United Nations Development Programme

Country: Republic of Sao Tome and Principe

PROJECT DOCUMENT

Project Title: Promotion of environmentally sustainable and climate-resilient grid/isolated grid-based hydroelectric electricity through an integrated approach in Sao Tome and Principe.
UNDAF Outcome(s): #4 – By 2016, the Government and districts, as well as the population, adopt techniques and behaviour that promote a sustainable environment and ensure better prevention and management of risks and natural disasters.

UNDP Strategic Plan Focus Area: Environment and Sustainable Development: Promoting the use of renewable energy and alternative sustainable habitats.
Mainstreaming environment and energy.

Executing Entity/Implementing Partner: Ministry of Public Works, Infrastructure, Natural Resources and Environment (MPWINRE).

Other Implementing Partners: Empresa da Agua e Electricidade (EMAE – Water and Electricity Company), Ministry of Agriculture, Fisheries and Rural Development.

Implementing Entity/Responsible Partners: United Nations Development Programme.

Brief Description: The objective of the project is to introduce an integrated energy and ecosystems-based approach to grid/isolated-grid-based mini/small hydro-electricity generation in Sao Tome and Principe by leveraging $ 20.7 million in multilateral and private sector financing over its five-year implementation period. This, in turn, is expected to generate direct global benefits of 137,200 tons of CO_2 over the same period and 36,850 tons CO_2/yr thereafter in avoided greenhouse gas (GHG) emissions. 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 874,200 (737,000 + 137,200) tons, including the CO2 reduction related to sustainable land and forest management; this is equivalent to $ 6 of GEF funds per tCO_2. The project will achieve this target by introducing a conducive regulatory framework and by establishing a financial support mechanism that together will facilitate private sector participation in increasing the share of hydropower electricity generation in the country.

In addition, in order to ensure the availability of hydro resources for electricity generation (and irrigation for job creation), the project will implement an integrated watershed management approach. It aims at integrating natural resource management with community livelihoods improvement in a sustainable way and within a landscape approach. The project will introduce innovative participative methods of natural resource management, conservation farming and agro-ecology. This will be achieved through watershed level land use planning and implementation of community forests over 6,000 ha, sustainable agricultural land management practices over 10,000 ha, and income generating activities (such as mushrooms, medicinal plants, ecotourism, etc.) for rural communities. This landscape approach will be sustained by a financial mechanism between the private hydroelectricity producers and the upstream communities, based on the maintenance of environmental services (water supply regulation).

Programme Period:	2011-2015
Atlas Award ID:	00087589
Project ID:	00094537
PIMS #	4602
Start date:	January 2016
End Date:	December 2020
Management Arrangements:	NIM
PAC Meeting Date:	TBD

Total resources required (total project fund)	**$25,980,248**
- Regular (UNDP)	$1,000,000
- GEF	$5,274,544
Other (partner managed sources)	
•	
• Government	$15,382,704
• Private sector (banks)	$800,000
• Private sector (IPPs)	$3,400,000
• NGO	$123,000
•	

Agreed by (Government):

Date/Month/Year

Agreed by (Executing Entity/Implementing Partner):

Date/Month/Year

Agreed by (UNDP):

Date/Month/Year

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LIST OF ACRONYMS

APR	Annual Project Review
A/R	Afforestation/ reforestation
BD	Biodiversity
CBNRM	Community-based natural resources management
CF	Community Forest
CO	UNDP Country Office
CO_2	Carbon dioxide
ECOFAC	Ecosystèmes Forestiers d'Afrique Centrale
EIA	Environmental Impact Assessment
EIB	European Investment Bank
EMAE	Empresa de Agua e Electricidade
EP	Ecological Perimeter
EU	European Union
FAO	Food and Agriculture Organisation of United Nations
FRA	Forest Resources Assessment
FSM	Financial Support Mechanism
GEF	Global Environment Facility
GHG	Greenhouse Gas
IBA	Important Bird Area
IPP	Independent Power Producer
IUCN	International Union for the Conservation of Nature and Natural Resources
IWM	Integrated Watershed Management
IWMP	Integrated Watershed Management Plan
kW	Kilowatt
kWh	Kilowatt-hour
LD	Land Degradation
LUCF	Land use change and forestry
LULUCF	Land use, land use change and forestry
M&E	Monitoring and Evaluation
MAFRD	Ministry of Agriculture, Fisheries and Rural Development
MPWINRE	Ministry of Public Works, Infrastructure, Natural Resources and Environment
Mtoe	Million tons of oil equivalent
MW	Megawatt
MWh	Megawatt-hour
NBSAP	National Biodiversity Strategy and Action Plan
NGO	Non-Governmental Organization
NIM	National Institute of Meteorology

NRM	Natural resource management
QPR	Quarterly Progress Report
PES	Payment for Environmental Services
PIF	Project Identification Form
PIR	Project Implementation Review
PMU	Project Management Unit
PA	Protected Area
PPA	Power Purchase Agreement
PPG	Project Preparation Grant
PRSP	Poverty Reduction Strategy Paper
PV	Photovoltaic
RCU	UNDP Regional Coordination Unit
REDD	Reducing Emissions from Deforestation and forest Degradation
RTA	UNDP Regional Technical Adviser
SFM	Sustainable Forest Management
SLFM	Sustainable Land and Forest Management
SIDS	Small Islands Developing States
STP	Sao Tomé and Principe
toe	Tons of oil equivalent
TPR	Tripartite Review
TTR	Terminal Tripartite Review
UNCCD	United Nations Convention to Combat Desertification
UNDAF	United Nations Development Assistance Framework
UNDP	United Nations Development Programme
UNFCCC	United Nations Framework Convention on Climate Change
USD	United States dollar
VOA	Voice of America

1. SITUATION ANALYSIS

Context and Global significance

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.

