of Public Works, Infrastructure, Natural Resources and Environment to appraise mini/small-hydro projects for PPAs and lending. Training will be provided to the local stakeholders on how to utilise the criteria and guidelines developed under the project to technically appraise projects, determine the appropriate feed-in tariff to be allocated to a given developer and the guidelines that local banks may wish to follow in appraising projects for lending.
- Increased national and local capacity to coordinate institutions for inter-sectoral SLM approach and to implement integrated resources management at the watershed level.

Because the IWMPs will function as a spatial framework for long term land planning and management policy, it is needed to develop inter-sectoral collaboration at the national level between the main governmental directories, but also at the local level with the districts and the communities. The project will support capacity development of MAFRD, MPWINRE, Camara and Community leaders through all aspects of the implementation of the SLFM at the integrated watershed level. In particular, local agents of the MAFRD will be trained for forests surveillance, data collection and also forest law dissemination at the local level. This will include the development of working relationships between the Ministries relevant to land uses, natural resource and energy production. A coordinated inter-sectoral database for SLFM will be developed.

Activities will be (see details in the UNDP PRODOC): (i) support the inter-sectoral work among government departments and streamline the inter-sectoral National Environmental Commission and the National Coordination Committee on SLFM, (ii) Increase the capacities of the local agents of the MAFRD for forests surveillance, data collection, forest co-management and inventories, but also on self defense techniques, (iii) Dissemination of the forest law among the stakeholders at local level, (iv) Develop a coordinated inter-sectoral database for sustainable lands and forests management at the watershed level.

<p>Outcome 2: To promote investment in mini/small-hydro through appropriate catalytic financial incentives for project investors.</p>
--

The expected outputs are:

- Financial Support Mechanism (FSM) established and capitalized to support private investment in grid connected mini/small-hydro to EMAE. This will include, among others, drafting the general rules and regulations establishing the FSM, seeking any approval that is required by Government authorities for its establishment and outlining the process to be followed to solicit other donors to further capitalise the FSM.
- MOU signed with Central Bank of Sao Tome and Principe setting out the objective, funding mechanism and administration rules governing the FSM. The MOU will outline the responsibilities of the Ministry of Finance and UNDP as joint managers of the FSM, of the Central Bank as the custodian of the funds and spell out the conditions that need to be met for disbursement of funds to project developers under the FSM.
- Incentives to be provided to project developers developed and operationalised. These will include: reduction/elimination of import duties/taxes on equipment and spare parts, income tax holiday for a specific duration, simplification of foreign exchange regulations, simplifying EIA procedures for mini/small hydropower, building or participating in building access roads to SHP sites ear-marked for development. All these will be operationalised by MPWINRE in consultation with other Government Departments.
- Documents confirming financial closure with identified investors. Following a transparent and competitive process, hydropower sites will be awarded to potential developers under a concessional agreement for a

period of 25 years and will include a renewable clause. Construction and operation of the power station will be solely the responsibility of the developer for supply of electricity to the EMAE grid/mini-grid under the PPA. The agreement will also specify procedures to be followed in case the concession for operation is not renewed after the initial 25-year period and at the end of any renewal term.

- Installed capacity of a minimum of 4 MW (in fact, the installed capacity will be 5.51 MW) of on-grid/isolated-grid generation from mini/small-hydro IPPs commissioned at various sites by end of project.

During the course of the scheduled project mid-term review, an assessment of the FSM will be undertaken to ensure that it is performing as planned, including its gradual decrease and eventual phase-out over time. The mid-term review will also ascertain the level of support, if any, that future project developers may require beyond completion of the project, while capitalising on the momentum that it has generated.

Outcome 3: Integrated land use, sustainable forest management and natural resource management provide social benefits and sustain environmental services at the watershed level.

Under Component 3, stakeholders to the watershed will manage the natural resources according to the Integrated Watershed Management Plan (Output 1.1). In particular, the project communities will manage their Community Forests and implement sustainable agricultural practices, to provide multiple services and benefits, including water flows supply, lands and biodiversity conservation. Alternative income-generation projects will include new ecotourism initiatives and production and marketing support to sustainable harvests of natural resources. Water flows monitoring within the watershed will provide information for measuring the success of SLFM efforts and for designing an innovative mechanisms for ecosystems services maintenance. The key lands conservation & SFM outcome under this component of the project will include management for conservation and sustainable use by communities of 23,000 hectares of lands. This global objective has been determined during the PPG with the MARP and includes 10,000 hectares of lands managed with conservation agriculture practices, 6,000 hectares of forest managed with community based approach (CF) and 7,000 hectares of forests rehabilitation. These sustainably managed lands are representative of several globally important and rich eco-geographical zones of STP. In addition, the wider landscape within IWMP's territory will also be managed for productive uses in a more sustainable way aiming equally at improving livelihoods. Key associated climate change mitigate benefits under this component includes avoidance of ~688,500 t CO₂ emissions over 30 years through SFM, forest restoration and avoided land degradation. The expected outputs are:

- Each specific IWMP includes a water & carbon monitoring scheme which provides information on carbon stocks and on the water flows upstream of the hydroelectricity production.

During the PPG, major gaps have been highlighted for official environmental data in STP. For example, the FRA 2010 lacks much information about carbon stocks in the forests of the country. In sites where sustainable exploitation of resources is a management objective (e.g. harvest of medicinal plants, apiculture) in secondary forests, baseline surveys will establish the extent of the resource to be exploited, acceptable limits for exploitation and means of measurement of the resource. Participative mapping and GIS maps will be designed as part of activities under output 3.2. This Monitoring Scheme will use the data collected during project activities, and establish baseline values and regular monitoring of simple indicators. A community-based carbon stock & water flow monitoring scheme will be developed through an initial consultancy and participatory involvement of all the watershed stakeholders (village committees, ecoguards and ecoguides, local agents of DF and CADR). The scheme will use appropriate methods and technologies (e.g. easily observed or measured indicator, mobile phones) to allow local site staff (ecoguards and agents) and villagers to carry out regular surveys and report results to a centrally coordinated scheme. The scheme will start by establishing baselines for water resources within all watersheds. Specific objectives, indicators and targets will be developed for each site (related to lands management objectives and the sustainable hydroelectricity production). Wherever possible, monitoring will be carried out in collaboration with existing schemes (e.g. biodiversity monitoring with PAPAFA) or other monitoring programmes and in collaboration with MAFRD agents in adjacent Obo National Park.

Terms of Reference for the development of the Water & Carbon Monitoring Scheme are attached at Annex 4 of the UNDP PRODOC.

- Integrated managed lands in watersheds include at least 6,000 ha of Community Forests managed effectively for sustainable resource conservation.

The project will introduce the Community Forests (CFs) concept in the country (at least over 6,000 ha). As this community based approach of natural resource management is new in the country, an appropriate legal text and framework will be drafted by a consultant and validated by the government. Management rights and responsibilities are transferred from the administration (MAFRD) to the communities. Land will be still State's owned, but management rights will be transferred under a contract. The CFs are managed by and for the benefit of communities, with advice from MAFRD and local authorities (namely the "Camara").

An initial mapping of the project zones will be carried out by a team of local experts. A detailed assessment for each area will include: a clear delimitation of the upstream forests, identification of the biodiversity and the ecosystems services, identification of the uses and the users and the stakeholders to the natural resources (forest dweller communities but also private sector, civil society, institutions and decision-makers), and an assessment of potential income generating activities. The data collected will support the design of participatory management plans. As a constitutive part of the IWMP, the CF management plans will be developed for each forest with operational guidance for sustainable forest management. They will include (i) the situation description (reference assessment), (ii) the measures required to conserve lands and to sustainably manage natural resource, (iii) the responsibilities of each stakeholders, (iv) a detailed workplan and budget. Each plan will be validated by stakeholders during meetings, before its official approval by authorities. Together with this process, a co-management convention will be negotiated at the local level, and agreed upon and signed by each local authority ("Camara") and Community Committee to clarify roles, responsibilities and benefits in relation to management of the forests.

Community Forests establishment also includes organisational support and capacity building for communities. A committee will be established in each village in order to manage the forest. It will be formed by community leaders during the development of the participatory plans. The committee will benefit from a learning and capacity building process including environmental, development, organizational and economic topics. It is expected that each community leader will act as a multiplier of knowledge within his own community, disseminating the principles for the sustainable management of productive landscapes and the maintenance of the ecosystems services in each watershed.

- New methods and techniques of agroforestry (conservation farming practices) reduce lands degradation in watershed on over 10,000 ha.

Extensive and poorly managed and regulated agriculture is a barrier to the achievement of all other land and water management functions and objectives in the Integrated Watershed model.

This output will support the introduction of Sustainable Agricultural Land Management (SALM) practices among the farmers through a capacity building process including pilot land plots, training, technical assistance to the farmers and investments for the adoption and dissemination of sustainable farming techniques.

During the PPG, the MAFRD expressed the need for capacities building in SALM techniques. With the support of an international expertise, a training programme will be organized for at least 4,000 farmers in SALM practices for reducing soil erosion. The training plan will be developed in collaboration with the CIAT, farmer's organisation and the international expertise. It will go into depth the efficient SALM techniques adapted in the context of each watershed: (i) Agronomic practices (crop rotation, cover crops and green manure), (ii) soil fertility management (mulching, improved fallows and composting), (iii) water management (river bank protection) and (iv) mechanical land management (terraces, stone lines and anti-erosion small dams). The learning cycle will be sustain by monitoring in the field both by local agent of the MAFRD and by a local NGO that will be also trained by the international expertise.