Electricity generation

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	42,825949
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 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 a 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 nº 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 locations, Principe	1,944 (mini-grids)	1,120	2 generators (328 and 496 kW) not in operation 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 owned by Renergia Ltd. at Bobo Forro operates at approx. 50% capacity because of outstanding payments from EMAE; under this scenario, the power station 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 (Bobo 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. It 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 was 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, 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 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

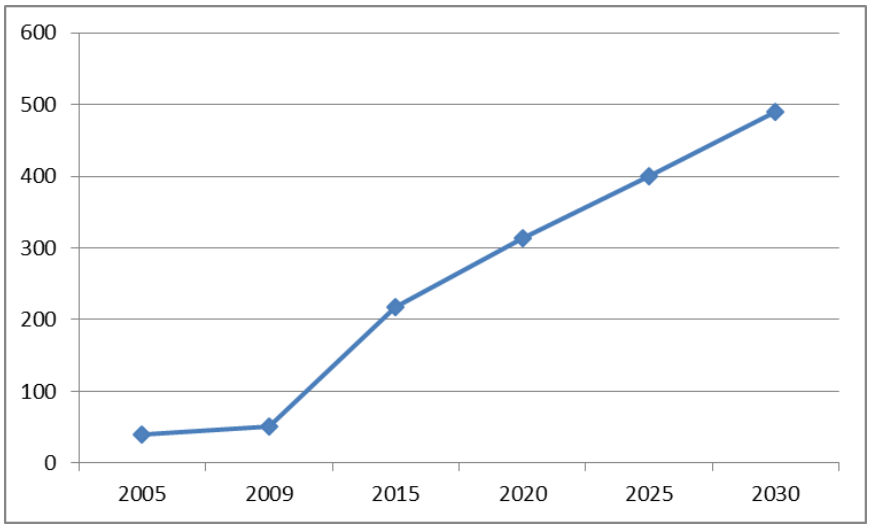
The country's use of imported diesel fuel for electricity generation and the associated expenditures in terms of foreign currency have been on an increasing trend over the few years. For example (Table 3), in 2009, the expenditures related diesel for electricity generation were approx. $ 8 million and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

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 tCO_2" 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: CECI Engineering Consultants, Taiwan

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.

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	1340
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: CECI Engineering Consultants, Taiwan

*Hydropower capacity (kW or MW) is directly proportional to the Head (in metres) and flow rate (in m^3/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.

Ecosystems, land use and forest management

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. As stated by the Government and highlighted by several technical reports[1], 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. 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 latest FAO Forest Resources Assessment (FRA 2010) estimates that the lands under trees cover is approximately 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. Growing 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.

Six broad ecosystem and land use categories (encompassing terrestrial and aquatic habitats) were identified for STP : (i) Cloud & montane forests, (ii) Lowlands forests, (iii) Secondary forests, (iv) Shade forests, (v) Savana & dry forest, (vi) Mangrove.

[1] 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).

Table 5. Main eco-geographic zones for STP

ECO-GEOGRAPHIC ZONES	KEY CHARACTERISTICS AND GLOBAL ENVIRONMENTAL SIGNIFICANCE
The cloud & montane forests Ecosystem	The cloud forests site comprises the highest parts of the island and includes three peaks, Pico de São Tomé (2,024 m), Calvario (1,594 m) and Pico Ana Chaves (1,630 m), as well as Lagoa Amelia, an old crater-lake and the surrounding marshy area. The area holds most of the montane and cloud-forests in the centre of the island above 1,000 m, around the Pico de São Tomé massif. Montane forests extend to 1,400 m, above which they give way to cloud-forest. The cloud forest Ecosystem belongs to the Ôbo National Park. Montane forests are located between the agricultural lands and the clouds forests. This is a transition zone. The area that held forest between 800 m and 1,000 m on the northern edge of the massif is excluded, as it has been cleared for cultivation. The climate of the area is characterized by strong rains, fog patches, and low temperature. Trees are dominated by epiphytes. Typical tree species of both forest-types include *Tabernaemontana stenosiphon*, *Homalium henriquesii*, *Croton stelluliferus*, *Polyscias quintasii*, *Craterispermum montanum*, *Podocarpus mannii*, all of which are endemic to the Gulf of Guinea islands, and the more widespread *Olea capensis*, *Syzygium guineense* and *Pauridiantha floribunda*. *Podocarpus mannii* is a gymnosperm endemic in Sao Tomé. *Phylippia thomensis* et *Lobelia barnsii* are located only in the Pico de São Tomé massif.
The lowlands forests Ecosystem	This ecosystem extends from the coast to the about 800 m high. It is mainly located in the south-west and extends from the Binda and Quija rivers, on the west coast, to the confluence of the Ana Chaves and Io Grande rivers and the right bank of the Io Grande. The area comprises most of the lowland primary evergreen forests of the island as well as, in the centre, montane forest on the Cabumbe peak (1,403 m). The southern slopes of the Pico de São Tomé massif define the northern boundary of the site. Old secondary forest occurs near the coast, in the valleys of the Binda, São Miguel and Quija rivers, resulting from the regrowth of plantations abandoned in the late 1970s. Further inland the terrain is rugged and the ground broken and stoney, making walking difficult. The forests have not been fully surveyed botanically, but large trees include *Uapaca* sp. The understorey is generally open under a closed canopy, with few shrubs.
The secondary forest Ecosystems	This ecosystem is old primary forest that was cleared for cacao plantations. They were later abandoned and turn into secondary forest. The floristic composition is mainly characterized by exotic and cultivated species with rapid growth, such as *Bambusa vulgaris*, *Cecropia peltata*, *Maesa lanceolata*, *Dracaena arborea*, *Ficus sp* and *Cestrum leavigatum*. Fruit trees are also part of this ecosystem: *Pycnanthus angolensis, Pentaclethra macrophylla*, *Artocarpus altilis*, *Artocarpus heterophyllus, African Treculia*.
The shade forest Ecosystems	This ecosystem results from intensification and modernization operations, since the 60's, of cacao plantations (Theobroma cacao) and coffee (Coffea sp.). It is composed of both spontaneous and introduced species for the purpose of shade species: *Milicia excelsa*, *Cedrela odorata*, *Fagara macrophylla*, *Carapa procera*. Also, *Eritrina* species were introduced for nitrogen fixation.

ECO-GEOGRAPHIC ZONES	KEY CHARACTERISTICS AND GLOBAL ENVIRONMENTAL SIGNIFICANCE
The savana & dry forests Ecosystems	The site is situated on the northern coast, between Lagoa Azul and Diogo Nunes, and includes a succession of grasslands, coconut plantations and herbaceous swamps. Around the coastal lagoon of Lagoa Azul there are also thickets and dry lowland forest along narrow gullies The northen savana is one of STP's most degraded and threatened ecosystems due to human encroachment and activities, compounded by droughts. In the top North, the vegetation is grassland and shrub steppe. Rainy season precipitation is very variable in time and space and has decreased significantly and become more irregular in recent decades. This savanna represents about 1,000 ha. There is a protected area in Praia das Conchas (belonging to the Ôbo National Park) which is very threatened.
The mangrove Ecosystems	The mangrove ecosystem is located in the lagoons, separated from the mainland by rivers. The vegetation is dominated by two species: *Rhizophora mangle* (Rhizophoraceae) and *Avicennia germinans* (Avicenniaceae). In the intertidal zone, an association of several species of algae covers mangrove roots. These surfaces also host invertebrates such as oysters (Isognom) and the mangrove crab (Aratus). The ornithological fauna consists of species such as *Gallinula chloropus, Bubulcus ibis*, or *striatus virescens*.

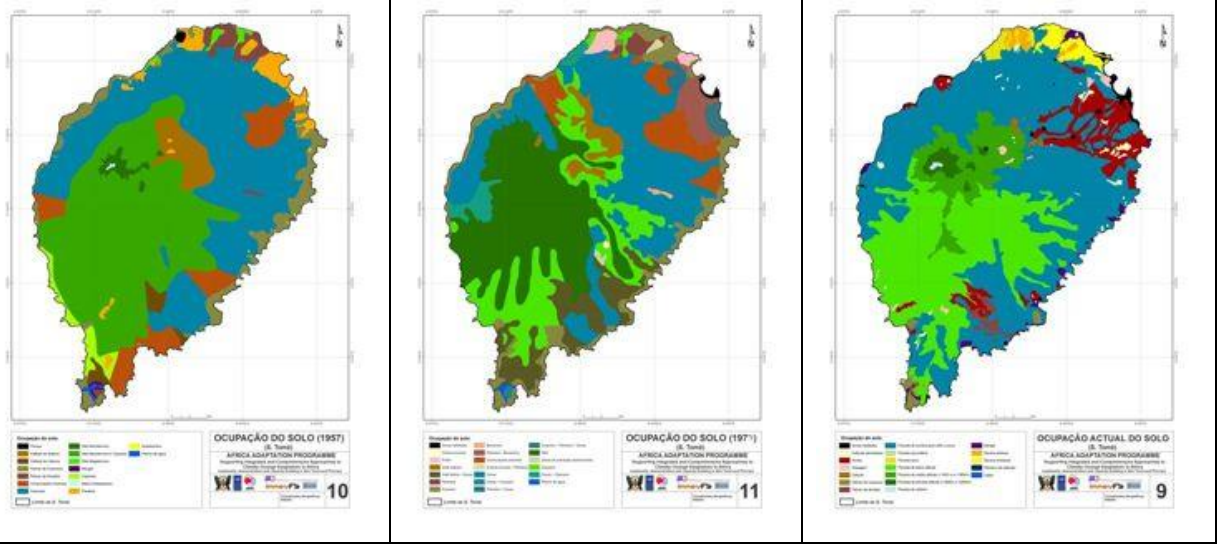
Poorly managed shifting agriculture and the absence of forests management plan degrade soils and ecosystems. Major pressures on the ecosystems are driven by demand for wood and for charcoal as a domestic fuel in the capital, and by illegal trees cutting.

The 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[2] 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. Recent mapping shows important land uses changes in the country (table 6).

[2] Net deforestation in Central Africa is 0.16% per year. Net degradation for the same region is 0,09% per year (Duveiller at al. 2008).

Table 6. Evolution of the land occupation in STP in 1957, 1975 and 2013 (from left to right).



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 world[3]. 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 monsoon[4]. 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 investment[5], 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.).

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

[4] 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.

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

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 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 reptiles 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 endemics[6]. 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 amphibians. 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 was 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 governement about 3 key flagship endemic birds which are critically endangered: Neospiza concolor, Lanius newtoni and Bostrychia bocagei[7].

Threats to lands & forests, root causes and impacts

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

[6] Report on the state of biodiversity in Sao Tomé and Principe, 2014.

[7] BirdLife International (2014) IUCN Red List for birds. Downloaded from http://www.birdlife.org on 22/03/2014.

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 coal 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 techniques cultivation 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 agroecology 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 slaw and burn deforestation process[8].

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

Box 1. Bombaim Village – Competing land uses in Bombain landscape

How the Bombaim landscape is a place of competing land uses?