The learning cycle in agroecology seeks to improve the capacity of participants to promote agroecological practices, by reinforcing both their knowledge (technical aspect) and their skills (methodological aspect). It will consist of both theoretical and practical sessions, in planetary and working groups' sessions. Efforts

will be made to organize participative and dynamic training sessions. Very comprehensive documents (with illustration and simple texts) will be given to the participants for dissemination in the communities.

Pilot demonstrative land plots will be established for two purposes: (i) organising practical training in the field and (ii) producing scientific knowledge for capitalisation on SALM techniques in the country.

Based on first results of these pilot plots, investments for material and equipment for the implementation of soil management techniques on a large scale will be done on plots of groups of farmers. Criteria for selection of farmers will include: motivation to take a leadership role in the process of dissemination of SALM techniques in his community, availability of time, geographic and social representation, focus on the weakest segments of the population (women, unemployed groups).

Trainings on good cultivation techniques will raise average yields compared to current level (e.g. for the main crop, maize, average yield is about 2 tons per hectare – International Cooperation and Development Fund ICDF). This is expected to increase revenues of farmers from main crops. The increase of yield for crops under SALM will be measure through field survey and reported to the Monitoring Scheme & watershed database.

- Watershed lands function to provide resources, alternative incomes and sustainable environmental services. At least 7,000 ha of forests are rehabilitated.

In order to reduce pressure on the natural resources, activities will be developed in communities to meet their needs for food, wood and other natural resources, harvested sustainably, and to provide alternative income-generation. Large-scale reforestation will be performed, both in savannah areas (Rio D'Ouro watershed) and in shade forests (trees plantation in cocoa agroforestry systems). The Center of Research on Agronomy and Technology Main (CIAT) and private sector involved in the cocoa/coffee value chains will be involved in the reforestation operations. Trees species that will planted are: *Cadrella odorata*, *Acacia* (*Albizzia moluca*), Gogô (*Carapa procera*), fruteira (*Artocarpus comunis*), jaqueira (*Artocarpus intiger*), and also erythina and cocoa (CIAT has high productive variety that meet the needs of the farmers and the processors). Nurseries will also produce endangered species such as *Milicia excelsa*, *Carapa procera*, *Fagara macrophylla*, *Manilkara multinervis*. Indigenous species will be produced in nurseries in close collaboration with CIAT.

Income-generating activities include (i) new agricultural products such as mushrooms, apiculture, medicinal plants and vanilla/spices grown on cocoa trees, (ii) non timber forest products, (iii) production of organic compost, (iv) eco-tourism.

The project proposes to organise the implementation of these income-generating activities around the Ecological Perimeters (EP) concept. EPs are established on about 2 to 5 hectares in each community and provide food (vegetables, fruits), wood (fuel wood and other purposes), non-wood products, fruits, medicinal plants, vegetables and orchards, mushrooms production, water supply, saplings for replanting degraded CFs, fishes in basins, etc. A pilot experimentation of aquaculture in the watershed will be performed and recommendations for dissemination will be formulated in case of promising results.

- A financial mechanism for re-investment of energy proceeds into community lands conservation is established and implemented.

During stakeholders meetings hold locally in the watershed, the Project will support the emergence of a common vision and common challenges between users of the natural resource (in particular water). Through a participatory approach, rules for water utilization will be defined, as well as the application of the « remover pays ». Thus a financial mechanism will be designed in order to sustainably finance part of the Community-based Forest Management. This mechanism will be based on the water flow regulation provided by SLFM in the watershed.

A financial mechanism will be set up by the project in order to sustain the Intergrated Management of the Watershed (outputs 3.4 and 3.5). This mechanism will be based on Payment for Environmental Services (PES) – payment from the IPPs based on sharing benefit scheme of the energy proceeds. A Community Trust (CT) is fuelled by IPPs and will finance every year micro-projects which contribute to sustainable

land and forest management in the watershed. The full mechanism is described below in the paragraph Financing Support Mechanism (part I).

The PES scheme must include a monitoring system which (i) assesses the link between sustainable activities implemented in the upstream lands and the environmental services (namely water flows and quality) and (ii) measure the maintenance or improvement of water availability in the watershed. There is thus an obvious need for: (i) qualitative and quantitative data on the water resource in each watershed, (ii) an information tool where such information and data on water resource (but also on land use, forestry and agriculture data) can be fed, and that can be available to all concerned stakeholders (communities, IPPs, agribusiness, scientists, agribusiness, NGO, decision-makers, etc.). This water monitoring scheme will provide information on the water flows upstream the hydropower installation, and it is expected that it will support the water users to progressively include to the CTs mechanism more criteria based on additional water flow that the SLFM will bring. In a second step, the CT mechanism will be presented and discussed with the downstream water users (such as water used for irrigation purposes) in order to enlarge the implementation of the mechanism with non-energy uses.

Outcome 4: To formulate an outreach programme and document/disseminate project experience/best practices/lessons learned for replication throughout the region/among SIDS countries.

The expected outputs are:

- Plan to implement outreach/promotional activities targeting domestic (and international) investors. This will include the preparation of promotional materials, briefing sessions with investors who are already active in the hydropower field in the country and, potentially, organising road shows to attract foreign investors.
- Capacity development of MPWINRE /EMAE and MAPRD to monitor and document project experience and data compiled. On-the-job training will be provided by international/local consultants to the stakeholders on how to monitor, record/document project experience.
- Published materials (including video) and informational meetings with stakeholders on project experience/best practices and lessons learned/website. These materials, in electronic form, will be widely disseminated throughout the region and among SIDS countries planning to implement similar activities.

Table 4: Potential Sites for Hydropower Development

No.	Site	River	Installed Capacity (MW)	Head (m)	Estimated Annual Generation (MWh)*
1	Cruz Grande	D'Ouro	0.88	100	3,461
2	Agustino Neto	D'Ouro	0.34	60	1,340
3	Almeirim	Agua Grande	0.44	50	1,731
4	Santa Luzia	Manuel Jorge	1.15	380	4,746
5	Santa Clara	Manuel Jorge	0.89	190	3,667
6	Mato Cana	Abade	2.0	60	5,599
7	Claudino Faro	Abade	2.0	100	5,348
8	Bombaim	Abade	4.0	280	9,685
9	Dona Eugénia	Ió Grande	9.6	80	30,448
10	Meteus Sampaio	Umbugu	0.5	28	1,519
11	Neves	Provoz	2.0	95	7,287
12	San João	Contador	0.9	200	1,382
13	Santa Irene	Lemba	3.0	100	9,229
14	Monte Verde	Xufexufe	0.80	60	2,935
15	Monte Rosa	Quija	3.75	260	10,427
16	Caldeiras	Carvao	0.02	50	100

Source: Etudes de la CECI Consultants, Inc., Taiwan, Déc. 2008.

*Hydropower capacity (kW or MW) is directly proportional to the Head (in metres) and flow rate (in m³/s), while the annual electricity production (kWh/MWh) depends on the available water supply, i.e. the flow rate. Hence, it is

normal to have somewhat similar installed capacities and heads with different amounts of energy produced on an annual basis because the flow rate is site-specific. As indicated earlier, the variance in river flows from river to river and depending on the dry season (June-August) and wet season can be substantial. These hydrological differences were taken into account by the CECI consultants in determining the annual electricity production at different sites.

During the 5-year project timeframe, it is expected, on the basis of discussions held with potential project developers that they would start implementation concurrently on Agustino Neto, Bombaim, Caldeiras and Santa Luzia, but because of the different volume of work required for each one of them, completion will be staggered. Rehabilitation of Augustino Neto (No. 2 in Table 4) can commence during the first year of activities and it should be completed within a period of 6 months; most of the civil engineering work is in place; only some rehabilitation of the civil engineering works and new turbine-generator units are required. Moreover, the EMAE grid is already available there for connection. Regarding Bombaim (No. 8 in Table 4), project developers would likely need to re-validate the existing design documents and infrastructure before proceeding with the construction of the remaining components. As indicated above, Hidroelectrica, which was later purchased by Soares da Costa of Portugal, commenced construction on some components of the Bombaim power station in 2008, viz. it installed 1 km of pressure conduit (out of a required 1.8 km) and partially built and strung the 12 km, 30 KV line from Bombaim to Agua Ize to connect the power station to the existing EMAE grid. For Caldeiras (No. 16 in Table 4 above), a 1.5 km diversion canal from Rio Carvao and a pondage basin were built in 2012, and because of its small size of only 20 kW, the existing technical design documents can likely be used for construction without much updating. Finally, the power station at Santa Luzia (No. 4 in Table 4) would be targeted. Thus, the total hydropower capacity to be added during the project timeframe would amount to 5.51 MW, slightly above the minimum of 4 MW, as envisioned in the PIF. Of course, it is hoped that the favourable investment environment that would have been created by the project would act as a magnet vis-à-vis other project developers to unlock the potential of additional capacity that can be built to supply the EMAE grid, both within the project timeframe and beyond.

Some of the SLM activities will be piloted over a much larger geographic area than just the hydro sites since the SLM/SFM components seek to alleviate pressures on natural resources from competing land uses and hydro energy development across a broad portion of the country's inland watersheds and this necessitates taking a landscape approach. Then, during the PPG process, 7 priority watersheds where 58 communities lived have been selected for project activities implementation: Rio D'Ouro, Rio Abade and Rio Manuel Jorge, Rio Papagaio, Rio Contador, Rio Lemba, Rio Io Grande.