Located in the Rio Abade watershed, the community of Bombaim (34 inhabitants) is an old annexe of the "Roça Milagrosa" and lives mainly from agriculture (cacao, coffee, palm oil), livestock and ecotourism.

Recently, the company SATOCAO has started forests clearance for cacao plantation rehabilitation. However, this creates land uses conflicts, as the community doesn't want that specific lands to be cleared on the hill close to their village. Indeed, they argue that tourists often climb this hill because of its beauty and diversity. If the forest is cleared, tourists will not appreciate and may not come any more.

Moreover, the engineers from the ministry alerts on the fact that some of the lands of Bombaim areas need to be kept as secondary forests, especially those on the top of the hills and on high slopes, in order to protect the ecological integrity of the watershed.

Besides, Bombaim is a high potential site for hydro production, and has been selected as a priority investment under the GEF project. Water supply is another uses of the land's ecosystems services.

This situation illustrates clearly the land uses conflict that happens in watersheds in STP. It shows the need for more clarity in land planning, and the need of a participatory approach, shared by all the users of resources of the watershed. This approach needs to facilitate the emergence of shared challenges and to define the rules of uses of natural resources in the watershed.

Long-term solution and barriers to achieving the integrated energy and ecosystems-based solution

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 energy, and preferably 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 biodiversity. 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.

Long-term solution: 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 coast waters due to soil erosion upstream[9].

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 communities' 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 work plan 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.

[9] Source: NGO MARAPA, interview with Manuel Jorge Carvalho Do Rio, March 2014.

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 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 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 purpose: (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 other 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[10]; 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.

[10] During the PPG, some farmers testify a loss of half of their yield within only 5 years.

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, 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 "subordinate 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 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 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 A below provides a snapshot of how the energy component of the FSM will be set up and operate:

Box A: 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 CBNRM[11].
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 is 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 year[12]. 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 operations[13] 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 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

[11] 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.

[12] 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.

[13] 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.

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).
The international part-time Technical Adviser will draft a specific manual of procedures of the disbursement of the CT for micro-projects before the launching of this activity.

Stakeholders analysis

The Project, with its broad vision of integrated action at the level of watershed, will need to bring together a wide array of stakeholders for both planning and implementation. The objective will be to engage all stakeholders at the relevant stage to employ their expertise and the resources they can bring to assist in achieving Project objectives. The following stakeholders are expected to play important roles, as outlined below:

Table 7. Stakeholder Matrix

Stakeholder	Stakes, roles and responsibilities in the project
The Ministry of Public Works, Infrastructures, Natural Resources and Energy of (PWINRE)	The Ministry of PWINRE is the project's executing agency. It has financial and management autonomy that enables it to implement the project, adopting good administrative practices and in line with the national execution modality. It will work closely with EMAE which reports to the Ministry of Public Works and involve both the environmental direction and the CCD committee in order to successfully build an inter-sectoral framework for land uses management at the watershed scale.
The Ministry of Agriculture, Fisheries and Rural Development (AFRD)	The Ministry of AFRD is responsible for component 3 implementation. It has significant experience in the development of rural projects. Besides the direction of Agricultura and the direction of Forests, the project will also work with two entities entities of the Ministry : CIAT and CATAP. - **The CIAT** (Center of Research on Agronomy and Technology) : it provides experimental supports for farmers and agrobusiness. With 57 staff, 32 ha of experimental plots and well equiped labs, it has the capacity to bring sugnificant contribution to the project implementation. - **The CATAP** (Center of Technical Training for Agriculture and Livestock) : it has weak capacities to provide specific training support to staff and farmers. The MAFRD shows important interests and motivation to the Project implementation. This will provide a guarantee of sustainability and replication of the project's pilot actions.
Local populations : farmers and their families	Especially social groups such as women and youth are most often active in the implementation of development activities at the local community level. At the same time, they may often be those causing the degradation of ecosystems, namely through the unsustainable & illegal harvest of forestry and wood products or extensive agriculture. Thus, raising their awareness (to promote a change of behaviour) and ensuring their effective inclusion in the project design, choice of activities and implementation of activities are a prerequisite for achieving conservation of natural resources at the watershed scale.
Farmers associations	Producers are grouped into one main farmer umbrella organizations, the FENAPA. This organization is active in the representation of rural people, negotiation and professionalization of producers in the fields of agriculture, livestock, fisheries, natural resource management, processing and marketing. Because of the communism past of STP, community based organisation such as farmers cooperative are not usual. However, some projects (such as the food security project supported