A.5 INCREMENTAL/ADDITIONAL COST REASONING

There is limited experience in Sao Tome and Principe with mini/small hydropower stations for electricity generation. Currently, there are only 3 hydropower stations in STP: 1 is operational and 2 have been out of service for many years. Only the 1,920 kW Contador power station built in 1967 by EMAE is still operational. However, the 320-kW hydropower station at Guegue that was built in 1994 by the Government on River Manuel Jorge, but operated by the private sector (Hidroelectrica/Soares da Costa) under a concession agreement, has been out of service since early 2012 and requires a new turbine-generator set. In addition, the Papagayo hydropower power station on Principe Island was built in 1994 under technical cooperation by the Portuguese Government and had a capacity of 400 kW. Within a couple of weeks, it was realised that the water volume was too little to operate a 400 kW hydropower station. It was then downgraded to 80 kW with the installation of a new unit and given for operation to Hidroelectrica/Soares da Costa, again under a concession agreement. However, after about only a few weeks of operation, its transformer was removed by EMAE to be relocated at a diesel power station on Principe Island. Since then, Papagayo has not been in operation.

The private sector has been reluctant to rehabilitate the 2 non-operational hydropower stations because of unclear legal/regulatory framework. In addition, for the same reason and as stated earlier, construction work on the 4 MW Bombaim power station had to stop.

The project is also designed to incorporate an integrated ecosystems-based approach within the development of hydroelectric electricity generation in the country. More specifically, it will remove barriers to an integrated approach to sustainable land use and natural resource management in rural areas of STP through the IWM model. In the baseline situation, the hydropower development programme in STP would be implemented with only technical

solutions for energy production without taking into account the land use changes, the water flow protection thanks to sustainable forest management. The environmental aspects of this programme, in particular its contribution to improved forests management and the sustainable land planning and management, would not be developed without the GEF funding.

Hence, GEF intervention is needed to remove the legal, regulatory and market barriers which hamper realization of the Government plans to harness the relatively abundant potential for mini/small hydropower development in STP and to sustainably manage land, forest and other natural resources such as water at the watershed level (upstream and downstream the hydropower plant). Some of the main barriers are:

- **Institutional**: The Ministry of Public Works, Infrastructure, Natural Resources and Environment is the central body responsible for formulating and implementing the Government's policy in the field of energy. In the specific area of electricity generation from renewable energy, at the end of 2013 the Ministry set up a Special Unit within EMAE that is tasked into looking for options to substantially increasing the country's reliance on renewable sources of energy, including hydropower, for electricity generation. This Special Unit, presently manned by 2 persons, is entrusted with formulating plans and programmes for the development and utilisation of hydropower for electricity generation. The institutional barriers that the project will specifically address relate to (i) supporting the Special Unit in terms of staffing, ToRs, capacity development required, (ii) likewise, for the one-stop-shop to facilitate the issuance of licenses and permits for hydropower development. The various governmental entities are acting in a dispersed and uncoordinated manner, as regards the land use planning, natural resources (such as water) protection for hydro-electricity production. The lack of cooperation and governance framework does not slow down the degradation of land and forest sufficiently on a national scale. For instance, the National Coordination Committee on SLM is not effective and haven't bring any concrete results yet. Lands and natural resources continue to be used non-sustainably. The institutional barriers that the project will specifically address relate to (i) supporting the inter-sectoral work among government departments, including the development of a coordinated inter-sectoral database for sustainable lands and forests management at the watershed level (ii) supporting the capacities of the local agents of the MAFRD working on transversal issues at the watershed level.
- **Regulatory**: Even though the need to create a favourable legal framework for mini/small hydropower stations for electricity generation is implicit in the Government's Plan for 2014 to "increase supply to the national grid, both in terms of quantity and quality (of energy) to meet the demand from consumers", respective by-laws and regulations to implement them are lacking. These relate to, for example, the allocation of long-term lease of land to project developers to construct hydropower stations, right of way for pressure intake, surge tank, spillway and distribution lines, license to divert river water flow over short distances to accommodate run-of-the-river power stations, incentives to be provided to project developers in terms of taxes on imported equipment and supplies, etc. In addition, the project will look into whether the present regulation limiting IPPs to selling electricity exclusively to the EMAE grid does not serve as a deterrent to the private sector wanting to develop a site and construct a mini-grid to supply communities remote from the EMAE grid.

At national level, legal codes and texts relating to forest conservation and natural resource management do not include yet the involvement of local communities and co-management principle, although it has been suggested by the COMIFAC and by the Forestry Management Master Plan draft (2002). There is a need to establish and implement a co-management policy as well as integrated water resource management. A key tool developed during the project, the Integrated Watershed Management Plan (IWMP), will support the implementation of this legal framework by giving a global vision of land uses to all stakeholders at the watershed level.

- **Financial**: Discussions held during implementation of the PPG with private sector investors indicated that they consider the issue of payment guarantee for electricity supplied to EMAE as a major bottleneck to venturing into business opportunities in mini/small hydropower development. Hence, before making any investment, they would like to see a payment guarantee scheme in place. This presents the project with a great opportunity to support both the Government and the private sector to enter into a win-win situation by having, on the one hand, a payment guarantee modality that will provide confidence to the investors and, on the other hand, enable the Government to secure confirmed interest from developers to generate electricity from hydropower, thus reducing the country's expenditures on imported fuel. The project will establish a Financial Support Mechanism

that will consist of \$ 1.2 million from GEF and UNDP that will be available to support private investors in case of non-payment by EMAE. These funds will be “hosted” at the Central Bank and will be managed jointly by the Ministry of Finance and UNDP.

The Ministry of Agriculture, Fisheries and Rural Development (MAFRD) is largely dependent of external funding to implement its sustainable resources management policy, and thus the farmers are involved only on a “short term dynamic” (for the duration of a project). Within the Integrated Watershed Management approach, a benefit sharing scheme will be establish through a participatory approach involving hydropower investors, government and local communities in charge of forest co-management. A Community Trust, financed through the benefit-sharing scheme, will be established at the watershed level. It will be fuelled by the IPPs proceeds (output 1.5) based on results achieved by the community such as number of hectare under SLFM and water flow regulation (output 3.4).

- **Technical:** The lack of an integrated response to land and forest degradation contributes to a reduction in the overall effectiveness of hydro-electricity production, as the CECI Consultants (Taiwan) report indicates an average plant load factor of only 33%. The variance in river flows, due to ecosystems degradation, can be substantial and exacerbated by the climate change. The lack of a global vision on the part of stakeholders means that anthropic pressures on natural resources, in particular forests, will continue to degrade these resources, releasing GHG. Communities are not sufficiently involved in the management of their land and are not adapting their unsustainable practices in a systematic way. Communities need simple, repeatable survey and monitoring methods to obtain baseline information and to monitor trends in water and other natural resources to ensure that community management achieves conservation objectives and that natural resource exploitation is carried out sustainably. Adaptive management requires this information to allow for changes in management if conservation or other objectives are not being met.
The project will remove the technical barriers to allow the communities to become the first stakeholders of sustainable development. They will be trained in new agricultural practices that respect the environment, in co-management of forest.
- **Economical:** Poverty, tradition and lack of alternatives drive communities and individuals to continue to carry out unsustainable practices of resource exploitation both legal and illegal (e.g. charcoal production from the protected area Praia das Conchas). The lack of jobs and alternative options for income generation drive the rural exodus. During village interviews at the PPG stage, all communities expressed the need for social and economical benefits in villages (health, income-generating activities and employment) as well as improved natural resource management. Examples of alternative income-generating activities (IGAs) exist in rural villages in STP but these are limited and usually initiated under the umbrella of donor-funded development projects. The project will develop sustainable community activities with linked social/financial and environmental benefits. This approach will be based in the framework of IWMP in order to be widely replicated as part of the model.
- **Promotion/Outreach:** In the absence of sufficient experience with private sector-implemented mini/small hydropower electricity generation, there is evidently a lack of information on in-country best practices and lessons learned. Once implementation has started, this situation will be remedied through the compilation and publication of project experience and best practices in electronic form.

A summary of the barriers and the strategy for addressing them are presented in Table 5 below.

Table 5: Summary of barriers and mitigation strategies

Barrier	Present Situation	Strategy for addressing barrier
Institutional	Insufficient human resource capacity to perform effectively.	Outcome 1: Formulate and implement capacity development programme to strengthen institutions and address specific barriers.
	Lack of cooperation and governance for effective SLFM.	Outcome 1: Support to coordinate institutions for inter-sectoral SLM approach.

Regulatory	<p>Absence of consolidated set of regulations governing mini/small hydropower stations for electricity generation.</p> <p>Absence of transparent procedures for selection of project sites.</p> <p>Absence of adequate policy and legal instruments relating to land use and community management of natural resources in watersheds.</p>	<p>Outcome 1: Develop a set of regulations related to mini/small hydropower stations for electricity generation.</p> <p>Outcome 1: Design and implement transparent procedures for selection of project sites.</p> <p>Outcome 1: Establish and implement an appropriate policy and regulatory framework for integrated watershed management.</p>
Financial	<p>Absence of a Financial Support Mechanism (FSM) to jumpstart projects.</p> <p>Absence of benefit-sharing scheme to sustainably finance forest management.</p>	<p>Outcome 2: Establish FSM within Central Bank.</p> <p>Outcomes 3: Establish and implement a benefit-sharing scheme between IPPs and communities for maintenance of ecosystems services through sustainable forest management.</p>
Technical	<p>Absence of sustainable land and forest management practices among the communities.</p> <p>Absence of a proper assessment, monitoring and planning regime for the maintenance of ecosystem services in watershed.</p>	<p>Outcome 3: Promote SLFM practices within the watershed dwelling communities.</p> <p>Outcome 3: Establish a water monitoring scheme in the watershed.</p>
Economical	<p>Absence of alternative incomes in the communities.</p>	<p>Outcome 3: Implement alternative income generating activities.</p>
Promotion and Outreach	<p>Lack of promotional/outreach activities and absence of project experience/best practices.</p>	<p>Outcome 4: Implement outreach/promotional activities and document project experience.</p>

A.6 RISKS (including climate change, potential social and environmental risks that might prevent the project objectives from being achieved and measures that address these risks).