Stakeholder	Stakes, roles and responsibilities in the project
	by the taïwanese cooperation, or the PAPAFPA) have recently succeed in organising farmers in associations. These young associations will be key partners of the projects. These associations can make a significant contribution to the project in the implementation of certain project activities, such as training and adopting new sustainable agricultural techniques and in the dissemination of project results.
The decentralized state technical structures : CADR	Centre d'Appui au Développement Rural (CADR) is also key partners, as they are the delegation in the field of the State Minitry AFRD. They have an overall authority to organise, monitor and coordinate development activities within their respective scope of expertise (mainly agriculture, but also forestry). They are also responsible for overseeing and ensuring continuity of the various support projects within their remit. Thus, these structures (with appropriated reinforcement capacity) must be fully involved in the operational process : implementation, monitoring and evaluation of the project to take advantage of their technical skills and to ensure continuity.
Local Authorities : the CAMARA	There are 6 « Camara » (Municipalities) and one autonomous region in STP. These local authorities are responsible mainly for social aspects but also for environmental & natural resources issues at the local level. For instance, they are facing the problem of competing land uses within their disctrict. **The Camara** has the mandate to promote development at the district level. It is involved in the natural resources management (for example, controls of illegal logging) and land management plans, but with very weak capacities. It can coordinate land uses plans and community based NR management. It can act as local focal point in the coordination of development activities.
Non-Governmental Organisations	There ar a few NGOs active in the field of NRM and can thus provide additional support to the project, especially since they are often directly involved at the community level and can make a significant contribution in raising awareness. They are also involved in support to social activities (health, education, literacy, water, etc.) and can therefore provide additional support to the project that meets real needs and is often an important source of motivation, or a condition for the population's participation in conservation activities. The following NGO can be involved in the projects activities implementation : ADAPA, League of Nature Conservation in Sao Tomé & Principe, ZATONA, ALIZEE, AgriSud International, etc.
Private Sector in agribusiness : SATOCAO, etc.	The private sector consists of companies or economic interest groups that are more or less well established and which intervene in the sectors of production, processing and marketing. They include cacao & oilpalm producers and exporters, hydro energy producers, loggers, industries that sell goods and services and service providers, among others. They play an important role in input supply, production, processing or marketing of products derived from the local population's activities (such as cacao). They are thus an essential link between local populations and their economic environment for the exploitation of local resources and sustainability of activities initiated in the Project. Some private actors like illegal charcoal producers or game poachers may have to lose with the present project; this will need to be addressed, for example through incentive schemes developing alternative revenues streams for them.
Projects (e.g : PAPAFPA, etc.).	Various partner projects intervene in the Project areas, supporting the same populations and in some cases carrying out similar activities. They have relatively large financial, human and technical resources that may benefit the Project directly (co-financing) or indirectly (associated financing). These include: **The Food Crops Development Project**, supported by the taïwanese cooperation, is a strategic partner given its important contribution to the establishment of producers associations in some areas, which create a local dynamic for rural development. The Project will based its activities on these producers associations, in order to integrate conservation practices farming, sustainable lands uses and natural resources protection.

Stakeholder	Stakes, roles and responsibilities in the project
	PAPAFPA is another strategic partner, as they are working with communities in the buffer zones of the Ôbo National Park. A cooperation MoU should be signed in order to seek synergies in sustainable forestry and land management. Harmonization of interventions between PAPAFPA and the Project should improve the performance of the two projects to the benefit of local populations.
The financial partners	Co-financiers are expected to provide support in the form of opportunities between the project and other projects and programs implemented in similar geographic and sectoral areas, with complementary objectives. This should be facilitated by the few number of Donors in the country and the major position of UNDP.

Introduction to project sites

The project aims to pioneer an integrated energy and ecosystems-based approach to grid-based hydroelectric electricity generation in the country via interrelated components related to both energy and SLM/SFM activities. It develops activities for sustainable lands & forests management in order to secure the ecosystem services flows (in particular water supply) generated by the forests. Thus, many of the activities of the project are directly interlinked on a geographic level, namely the watershed.

However 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, for the preparatory phase of this project, the PPG consultants' team conducted research and interviews in a few communities in order to select potential project sites. The preliminary selection of the communities visited was made according to the criteria of relevance and feasibility developed jointly with the energy experts (see Box 2).

The PPG team discussed the project sites list during preparation of the Prodoc and it was finally refined down to 7 proposed sites (see Table below). The PPG team however alerts on the fact that private investors will decide the final location of their mini-hydro investment installation. Then the Project management team needs to be flexible as regards the sites of the project implementation.

Box 2. Criteria for selection of sites for the project

Essential criteria:

1. Communities upstream of a watershed with high potential for hydro production establishment (14 promising small-scale hydropower sites were identified in the feasibility assessment carried out with the Taiwanese development cooperation).
2. Communities where lands erosion are endangering ecosystem services flows (such as water regulation) sustainable livelihoods and threatened protected areas.
3. Zones where potential for land restoration & alternative activities development is high.
4. Land availability and lack of hard land conflict.
5. Engagement of villagers and social cohesion, including the willingness to contribute (financially or in kind) to programme activities.

Secondary criteria:

6. Communities downstream of a watershed where mini-hydro will be established and where lands restoration is a need.
7. Accessibility of village (for instance, Rio Quija and Rio Xufexufe watershed are not easily accessible).
8. Communities where farmers are organized in producers associations.

The LD & SFM activities location has been chosen according to the need and in order to maximize synergies with the potential hydro production site. The project will also fund specific reforestation activities in 6,000 ha of degraded secondary forests in selected riparian zones around and upstream of the proposed mini-hydro water intake sites and groundwater recharge areas. These areas of forests rehabilitation can also be much larger than the mini-hydro sites.

Table 7 below presents the final selection of project sites.

Table 7. Introduction to Proposed Project Sites and Communities

#	Watershed, Project site (capacity production)	Population	Potential of SLFM within the watershed	Communities in the watershed (number of inhabitants) and Socio-economic background Main ecosystems
Priotity areas where hydro sites will be installed during the project time				