Table 6: Risks, Rating and Mitigation Approach

Risks	Rating	Mitigation Approach
Political: A sudden change in Government could lead to delays in enacting any new legislation and implementing policies.	Medium	Consultations with government stakeholders reveal that the project objectives and proposed interventions enjoy wide support from all political factions. The Government's "Second National Strategy to Reduce Poverty, 2012 – 2016", which focuses on making the economy more competitive by increasing investment in infrastructure (particularly energy), enjoys broad-based support and this bodes well for continued political support for the project's proposed interventions regardless of possible changes in government.

Institutional: Reluctance in some quarters of the Government to introduce the necessary policies/regulations in support of mini/small hydropower development.	Medium	The Government of Sao Tome and Principe is strongly motivated to increase and diversify its generation capacity through mini/small hydropower plants and is driven by its plans to increase access to electricity services to the population. Hence, it will ensure that all its associated Ministries/Departments get on board.
Flooding: Floods with watersheds can cause damages in reforested areas and to mini/small hydropower installations.	Low	This risk is caused by both localized and external factors (i.e. climate change) but in the short-term to the extent possible will be mitigated by using climate modelling data from the GEF-funded climate monitoring systems project as well as applying the proposed methodology developed for a joint environmental (including climate resilience), economic and financial evaluation for all hydro plants and data collected as part of the development of the watershed basin plans. Hydro sites and rehabilitation activities will not be selected in watersheds which are deemed to have inordinate exposure to flooding and procedures will be put in place as part of the watershed management plans to control water levels.
Rehabilitation of forests and defining no-development zones in the country's watersheds may encounter resistance from production sectors such as infrastructure, agriculture, and local communities.	Medium	The project will work towards developing capacity of local government officials and stakeholders in different sectors in developing integrated local land-use and development planning. The process will be done with the full participation of the stakeholders in government, non-government and the private sector, and including women, fostering understanding of the need for striking the right balance between development and safeguarding of ecosystems. The project will also make the economic case of sustainable land management versus the development of certain sectors in sensitive areas delivering critical ecosystem services. An effective communication strategy and stakeholder involvement plan will also be developed and implemented, for stakeholder support
Environmental/ Climate Change.	Medium	There are multiple environmental risks (e.g. a decrease in the watershed area due to a change in climatic conditions, forest fires and increasing temperatures, which may all lead to reduced water flows) which are potentially associated with hydropower development. This risk will be mitigated by paying special attention to implementing measures for sustainable forest management and a reduction in land degradation. These are integrated in the project in order to avoid any potential negative impact.
Environmental/Wild life	Low	The STP Government signed an agreement in 2013 with the Brazilian company Tecnic for the development of a 9.6 MW site at Dona Eugénia on Ió Grande. Birdlife International (an NGO registered in the UK) has made representation with both the Government and UNDP that the forests surrounding the site "support important populations of a number of Critically Endangered birds including the Dwarf Olive Ibis". BirdLife has further indicated that it "has been engaged in quiet advocacy, through engaging the government to stop the project, which is untenable if a serious EIA is carried out". UNDP understands BirdLife's concern and has made it very clear to the latter that it is not an advocacy group and that the sites it proposes to develop during the 5-year project timeframe do not include the proposed site the Government has allocated to Tecnic on Ió Grande.

Financial: Lack of commitment from private sector to invest in mini/small hydropower.	Medium	Several potential investors expressed their interest, during the implementation of the PPG, to invest in mini/small hydropower provided that a conducive and appropriate investment environment is created. As indicated under the FSM section above, in the view of project developers, mini/small hydropower development is fairly well-known among lending institutions throughout the world; hence, securing loans in the international finance market for investment in this area does not pose much of a problem. However, of real concern is the potential that they (the investors) may not get paid for the energy they supply to the EMAE grid. Therefore, it is of utmost importance that such a conducive investment environment be put in place.
Operational: Weak capacity of communities is a risk for all project activities proposed at local level – land use planning (IWMPs) and management, CF management, IGAs, wide-scale planting, etc.	Medium	Large part of project budget devoted to capacity development at communities level – stakeholder meetings, training, learning by doing through project implementation. Specific training activities will include ecotourism, water monitoring, land use planning and management, agroecology methods and conservation agriculture practices. The selection of pilot communities will allow thorough development of activities which are chosen by all stakeholders in villages and have strong technical and financial support to ensuring their effectiveness
Overall	Medium	

A.7 COORDINATION WITH OTHER RELEVANT GEF-FINANCED INITIATIVES

Under the Japan-funded Africa Adaptation Programme implemented by UNDP, a study was undertaken to construct a 20-kW run-of-the-river micro hydropower station at Caldeiras on Rio Carvao. In addition, 4 PV-operated street lights were installed. Caldeiras has a population of 300 inhabitants (50 houses) and is located some 4 km from the town of Agustino Neto where the EMAE grid stops. The site for installing the turbine-generator set of the micro hydropower station was selected, and a 1.5 km diversion canal and a pondage basin were built in 2012; however, the project ended before the power station could be built.

Under the same Africa Adaptation Programme implemented by UNDP, the town of Agua Sampaio (pop. of 700 inhabitants, 134 houses) was identified for 20 kW central PV station. Several PV-operated lights were installed, posts for the electricity distribution system were erected and the housing for the batteries, inverter and controller was partially built (the roof is missing). The PV panels have been ordered and are in storage in Sao Tome, awaiting completion of the recruitment process of a contractor to undertake installation.

UNDP is presently formulating a GEF-funded project entitled “Enhancing capacities of rural communities to pursue climate resilient livelihood options in the Sao Tome and Principe districts of Caué, Me-Zochi, Principe, Lemba, Cantagalo, and Lobata (CMPLCL)”. The objective of the project will be to strengthen the resilience of rural community livelihood options against climate change impacts in the targeted districts and will include management of water resources for small-scale irrigation.

In addition, UNDP is implementing, in cooperation with UNEP, an “Integrated Water Resources and Wastewater Management” that targets the Rio Provaz hydrographic basin. This project is funded by GEF and aims at developing a technically robust river basin management plan enabling equitable water resources allocation and protection to support sustainable economic development, public health and environmental protection.

Under the Participatory Smallholder Agriculture and Artisanal Fisheries Development Programme (PAPAFPA), a new component financed by GEF has been launched in 2013 with the objective to support communities in biodiversity conservation around the Ôbo National Park.

During implementation of the proposed project, UNDP will ensure that the various project partners periodically meet to share information on progress in project activities and to avoid any duplication. These meetings may be organised in conjunction with meetings of the Project Board.

Other non-GEF-related Initiatives

- The African Development Bank is implementing a programme covering the whole of Africa that encourages Governments to promote a transition to green energy. This programme targets small and medium enterprises and has put in place lines of credit that can be accessed by individual banks to make “green” loans. In STP, this line of credit is available with the EcoBank.
- The EU completed its 10th cycle under the European Fund for Development (EFD) in December 2013. For its 11th cycle over 2014 – 2020, EFD will target 2 specific areas: Agriculture, and Water and Sanitation. Activities under this programme deal with subsidies to project promoters and require counterpart financing.
- The project will establish links with the Cameroon-based non-profit ARPEDAC (Association pour la Recherche et la Promotion de l’Energie Durable en Afrique Centrale) to benefit from its experience on “affordable small scale off-grid electricity technologies supply and services” aimed at poverty reduction. It will also develop a working relationship with CEREECA (Centre of Excellence in Renewable Energy and Energy Efficiency in Central Africa) that focuses on “energy efficiency and renewable energy needs for the Central Africa sub-regions, new businesses and R&D opportunities, etc. as well as other initiatives being supported by the ARPEDAC.
- The Food Crops Development Project, supported by the Taiwanese cooperation, aims at achieving food safety in STP by promoting the production of maize, cassava, sweet potato, taro and soybean. The project supports the farmers in crop cultivation management, in seeds and seedlings production, in order to increase the food production and to improve the quality.
- SATOCAO is a private initiative, which aims at reviving the cacao production in STP. It will develop 2 main activities: (i) rehabilitation of 2,500 ha of old cacao plantations, (ii) support to cacao producers organisations. The objective of SATOCAO is to increase the cacao production from 1,500 T / year to 6,500 T / year.
- ECOFAC is an EU financed program with objective to preserve environmental quality and biological diversity. One of the main achievements has been the identification and legal establishment of protected areas and surrounding buffer zones for both islands. The ongoing ECOFAC 5 phase is focussed on supporting the civil society.

B. ADDITIONAL INFORMATION NOT ADDRESSED AT PIF STAGE:

B.1 Describe how the stakeholders will be engaged in project implementation.