#	Watershed, Project site (capacity production)	Population	Potential of SLFM within the watershed	Communities in the watershed (number of inhabitants) and Socio-economic background Main ecosystems
1	**Rio D'Ouro** Agostinho Neto (0.34 MW) Caldeiras (20 kW)	2,399 inhabitants	Potential for land restoration : 2500 ha Potential for CFM : 1000 ha Potential for reforestation: 2000 ha	Communities close to the potential hydro production site : Agostinho Neto (869), Caldeiras (201), Rio do Ouro Pequeno (67), Monte Macaco (261), Bom Retiro (54), Boa Esperanca (82). Others communities in the watershed : Monte Carmo (54), Santa Clara (255), Santa Luzia (261), Agua Coimbra (65), Agua Sampaio (230). Mainly dry forests & savanna
2	**Rio Abade watershed** Bombaim (4 MW)	566 inhabitants	Potential for land restoration : 2000 ha Potential for CFM : 800 ha Potential for reforestation: 2000 ha	Communities close to the potential hydro production site : Bombaim (34), Roça Nova (135), Agua das Belas (42), Abade (160), Java (31). Others communities in the watershed : Sao Paulo (19), Vale Formoso (33), Carcavelos (9), San Januario (103). Lowlands forests and cloud forests up to the buffer zone of the Ôbo NP.
3	**Rio Manuel Jorge watershed** Santa Luzia (1.15 MW)	1,196 inhabitants	Potential for land restoration : 1500 ha Potential for CFM : 650 ha Potential for reforestation: 1500 ha	Macambrara, Bom Sucesso, Famalicao (2), Sao Nicolau (100), Nova Moca, Saudade (79), Casa de Repouso, Quinta das Flores (43), Alenquer (236), Milagrosa (418), Santa Elvira (25), Santa Adelaide (124), Santa Luzia (17), Plateau (152). Lowlands forests up to the buffer zone of the Ôbo NP.
Other watershed where integrated watershed management and SLFM are needed				
4	**Rio Papagaio watershed** Papagaio (60 kW)	301 inhabitants	Potential for land restoration : 800 ha Potential for CFM : 650 ha Potential for reforestation: 500 ha	Terreiro Velho (79), Bela Vista (96), Nova Cuba (1), San Joaquim (125), Oque Pipi, Esperanca. Lowlands forests
5	**Rio Contador watershed** San Jao (0,9 MW)	1,519 inhabitants	Potential for land restoration : 1200 ha Potential for CFM : 850 ha Potential for reforestation: 1000 ha	Lowlands forests up to the buffer zone of the Ôbo NP
6	**Rio Lemba watershed** Santa Irene (3 MW)	503 inhabitants	Potential for land restoration : 1000 ha Potential for CFM : 800 ha Potential for reforestation: 1000 ha	Ponta Furada (95), Lemba (286), Claudina, San Clotilde (122). Lowlands forests up to the buffer zone of the Ôbo NP.

#	Watershed, Project site (capacity production)	Population	Potential of SLFM within the watershed	Communities in the watershed (number of inhabitants) and Socio-economic background Main ecosystems
7	**Rio Io Grande watershed** NB : this hydro production site will not be developped under the GEF Project	511 inhabitants	Potential for land restoration : 1000 ha Potential for CFM : 1500 ha Potential for reforestation: 2000 ha	Dona Eugénia, Manuel Caroca, Granja, Soledade (71), Fraternidade (51), Vieira Machado, Guaiaquil, Santelmo, Praia Io Grande (184), Mateus Sampaio (6), Nunes Oliveira (8), Dona Augusta (191). Lowlands forests up to the buffer zone of the Ôbo NP

2. STRATEGY

Project rationale and policy conformity

The project's goal is to reduce GHG emissions by creating favourable legal, regulatory and market environment and building institutional, administrative and technical capacities to promote the utilisation of the country's extensive mini/small hydropower potential for electricity generation to supply the EMAE grid and its isolated mini-grids. The objective is to assist the Government of STP in addressing the various barriers with a view to having the bulk of the country's electricity generation from mini/small hydropower stations, as outlined in the December 2008 report of the CECI Engineering Consultants, Inc. of Taiwan. 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.
In the business as usual scenario, the share of mini/small hydropower for electricity generation within the same time-frame up to 2030, as elaborated by the Taiwanese consultants might remain negligible, similar to what it is at the present time. The project will accomplish this by supporting the Government of Sao Tome and Principe in:

- Creating attractive and competitive business terms and conditions for investors, such as providing financial incentives towards project development and implementation, which will give developers long-term stability and provide for sufficient investment return;
- Streamlining and simplifying the administrative procedures for developers of mini/small hydropower projects for electricity generation and assisting the Ministry of Public Works, Infrastructure, Natural Resources and Environment to promote this market through strengthening of the one-stop shop within EMAE; and
- Facilitating implementation of mini/small hydropower projects by assisting to put in place a fair and transparent project selection process, supporting subsequent negotiation and signature of Power Purchase Agreements and providing technical support and oversight throughout the construction process.

Institutional Structure

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 management and to combat land degradation. It designs and implements policy for agriculture and forestry sectors. The CADR (Centre d'Appui au Développement Rural) is a decentralized state technical structure. They have an overall authority to organise, monitor and coordinate development activities within their respective scope of expertise (mainly agriculture, but also forestry).

The focus of the project is 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, forests degradation, erosion, bushfires), exacerbated by climate change and droughts. The project will achieve this sustainable land and forest management through the establishment of Integrated Watershed Management Plans (IWMP), which include the development 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 has also a Community Trust (CT) component, which will provide long-term financing for land and forest management in the watershed.

Country ownership: country eligibility and country drivenness

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 with the last one prepared in October 2013 and entitled "Grandes Opções do Plano para 2014" (Major Options of the Plan for 2014). As per 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 (PRSP-2 - Poverty Reduction Strategy Paper), 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 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 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 adopted at the 2012 Conference of Ministers on a green economy. This Vision 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 for 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 in the country. As per these National Communications, GHG emissions were 378.9 million tCO_2 in 2005 and, in the absence of mitigation measures, were forecasted to climb as high as 740.7 million tCO_2 by 2030. Hence, increased use of biomass energy is one of the options in a basket of measures that the Government wants to pursue to reverse the trend in GHG emissions.

Sao Tomé and Principe ratified the relevant conventions for this project: The United Nations Convention to Combat Desertification (UNCCD) in 1998 and the United Nations Framework Convention on Climate Change (UNFCCC) in 1999. The country is committed to implementing these conventions and has been reporting regularly on progress towards the conventions' objectives.