The project will be implemented through the NEX execution modality by the Ministry of Public Works, Infrastructure, Natural Resources and Environment (MPWINRE). The Ministry will appoint a National Project Director who will assume overall responsibility for project implementation, ensure the delivery of project outputs and the judicious use of project resources. The National Project Director will be assisted by a Project Management Unit headed by a Project Manager (PM). The PM will be responsible for overall project coordination and implementation, consolidation of work plans and project papers, preparation of quarterly progress reports, reporting to the project supervisory bodies, and supervising the work of the project experts and other project staff. The PM will also closely coordinate project activities with relevant Government and other institutions and hold regular consultations with project stakeholders. A non-resident Technical Adviser (18 weeks/year) will be recruited to support the PM on technical issues, while a full-time Project Assistant (PA) will support him/her on administrative and financial matters. During the initial 6 months of project implementation, UNDP will re-evaluate the support

being provided by the non-resident Technical Adviser to determine whether the objectives and outputs of the project would be best served by having a full-time Technical Adviser on board. Furthermore, the need for additional staff for project implementation and supervision will be evaluated during the initial 6 months of the project.

National and international consultancy services will be called in for specific tasks under the various project Outcomes (components). These services, either of individual consultants or under sub-contacts with consulting companies, will be procured in accordance with applicable UNDP/GEF guidelines.

A Project Board, chaired by the Ministry of Public Works, Infrastructure, Natural Resources and Environment (MPWINRE) will be established to provide strategic directions and management guidance to project implementation. It will consist of representatives of the relevant ministries and Government departments, Ministry of Agriculture, Fisheries and Rural Development, Central Bank of Sao Tome and Principe, and EMAE) participating in the project, the Ministry of Finance, the UNDP Country Office, the National Project Director as well as representatives of the NGO community and women's groups (e.g. FENAPA, MARAPA, NAPAD, etc.). Representatives of the private sector may be invited to participate as observers.

Finally, the UNDP CO will provide specific support services for proper project implementation, as required, through its Administrative, Programme and Finance Units and through support from Addis Ababa Regional Centre. Specific support services will include support for annual PIR review (project implementation review), mid-term review and final evaluation. Additional details on the proposed management arrangement – including an organogram representing the implementation arrangement – can be found in the “Management Arrangements” Section of the UNDP Project Document).

B.2 Describe the socioeconomic benefits to be delivered by the Project at the national and local levels, including consideration of gender dimensions, and how these will support the achievement of global benefits.

The project will bring about benefits at both local and national/global levels through reduced environmental and human health threats due to less burning of diesel, thus reducing negative environmental impacts. Some of the benefits on the long term are listed below:

- A reduction in imported fuel and, as a consequence, an improvement in the reliability of electricity services.
- Additional income-generating opportunities for the local economy through the creation of some 200 jobs for the operation and maintenance of the hydro power stations and at least 6,995 inhabitants from 58 communities will benefit from additional income-generating activities (IGAs), technical support in sustainable agriculture practices, community forestry management and water monitoring. Given the role of Sao Toméan women in the gathering of firewood and in the production, harvesting, and processing of agricultural products, it is obvious that women, together with youth, will significantly benefit from the project activities implementation.
- A rural development dynamic through support to farmers organizations will be encouraged at the local level through additional income-generating activities such as apiculture, vegetable gardening and, at an experimental level, aquaculture in the water tank of the hydropower plants.
- Less social conflicts due to divergent land uses in the watershed: as the project will clarify land use planning and management, situation of social conflicts (for example in Bombaim as analyzed during the PPG implementation) will decrease.
- Opportunities for the private sector in job creation in the repair and servicing of electro-mechanical equipment utilised in the hydropower sector. If required, the project will support local training institutions (e.g. Centre de formation professionnelle and Centre de formation polytechnique) to develop technical capacity required by project developers.
- Long-term savings of millions of dollars to the national economy through the use of a locally-available hydropower resources.

- The project will seek to achieve gender equality through the empowerment of women to fully participate in all project activities and specifically those related to capacity development under the various project components.
- Participation of civil society, through the involvement of NGOs, including women NGOs already mentioned above, and stakeholder consultations, in the decision-making process related to electricity services, watershed management and reduction in land degradation, and for information and awareness raising activities.

In addition, availability of electricity services in presently unserved locations will enable households, especially women, to improve their productivity in income-generating activities like dress/school uniform making using electrically powered sewing machines and provide opportunities to start small enterprises making and selling refrigerated exotic fruits drinks, mobile phone charging, video clubs, etc.

As Sao Toméan women have a major role in the gathering of firewood and in the production, harvesting, and processing of agricultural products, they will significantly benefit from the project activities implementation. For example, incomes generating activities such as vegetable gardening will be developed by women.

Besides, youth will also benefit from the IGAs promoted by the project. Thus, they will have the opportunity to stay in their village to develop economic activities.

B.3 Explain how cost-effectiveness is reflected in the project design.

As indicated under the heading “The Economics of Electricity Generation from Mini/Small Hydropower in Sao Tome and Principe” on page 15, for the 16 mini/small hydropower sites investigated by the CECI consultants, the levelised cost of electricity generation varies between 2 and 10 US Cents/kWh. Compared to this low cost of electricity generation from mini/small hydropower, the cost of thermal generation at the busbars of EMAE power stations was 23 US Cents/kWh in 2013. Furthermore, the cost of generation at the 1.92 MW Contador hydropower is estimated at 2 - 3 US Cents/kWh by EMAE. This demonstrates the cost-effectiveness of generating electricity from hydropower in the country, compared to the alternative of utilising imported diesel fuel for that purpose.

It is assumed that while start of construction on the 4 identified mini/small hydropower stations (Agustino Neto, Bombaim, Caldeiras and Santa Luzia) will be staggered, construction works will run concurrently; thus, there will be no need to await completion of one power station before work on the next one can start.

It is assumed that project activities will commence during the second half of 2015. Under this assumption, activities addressing the regulatory issues should be completed within that year, including PPAs signed with IPPs. Then, priority will be given to the power stations at Agustino Neto and Caldeiras in view of some existing infrastructure, thus necessitating smaller investments (CAPEX) for completion. Accordingly, the first power plant of 0.34 MW scheduled for reconstruction at Agustino Neto is expected to come on line 15 months after project initiation. This should not be too difficult to accomplish as most of the civil engineering work (intake, penstock, machine hall, and tailrace) is in place; only some rehabilitation of the civil engineering works and new turbine-generator units are required. Around the same time or even slightly sooner, the 20 kW Caldeiras power station should be operational - the required 1.5 km diversion canal from Rio Carvao and a pondage basin were built in 2012. Of the remaining 2, Bombaim (4 MW) should come on line September 2016 (existing installations include 1 km of pressure conduit (out of a required 1.8 km) and the partially built and strung 12 km, 30 KV line from Bombaim to Agua Ize to connect the power station to the existing EMAE grid) and Santa Luzia (1.15 MW) in January 2017. Hence, by mid-project implementation, all 4 mini/small hydropower plants would be fully operational.

As per the CECI Consultants (Taiwan) report mentioned earlier, the 4 hydropower plants are expected to annually generate 1,340 MWh for Agustino Neto, 9,685 MWh for Bombaim, 100 MWh for Caldeiras and 4,746 MWh for Santa Luzia, indicating an average plant load factor of 33% - a low figure related to the variance in river flow. Discussions held with the Ministry of Agriculture and Rural Development during the PPG indicate that with proper forest management, water availability in the various catchment areas can be substantially increased, resulting in almost a doubling of the plant load factor.

As per the construction completion schedule described above, electricity generation will be 4,308 MWh during Year 2 of the project and 15,871 MWh during Years 3, 4 and 5 of the project. The generation figure would likely be higher due to the increased availability of water resources resulting from sustainable forest and land management. Thus, by project completion, some 51,921 MWh would have been generated and an annual generation of 15,871 MWh will be sustained over an expected 25-year projected life of the equipment. All this hydro generation, if not implemented, would have otherwise been accomplished through thermal power stations burning imported diesel fuel, with an emission factor of 0.875 tCO₂/MWh (Ref. Second National Communication to UNFCCC). Consequently, during the 5-year project period, slightly over 45,400 tons of CO₂ would have been avoided as a direct result of hydropower electricity generation. Including SLFM activities, an additional 115,800 tons of CO₂ would be avoided, giving a total of 161,200 tons of avoided CO₂ or equivalent to \$ 32.7 of GEF funds per tCO₂ (\$11 when considering only CCM funds). Furthermore, these 4 mini/small hydropower plants and the associated sustainable forest and land management will continue avoiding 42,850 tons of CO₂ annually during their remaining 21-23 years of project life. When one looks at the 25 year lifetime of the hydropower stations earmarked for development during the 5-year project period, the power station would have generated 365,000 MWh, with a combined amount of CO₂ reduced of 1,018,200 (857,000 + 161,200) tons, including the CO₂ reduction related to sustainable land and forest management; this is equivalent to \$ 6 of GEF funds per tCO₂ (\$1.7 when considering only CCM funds).

Finally, under the assumption of a conducive environment for investment, the estimated total replication potential of mini/small hydropower plants in Sao Tome and Principe with the participation of private investors (40 MW, as estimated for development by the CECI Consultants over the next 10 years of “project influence”) is several times greater than what will be achieved during the five-year project implementation. Thus, the indirect post-project emission reduction estimates related to only the additional capacity amounting to 35 MW – on the basis of a conservative policy scenario and a GEF causality factor of 80% (top-down approach) -- can be estimated at 4,790,500 tons of CO₂ avoided, which translates into an abatement cost of \$ 1.1 of GEF funds per tCO₂ reduced (\$0.4 when considering only CCM funds). In the case of the bottom-up approach, with a replication factor of 4 (fully attainable in view of the good potential for investment in mini/small hydropower that exists and expressed donor interest), the indirect post-project emission avoided would be 3,685,000 tons of CO₂.

In addition to the good hydropower resources of the country for electricity generation to replace diesel fuel, the other potential sources in the country, again for electricity generation are:

1. LPG/CNG: These would definitely emit less GHG than diesel, but will have to be imported, thus doing little relief to the country’s foreign exchange resources.

2. Solar PV: As per the publication “Emission Reduction Profile: Sao Tome and Principe”, June 2013” prepared by RISO with the support of ACP-MEA & UNFCCC, there are, to date, “no official studies on the exact solar power potential: therefore, further calculations of the emissions reduction potential can be hazardous”. In addition, the country has very few cloudless days and this makes PV electricity generation for grid/off-grid supply a very unlikely proposition.

Biomass: The RISO report indicates that “Due to the sparse agricultural production in São Tomé and Príncipe, the potential for reducing emissions in the (agricultural waste) sector (is) very little and insignificant”. In addition, due to the small size of the country (1,000 sq. km) and hilly terrain, there is very little potential for embarking upon forest plantations to provide biomass, to either directly fuel boilers or through the gasification process, for grid/off-grid electricity generation.

Wind: The RISO report mentions that “The wind measurements in the country indicate that wind power development has relatively low potential” and there are “no estimates of the exact wind power potential”.

Finally, the RISO study concludes that, by far, the hydro is the only potential source for emission reduction, with an annual potential of 86,764 tCO₂.

In broad terms previous experiences across the GEF UNDP portfolio of projects show that working with local communities is generally cost effective because they are the direct beneficiaries of the project. The component 3 (LD and SFM) of the present project will operate in the watersheds that have been identified as very high potential for hydropower installation during the PPG phase. The underlying objective is to use present (ex:

SATOCOA) and future (ex: hydropower companies) private investor resources and experience as leverage and to expand the integrated watershed approach while bringing additional funding from GEF, UNDP and co-financers, as well as operational partnerships. This is clearly more cost-effective than starting from scratch.

Key global environmental benefits will be achieved through the project activities implementation of the component 3:

- Sustainable Agricultural Land Management (SALM) practices: At least 10,000 ha will shift from conventional practices to SALM practices (residue management, mulching, soil and water conservation techniques) under the project implementation. According to the World Bank¹⁶, these SALM practices allow the sequestration of 4 tons of eCO₂ / ha / year. Experience from the Kenyan Agroforestry Carbon Project show annual rate of sequestration equal to 2 tons of eCO₂ / ha in very similar ecological conditions (Kisumu area). Then, with a conservative approach, we consider that the adoption of the SALM practices in STP will allow a sequestration of 1.4 tons of eCO₂ / ha / year.
- Community-based Forestry Management (CFM): At least 6,000 ha of secondary forests will be co-managed with communities. According to the FAO and the WOCAT, CFM allow a reduction of 1.2 to 2 tons of eCO₂ / ha / year in long term. Other research programs¹⁷ states much larger sequestration results in the first years of CFM implementation. As a conservation approach, we consider that CFM implementation will allow of carbon savings of 1.2 tons of eCO₂ / ha / year.
- Reforestation: At least 1,000 ha of savannah and 7,000 ha of shade forests will be restored. Technically, it means a density of 100 trees per ha for plantation in savannah (old forest that have been cut for charcoal production). We consider that reforestation will allow a carbon sequestration of 0.25 t / ha / year. In shade forest, carbon stocks are much higher. Plantation density will range from 25 to 50 trees per ha for plantation. Cocoa in shade forests has a high sequestration rate (from 5,9 to 10 tCO₂ / ha / year). As consider rehabilitation of forest (i.e starting from a carbon stock in old and unproductive forest), a conservative approach will be used. We consider that reforestation will allow a carbon sequestration of 1.25 tCO₂ / ha / year.
- Reduction of GHG emissions: Given the potential market, the estimated average project/post-project annual generation from hydropower and sustainable forest/land management, substituting for diesel oil, (see para. B.3 below) over the next 25 years would be 15,871 MWh, with a GHG emission reduction of 32,000 tCO₂/year.

Table 7 below summarises the global environmental impacts, including direct and indirect total CO₂ emissions reduction, achieved during implementation of the project and beyond.

Table 7: Project Global environmental impacts (incl. GHG emission reduction)

GEF Investment Element	Total	Aprox. GEF investment per unit (\$)
Total CO ₂ emissions reduced (tons)	161,200 tCO ₂ up to the project completion + 857,000 tCO ₂ over the next 20 years = Total of 1,018,200 tCO ₂	\$ 5.2 / tCO ₂
Detail per component		
<u>Component 2 (CCM):</u> Expected emission reduction from only hydropower installations.	45,400 tCO ₂ up to the project completion. + 278,000 tCO ₂ over the next 20 years. = Total of 323,400 tCO ₂	
<u>Components 3 (LD & SFM impact on CCM):</u> Expected emissions reduction and sequestration from the Component 3	115,800 tCO ₂ up to the project completion + 579,000 tCO ₂ over the next 20 years = Total of 694,800 tCO ₂	

¹⁶ Tennigkeit and al, 2009, Agricultural Carbon Sequestration in Sub-Saharan Africa: Economics and Institutions. Washington DC: World Bank.

¹⁷ Skutsch and al, 2010, How much carbon does community forest management save? The results of K:TGAL's field measurements.

GEF Investment Element	Total	Aprox. GEF investment per unit (\$)
investment		
Other impact for component 3 (LD & SFLM)		
Target population at the community level	6,995 inhabitants	\$441 / villager
Hectares of restored agricultural lands (conservation farming practices), of CF, and of reforestation / forests rehabilitation	23,000 ha	\$134 / ha

During the PPG exercise, several considerations pertaining to the cost-effectiveness of the project strategy were analyzed. First of all, the project will ensure a cost effective approach to SLFM by working with communities, local leaders, local NGOs, and other key stakeholders which have a vested interest in the good stewardship of the proposed land conservation areas. Experiences across the UNDP/GEF portfolio show that partnerships with communities involved in the management of land and forest are generally a cost-effective approach. This is because surrounding communities depend to a certain extent, on the resources contained in forest for their livelihood and it is in their interest to adopt measures to improve the ecosystems' function and services.

Moreover, the project takes a multi-sectoral, integrated approach at the watershed scale. GEF funds will therefore support many sectors (natural resources, hydro energy, trees plantation, lands conservation, etc.) for one unit of population. Although it can be argued that an incremental investment of \$441/villager is average to high, this should be put into the perspective: such costs would normally be higher than those of a single-sector project.

The project will harness EMAE's capacity to meet the needs of the approx. 50% of the population that has no access to electricity services. Then the targets in the long-run, currently some 90,000 inhabitants, translates incremental costs into approximately \$56/villager.

Alternative approaches to pursue the conservation of the forest and natural resources in the watershed were analyzed during the PPG and found to be limited in scope, to carry a high economic cost and have a low probability of success. For example, the following possibilities exist: (i) direct monetary incentives or subsidies given to villagers to maintain lands and forests, (ii) investments in patrolling and policing forests and adoption of a strict command and control approach, (iii) incentives for Camara to take charge of forests within their jurisdiction, and (iv) turning over management of forests to special interest groups (medicinal plant collectors, hunters, fuel wood and charcoal producers) and community organizations. All of these options suffer from one or more of these basic weaknesses: (a) lack of technical, organizational and administrative capacity, (b) lack of credibility and thus authority vis-à-vis the community, and (c) lack of an integral or holistic vision which accounts for community participation, cultural traditions, established political and economic interests and the ecological need to maintain the forests, all at once.

C. DESCRIBE THE BUDGETED M & E PLAN:


Project monitoring and evaluation will be conducted in accordance with the established standard UNDP and GEF procedures. For further details, please see Section 5 (page 57) of the UNDP-GEF project document.

PART III: APPROVAL/ENDORSEMENT BY GEF OPERATIONAL FOCAL POINT AND GEF AGENCY

A. RECORD OF ENDORSEMENT OF GEF OPERATIONAL FOCAL POINT ON BEHALF OF THE GOVERNMENT

NAME	POSITION	MINISTRY	DATE (mm/dd/yyyy)
MR. LOURENCO MONTEIRO DE JESUS	GEF OPERATIONAL FOCAL POINT, DIRECTORATE OF THE ENVIRONMENT	MINISTRY OF PUBLIC WORKS, INFRASTRUCTURE, NATURAL RESOURCES AND ENVIRONMENT	FEBRUARY 18, 2013

B. GEF AGENCY(IES) CERTIFICATION

This request has been prepared in accordance with GEF policies and procedures and meets the GEF criteria for CEO Endorsement.					
Agency Coordinator, Agency name	Signature	Date (Month, day, year)	Project Contact Person	Telephone	Email Address
Adriana Dinu UNDP/GEF Executive Coordinator		May 26, 2015	Saliou Touré Regional Technical Advisor, EITT	+251 912 503 320	saliou.toure@undp.org

ANNEX A: PROJECT RESULTS FRAMEWORK

An abridged version of the logframe is provided below. However, a complete version can be found in Section 3, page 59 of the GEF-UNDP project document.