During the project, the development of new hydropower plants will 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.

Design principles and strategic considerations

The project will promote a market-driven approach to encourage the participation of the private sector to supply electricity to the EMAE grid, including isolated grids, from mini/small hydropower generation. In line with GEF requirements, "the emphasis will be upon developing policies and regulatory frameworks that provide limited incremental support to strategically important investments", such as investment in replacing imported diesel for electricity generation with locally-available hydropower, allowing the country to move towards energy independence and increased energy security in an environmentally and climate-friendly way. Further, the "host country willingness to adopt favourable policies and to follow through on the initiatives" was demonstrated by the Government through the "Grandes Opções do Plano para 2014" (Major Options of the Plan for 2014). As per 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". Thus, the project will assist the Government to realize the objectives of the "Grandes Opções" through the design and adoption of policies/regulations and the provision financial incentives aimed at promoting mini/small hydropower for on-grid and off-grid electricity generation.

Project objective, outcomes and outputs/activities

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 management and to combat land degradation.

The project objective is: To introduce an integrated energy and ecosystems-based approach to grid/isolated-grid-based mini/small hydropower generation and sustainable watershed management.

The focus of the project is 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 that has no access to electricity services. This is proposed to be achieved through the participation of the private sector.

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.

The project will integrate the hydroelectricity development objective with sustainable land and forest management at the watershed level. Through a landscape approach, the project will implement the concept of Integrated Watershed Management (IWM) in STP, which provides a framework to integrate natural resource management with community livelihoods improvement 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 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 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. 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.

***Component 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 activities under Component 1 will aim at removing legislative and institutional barriers, at national and local levels, which currently hamper private investments in hydroelectricity generation and developing integrated approaches for sustainable land and forest management, including Community-based Forestry Management that will provide a much more significant impact on climate change mitigation, lands conservation and sustainable forests management.
The expected outputs under this component are:

- Streamlined policy and legal/regulatory framework established and operational for (A) private sector electricity generation, and for (B) development of updated integrated resource and forestry/watershed management master plans and environmental safeguards for site development.

  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, livestocks breeding, ecotourism and renewable energy production. More specifically, the global benefits concerned under this output pertain to policy and legal barriers to land uses planning, natural resources co-management and community-based forestry.

  Activities will be: (i) update and validate the Forestry Management Master Plan,

  Drafted in 2002, the national Forestry Management Master Plan (FMP) is still not yet finalized and needs some updates. The MAPRD will then conduct further studies to update the FMP with (i) accurate data on the state of the forests, (ii) a deeper analysis of the Community based forest management, (iii) specific actions plan in the forestry sector for the next 5 years.

  (ii) Design legal texts for Community-based Forest Management development and for SLFM,

  Community-based Forest Management is a promising path for SLFM in STP. This is in the strategy of the MAFRD. However, no legal framework exist for community comanagement of natural resources. MAFRD, supported by legal experts and commissions as required, will draft legal texts aimed at removing existing legal and regulatory barriers to the effective involvement of communities through co-management of forests. Finally, at local level, a convention will be negotiated, agreed upon and signed by each Camara President and Community Leader to clarify roles, responsibilities and benefits in relation to management of the forests.

  (iii) Finalize, validate and promote an Integrated Water Resource Management Law,

  A first draft has been designed by the MPWINRE but is not yet finalized. The project will support the finalization and the validation of an Integrated Water Resource Management law. It will also support the vulgarisation of the law to different stakeholders who are using water resource at the watershed level.

(iv) Develop a generic framework for the Integrated Watershed Management Plan (IWMP) and establish specific IWMPs for potential hydro-production sites,

An essential element is for MAPRD and its partners to count on practical and tested 'tools' for the management of landscapes where the objectives of conservation, food and energy production and sustainable forests management are able to co-exist in a balanced, coordinated and sustainable way. A key tool identified during the PPG phase for this project is the Integrated Watershed Management Plan (IWMP). See page 19 to 21.

This activity will include the development of a generic framework for the IWMPs, which will focus on both the land uses planning aspect and on the integrated resource management. It will also put a focuss on the water supply services and biocarbon aspect of 'Land-Use, Land-Use Change and Forestry' (LULUCF) in the watershed. This will include e.g. the preparation of detailed and structured forms for collecting data, assessing the patterns of land use and defining landscape management priorities. Recognising that each IWMP will be different and given that different communities face different realities, minimum and ideal criteria for the development, wide endorsement and implementation of IWMPs will also be defined. MAPRD will be reinforced with the necessary skills to be able to provide GIS and landscape management services as well as water and biocarbon expertise to support the development of IWMPs. Partnerships with centres of excellence will also be sought in this regard.

Further to the development of the generic framework for IWMPs, the project will support practical experiences with preparing IWMPs by testing them in pilot sites and by ensuring adaptive learning and feedback.

In all pilot watershed, communities and management committees will be supported to assess their available land and water resource and its potential for provision of different goods and services and to define an IWMP (see feasibility assessment for more detail). Plans will have a global vision for sustainable management and use of all land, water, natural resources and energy in the watershed and will be developed through participatory workshops involving all stakeholders (village user groups, private sector, hydroelectricity producers etc.). This will support the Integrated Watershed model by identifying and defining zones and areas of land and water, used and managed by villages, which contribute different functions and may require different forms of management. For example:

- ***Community Forests (CFs):*** the principal purpose is sustainable use of natural resources that do not compromise forests conservation and provision of environmental services (e.g. ecotourism, honey, other sustainable harvests). Where CFs are adjacent to the Ôbo National Park, they will also function to support biodiversity conservation in the PA (through providing a buffer zone, extension of habitat and/ or migration corridor).
- ***Hydroelectricity plant lands*** : it includes the plant itself, but also the water pool and the pipe. The project will test the feasibilibty to introduce aquaculture upstream and dowstream the hydroelectricity plants in order to generate more income to the communities.
- ***Ecological Perimeters (EPs):*** they provide food (vegetables, fruits), wood (fuel wood and other purposes), non-wood products, fruits, medicinal plants, vegetables and orchards, water supply, saplings for replanting degraded CFs, secondary forests and firebreaks, fish in the water basin ;
- ***Shade forests*** : they are cacao or coffee plantations belonging to communities or private companies. Many of them need to be restored with high quality trees ;
- ***Agricultural lands***: they belong to smallholders or private companies. They are managed for crops and livestock, and need to get improved by agroecology (conservation) practices.