Objective/ Outcome	Indicator	End of Project target	Source of information
Objective - To assist the Government in addressing the barriers to significantly increase grid/isolated-grid-connected mini/small hydropower capacity and to sustainably manage the watershed.	1. Framework in place to enable the private sector to invest in grid/isolated-grid-based mini/small hydropower generation.	Hydro-electricity generation of 51,921 MWh, resulting in direct reduction of 137,200 tons of CO2 over the 5-year FSP project life cycle.	Project's annual reports, GHG monitoring and verification reports. Project Terminal Evaluation report.
	2. Hydro-electricity generation Reduction of CO2 over the 5-year FSP project life cycle. Subsequent generation of MWh/year and reduction of CO2 over the remaining lifetime of the plants.	Subsequent generation of 15,871 MWh/year and reduction of 874,200 tons of CO2 over the remaining lifetime of the plants. Estimated cumulative indirect GHG emission reduction of 4.8 million tons of CO2 by 2035 on the basis of a conservative policy scenario and a GEF causality factor of 80%.	Project's annual reports, GHG monitoring and verification reports. Project Terminal Evaluation report.
	3. Three (3) Integrated	At least 3 IWMPs for project sites	Project's yearly

Objective/ Outcome	Indicator	End of Project target	Source of information
	Watershed Management Plans (IWMPs) are adopted and 23,000 ha under SLFM.	have been successfully developed, adopted (endorsed) by communities and under implementation. 10,000 ha of lands under good management practices. 6,000 ha of secondary forest are under co-management. 7,000 ha of degraded forest are rehabilitated.	reports. Project site visits and evaluation for verification
Outcome 1 – Streamlined and comprehensive policy and legal/regulatory framework for private sector investment in on-grid/isolated-grid mini/small hydro electricity generation and for integrated watershed management.	4. Frameworks finalized and available for consultation by potential investors and by watershed stakeholders.	To be completed within 12 months of project initiation and approved by Government early in Year 2.	Published documents. Government decrees/laws.
Outcome 2 – Promotion of investment in mini/small-hydro through appropriate catalytic financial incentives for project investors.	5. Document outlining incentives drafted, approved and available to investors.	To be completed within 12 months of project initiation and applied by Government thereafter.	Project documentation.
Outcome 3 - Integrated land use, sustainable forest management and natural resource management provide social benefits and sustain environmental services at the watershed level.	9. Number of ha under SALM practices.	10,000 ha of lands under good management practices.	Project's yearly reports. Project site visits and evaluation for verification
	10. Carbon stock enhanced in the forests.	At least an enhancement of 144,000 tCO ₂ during the 20 years lifetime.	
	11. CO ₂ sequestration with trees plantation / forest rehabilitation.	At least 35,000 tCO ₂ sequestered during the 20 years lifetime.	
Outcome 4 - Outreach programme and dissemination of project experience/best practices/lessons learned for replication throughout the region/among SIDS countries.	12. Outreach programme formulated. Project experience compiled, analysed and disseminated.	Increased awareness among stakeholders in place to promote and develop the market for on-grid/isolated-grid mini/small-hydro.	Project final report and web site.

ANNEX B: RESPONSES TO PROJECT REVIEWS (from GEF Secretariat and GEF Agencies, and Responses to Comments from Council at work program inclusion and the Convention Secretariat and STAP at PIF)

RESPONSES TO COUNCIL RECOMMENDATIONS

Comment	Response	Comment
<p><i>Germany's Comments</i></p> <p><i>Germany approves the following PIF in the work program but asks that the following comments are taken into Account:</i></p> <p>Germany requests that the following requirements are taken into account during the design of the final project proposal:</p> <p>The proposed project addresses important challenges in the rural areas of Sao Tome and Principe, which are facing difficulties in energy supply.</p> <ul style="list-style-type: none"> • The current setup focusses on establishing proven technologies. However, with regard to the new technologies, especially the mini hydro technologies, a stronger capacity building component shall be considered in order to ensure local operation and maintenance. • The involvement of the private sector should be explored further. This could, for example, include exploring business schemes for the establishment of sustainable energy sources and of necessary grids and storage capacities. 	<p>The issue of local capacity development is addressed in Section B.2 of the RCE. During implementation of the PPG, discussions were held with Centre de Formation Professionnelle and Centre de Formation Polytechnique to support project developers with the technical capacity required during construction, operation and maintenance of the power stations.</p> <p>The private sector is keenly interested in having sustainable watershed management that will provide more rainfall and increase the capacity factor of the hydropower stations to supply the grid/mini-grids. With regard to storage, reference is likely being made to battery storage or hydro pumped-storage (hydrogen storage may not be presently appropriate in STP). These storage routes are used to store (cheap) electricity generated off-peak to be used during peak hours. They are both very expensive as batteries are required in the first case and there is a need for 2 reservoirs, one upstream and one downstream, in the second case. The mini/small hydropower stations proposed for development in STP are run-of- the-river type, not requiring any dams. Hydro pumped-storage</p>	

	requires water to be pumped upstream during off-peak hours and energy generated from that water during peak hours. In the case of STP, as hydro generation is way cheaper than generation using imported oil, all hydroelectricity will be fed into the grid to save on diesel fuel; thus hydro pumped-storage is not appropriate.	
--	--	--

RESPONSES TO STAP RECOMMENDATIONS

Comment	Response	Reference
<p>1. STAP acknowledges the receipt of this project proposal in Sao Tome and Principe that has a goal to introduce an integrated energy and ecosystem-based approach to grid-based hydroelectric electricity generation. The integrated approach is exercised through combination of the three project component, two of which focus on enabling environment for energy investment and one component focuses on mitigation of degradation of agro-systems and forest ecosystems.</p> <p>The project is "unusual" by combining resources of different focal areas to support integrated development of hydropower resources in Sao Tome and Principe. The related issues of biodiversity, land use, water and forest degradation are made clear and the link with reforestation is commendable. This integrated energy and ecosystem based approach to "pioneer a new paradigm for sustainable development of mini-hydroelectric plants in ecologically vulnerable landscapes in SIDS" makes good sense.</p> <p>Past hydropower GEF projects were designed to remove key market, policy, technical, and financial barriers to micro-hydro development and utilization, and complements the ongoing and</p>	<p>At the present time, just over 50% of the population has access to electricity services, with the bulk of generation (92%) based on imported diesel. The "2013 Basic Electricity Sector Law" wants to reverse this trend through the following measures: (1) To promote an increase in the utilisation of renewable energy and co-generation for electricity production and (2) To attract national and foreign investors for NES (New Energy Sources) through conditions that are stable, equitable, favourable and transparent for investors. Hence, hydropower electricity generation is meant to both supply the grid as a replacement for imported diesel and to supply isolated mini-grids where no electricity services are available.</p> <p>With regard to the baseline, the RCE indicates that (page 13 + Fig.1) "...electrical energy demand in the country would increase from 39,000 MWh in 2005 to 490,000 MWh by 2030 (Fig. 1). In 2013, the demand was projected to be approx. 175,000 MWh; however, EMAE was able to supply only 77,000 MWh, representing only 44% of what the country was reasonably expected to need as per the projection. This is an indication that electricity demand in the country is highly suppressed due to EMAE's inability to build additional capacity to meet the increasing</p>	

<p>planned renewable energy and rural electrification initiatives of the government and private sector. Analysis of the barriers 1 and 2 in the proposal shows that the project intends to tackle policy, market, technical, and financial barriers to comply with the Focal Area Climate Change Objective 3 (CCM-3: Renewable Energy: Promote investment in renewable energy technologies). However, the proposal lacks the analysis on the dynamic baseline for future energy grid composition and subsequent GHG emissions. Do the activities in the proposed project intend to reduce the reliance on the imported fossil fuels? Therefore, STAP questions the GEF incremental support to CCM-3 activities of the proposal that lacks a statement on dynamic baseline projections.</p> <p>2. In addition, Table 2 "Project Activities and Incremental Reasoning" lacks linkages to Project Framework with regard to Global Environmental Benefits (GEBs). The electricity supplied to the grid by itself does not bring GEBs in CO2 emission reductions; replacement of fossils fuels in the grid brings about direct emission reductions and proper policies bring indirect reductions. Please provide clarifications on what parameters went into CO2 calculation. The table also does not mention integrated forestry/watershed management master plan and environmental safeguards for on-grid mini-hydro, which would seem to be the reason for the incremental GEF support. Does it mean that these outputs are supported by co-financing and not the GEF?</p> <p>3. As we understand, the activities under Component 3 ("Watershed and Sustainable Forestry Management and Implementation") will address the identified Barrier 3 and Focal Area Objectives LD-3 (Reduce pressures on natural resources from competing land uses in the wider landscape) and SFM-1 (Reduce pressures on forest resources and generate sustainable flows of forest ecosystem services). STAP understands that PPG phase will bring clarification on the most optimal conservation farming and fire management techniques and wishes to suggest minor revisions on this component:</p> <p>a) Change the title of the component so that it reflects land management.</p> <p>b) Spell out forest ecosystem services that will be managed and how this will be achieved.</p>	<p>demand”.</p> <p>The serious electricity generation shortfall can be met through one of 2 ways: (1) Increase in diesel power generation for both on-grid and isolated mini-grids, which will exponentially increase GHG emissions or (2) Resort to hydropower generation in lieu of diesel generators. Hence, GEF’s direct support for removing the barriers to hydropower is perfectly justified.</p> <p>a) Component 3 is now: Integrated land use, sustainable forest management and natural resource management to provide social benefits and sustain environmental services at the watershed level.</p> <p>b) The rationale for the project to develop an integrated land and forest management at the watershed level is to sustain environmental services</p>	
--	---	--

<p>c) Consider adding a capacity building component as outlined in Barrier 3.</p> <p>d) Consider revising GEBs under Component 3. It is unclear whether rehabilitation of 3,000 ha of secondary forest will be done to offset the impact of the earthworks. Please identify GEB for LD component in carbon stocks additions. Project managers could benefit from using Carbon Benefits Project tools for estimating carbon benefits. The tool can be found here http://www.unep.org/climatechange/carbon-benefits/About/tabid/3539/Default.aspx</p> <p>e) What does stabilization of 20% of all forest buffer zones mean? The description of this activity is lacking.</p> <p>4. STAP recognizes that the project focuses on mini-hydro. However, STP also has potential to develop solar, wind and bio-power generation. The latter is particularly relevant as unsustainable biomass (fuelwood and charcoal) harvesting is an important driving factor of deforestation in the country.</p> <p>5. In designing project component on policy, institutional and legal framework for on-grid mini-hydropower, STAP recommends exploring policy, institutional and legal assistance to support other forms of RET. STP is facing substantial challenges of energy access and projects should start to build on ground work for other RETs having in mind</p>	<p>such as water supply in quantity and quality and with regularity. A monitoring scheme (combined with carbon data and indicators) will be developed in output 3.1 and will provide information on the evolution of water flows upstream the hydroelectricity production.</p> <p>c) Barriers towards the development of an integrated, sustainable and widely replicated integrated watershed management have been developed in the Prodoc. Lack of capacities at different levels (national in the Ministries, local in the districts and in the communities) is one of the barriers.</p> <p>d) Large-scale trees plantation will be undertaken in watersheds in order to restore ecosystems, to sustain water ecosystems services, and to provide resources for communities. As the PPG showed a larger need for tree plantation (mainly in shade forests, then called forest rehabilitation), the objective of reforestation will be 7,000 ha (1,000 ha of tree plantation in savannah and 6,000 ha of forests rehabilitation in capoeira). Forest rehabilitation will be performed as part of the project's activity (output 3.4). Carbon stocks additions for conservation farming is explained in the prodoc.</p> <p>e) This activity has been reformulated during the PPG as pilot sites have been identified. Three priority watersheds have been chosen, and 4 others have been characterized. Most of these watersheds have upstream lands in the buffer zone of Obo National Park. Thus activities of the project will have positive impacts on buffer zones. However, final indicators of the project concern SFM and LD but not BD. A partnership will be developed with PAPAFA at the inception of the project as regards the BD impacts of the project.</p> <p>As indicated above, the “2013 Basic Electricity Sector Law” will deal with all potential renewable energy sources and this responsibility is entrusted with the Special Unit that the Government has established at EMAE.</p> <p>While the “energy” component of the project is focused on hydropower, capacity development to be provided to EMAE will include supporting its recently-established Special Unit dealing renewable energy to explore options from other renewable energy sources like solar PV and wind for electricity</p>	
--	--	--

<p>longer-term prospects and future access to energy as demand increases.</p> <p>6. Support for integrated watershed management plans is a welcome initiative to ensure ecosystem-based management. Does the country have a legal and institutional framework for IWRM? If not, how will the project support water governance reforms beyond those few selected for hydropower watersheds? What is the risk that developed in the project watershed plans will not be implemented without proper national or regional frameworks?</p> <p>7. A 2-MW of hydro power plants exist so some experience is already in place. The remaining electricity generation is diesel generation which, if the total demand load is not increasing, will be partly displaced.</p> <p>8. The barriers to greater deployment are clear and well understood. Project interventions are focused largely on initial investment cost barriers to support mini-hydro. Less attention is paid on how to overcome lack of technical capacity for suppliers, installers and financiers; lack of awareness of other RETs; as well as market barriers such as support for feed-in-tariffs and exploring opportunities for carbon financing.</p> <p>9. The 4MW of new capacity generating 11913 MWh implies a 34% capacity factor. This seems low for a hydro project unless the hydro is assumed to be used for peak load following and the diesel remains as base load. Some clarification of how the power system will be managed would be useful.</p> <p>10. The CO2 reduction potential is calculated using a 34% capacity factor. Is that based on existing hydro plants on the islands? Reducing the capacity factor of diesel generation by running hydro plant more as baseload would provide greater displacement and avoid spilling of much water - that is assumed to be the case at such a low capacity factor for run-of-river schemes.</p>	<p>generation. However, electricity generation from biomass/forestry resources in a sustainable way, either through gasification technology or through small steam boilers, may prove problematic, as it may exacerbate the biomass/forestry situation in view of the limited availability of these resources and the small size of the country.</p> <p>At the present time, an IWRM law has been designed and is under validation at the government. The project will support this IWRM law through lobbying/advocacy if needed and through promotion of its implementation (output 1.1).</p> <p>The demand is presently suppressed; only 44% of the demand was met in 2013 with the available installed capacity that was operational.</p> <p>All these issues are dealt with under Components 1 and 2. In addition, the RCE states that (page 33) “the project will support local training institutions (e.g. Centre de Formation Professionnelle and Centre de Formation Polytechnique) to develop technical capacity required by project developers”.</p> <p>Low capacity factor of hydropower generation was identified as a bottleneck by the Taiwanese Consultants (Table 4). This relates to the fact that all the powers stations are/will be mostly run-of-the-river type, with only pondage and no expensive dams. Hence, the energy generated is completely dependent on the river flow that is, in turn, dependent on the rainfall. Hence, the rationale for the project to include sustainable forest and watershed management to improve on the amount and the regularity of rainfall that feeds the rivers.</p> <p>The GHG reductions are based on the projections of the Taiwanese Consultants in terms of MWh generated, with capacity factor of each power station factored in. To have these power stations operate as base load will necessitate the construction of expensive dams which may not be easily amenable in many cases because of the topography.</p>	
--	---	--

11. No indicators or milestones are presented that would enable the success (or otherwise) of the project to be measured.	Indicators in terms of MWh generated and GHG emissions avoided are provided in the logframe. As regards integrated watershed management, 4 indicators at objective level of the project have been detailed in the prodoc: number of IWMPs adopted by pilot sites, carbon stock enhancement in forest effectively co-managed, number of hectares under sustainable agricultural land management, CO2 sequestration with trees plantation / forest rehabilitation.	
12. To strengthen the regional approach to supporting RETs and ensure future sustainability of project efforts, STAP recommends that project proponents consider building links and exchange knowledge and experience with the Centre of Excellence in Renewable Energy and Energy Efficiency in Central Africa (CEREECA) as well as other initiatives being supported by the ARPEDAC - a non-profit association involved in research and promotion of services and technologies related to energy efficiency and renewable energy in the Economic Community of Central Africa - (http://www.arpedac.org/).	The project envisages to establish links with these organisations (page 38) in order to benefit from their experience.	

ANNEX C: STATUS OF IMPLEMENTATION OF PROJECT PREPARATION ACTIVITIES AND THE USE OF FUNDS

A. EXPLAIN IF THE PPG OBJECTIVE HAS BEEN ACHIEVED THROUGH THE PPG ACTIVITIES UNDERTAKEN.

The PPG objective of formulating detailed Project Document has been achieved. The project formulation was done through consultations involving a range of stakeholders. Consultative activities were taken up through individual interviews with stakeholders and workshop (Problem/solution analysis and Log frame Workshop).

B. DESCRIBE FINDINGS THAT MIGHT AFFECT THE PROJECT DESIGN OR ANY CONCERNS ON PROJECT IMPLEMENTATION, IF ANY:

N/A

C. PROVIDE DETAILED FUNDING AMOUNT OF THE PPG ACTIVITIES AND THEIR IMPLEMENTATION STATUS IN THE TABLE BELOW:

The activities achieved during PPG are shown in the table below:

<i>Project Preparation Activities</i>	<i>Implementation Status</i>	<i>GEF Amount (\$)</i>				<i>Co-financing (\$)</i>
		<i>Amount Approved</i>	<i>Amount Spent to date</i>	<i>Amount Committed</i>	<i>Uncommitted Amount*</i>	
Collection and analysis of baseline data including comparative review of other countries under similar conditions and circumstances	Completed	40,000	40,000			30,000
Review of experiences in Sao Tome and	Completed	25,000	25,000			20,000

<i>Project Preparation Activities</i>	<i>Implementation Status</i>	<i>GEF Amount (\$)</i>				<i>Co-financing (\$)</i>
		<i>Amount Approved</i>	<i>Amount Spent to date</i>	<i>Amount Committed</i>	<i>Uncommitted Amount*</i>	
Principe and other countries of the following: - hydropower based energy generation; - sustainable forest and land management; - financial mechanism managements; - Area/community-based energy needs assessment and planning						
Conduct a Logical Framework Analysis (LFA) to define project goal, objectives, outcomes, outputs and activities, including success indicators as well as delineation of responsibilities and coordination mechanisms	Completed	10,000	10,000			10,000
Stakeholder engagement, capacity needs assessment of key local implementing partners and co-financing	Completed	15,000	15,000			15,000
Detailed design of project implementation plan	Completed	10,000	10,000			15,000
Preparation and finalization of the full-sized Project Document	Completed	0	0			10,000
Total		100,000	100,000			100,000

*Any uncommitted amounts should be returned to the GEF Trust Fund. This is not a physical transfer of money, but achieved through reporting and netting out from disbursement request to Trustee. Please indicate expected date of refund transaction to Trustee. N/A