(v) Produce specific environmental saveguards framework for the hydropower site installation.

> The MPWINRE has functionning legal framework for the Impact Assessment Study before infrastructure construction. However, there is a need for specific guidelines development for hydro energy generation establishment.
>
> The environmental department of the MPWINRE, in partnership with the MAPRD, will develop an environmental saveguards framework for the hydropower sector. The environmental framework is designed to ensure protection of the environment, natural resource and particulary water quality in the the watershed. This document can be consulted by all stakeholders, including the investors.

- 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.

- Setting up of a one-stop shop 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 for evaluating hydropower projects and financial evaluation methodology for calculating small hydropower tariffs to be paid to IPPs, taking 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. This will include the development of working relationships between the Ministries relevant to land uses, natural resource and energy production.

Activities will be: (i) support the inter-sectoral work among government departments and streamline the inter-sectoral National Environmental Commission and the National Coordination Committee on SLFM,

This activity will support the coordination among government departments for NRM and particularly for water management and planning. It will involve in the energy, forestry, agriculture, land planning and natural resources sectors within the National Environmental Commission. In particular, this activity will bring the National Coordination Comittee on SLFM to a functionnal boby and to effective results 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,

This activities will include trainings and capacity building workshops. In particular, as key actor of the IWMP implementation, the forest guards and CADR local agents will received specific training for data collection (water, forests and other natural resources), but also for conflicts management. These trainings will be organized by CATAP with a support of international expertise.

More specifically, the forest gards will received support to strenghten their forest surveillance mission. This will start with improving the efficiency of the partnership agreement between MAFRD and the Ministry of Army to protect local agents from illegal loggers.

(iii) Dissemination of the forest law among the stakeholders at local level,

The Forest Law have been validated in 2001, but is still largely unknown by the local communities and the natural resources users. Some rules, such as keeping forests cover along the rivers, are not know by the farmers. For instance, during the PPG, communities met in the Lobata district were not aware of this legislation.

This activity will include local workshops, design and diffusion of illustrated posters which explain key rules to be respected (e.g. trees plantation along the river bank).

(iv) Develop a coordinated inter-sectoral database for sustainable lands and forests management at the watershed level.

Sharing information between all the stakeholders of a watershed is an essential element for an effective integrated management of the natural resource. Data (such as water quality and quantity, soil, etc.), that will be collected by local agents of the MAFRD, communities and other stakeholders of the watershed, will be gathered into an inter-sectoral database linked with a GIS tool . Then, each stakeholder can provide and find information on this database.

***Component 2*: To promote investment in mini/small-hydro through appropriate catalytic financial incentives for project investors.**

Table 4 above provides a list of potential projects selected on the basis of the 2008 Taiwanese study. These projects constitute a preliminary list that may be subject to change on the basis of additional information submitted by the short-listed investors during project implementation.
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, administration rules regarding its participation as fiduciary agent of 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 such as 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 project developers may require beyond completion of the project.

***Component 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 C02 emissions over 25 years through SFM, forest restoration and avoided lands 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 hydro-production.

  During the PPG, major gaps have been highlighted for official environmental data in STP. For exemple, 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 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 PAPAFPA) 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 3.

- Integrated managed lands in watersheds include at least 6,000 hectares 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.

  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 responsabilities of each stakeholders, (iv) a detailed workplan and budget. Each plan will be validaded by stakeholders during meetings, before its official approval by autorities. Together with this process, a co-management convention will be negotiated at the

local level, and agreed upon and signed by each local autority ("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, dissiminating 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. Among the few organisations working in STP in this field, AgriSud International is specialised in agroecology. The NGO is experimented and commited to provide cofinancing through a partnership to be signed at the beginning of the project. AgriSud International will support the organisation of trainings (educational contents, techniques, etc.) and the monitoring of the raining implementation. Two staff will be provided by the NGO.

With the support of this 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) 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 excpeted 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 dowstream water users (such as water used for irrigation purposes) in order to enlarge the implementation of the mechanism with non-energy uses.

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

Under Component 4, the project will assist the government in promotion and dissemination of good practice and replication of successful integrated approaches.
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.

Key indicators, assumptions and risks

Indicators

Key indicators of the project's success will include:

- Hydro-electricity generation of 51,921 MWh CO2 over the 5-year FSP project life cycle and subsequent generation of 15,871 MWh/year over the remaining portion of the 25-year lifetime of the plants.
- CO_2 emissions are reduced by 137,200 tons by the end of project activities.
- Post-project CO_2 emissions without replication are reduced by 874,200 tons, under the assumption of a 25-year equipment projected life.

- Indirect post-project CO_2 emissions with replication are reduced by 4,790,500 million tons, again assuming a 25-year equipment projected life and 80% GEF causality factor.
- Capacity developed within MPWINRE /EMAE and MAPRD to promote private sector investment in mini/small hydropower electricity generation.
- 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 6,995 inhabitants from 58 communities in sustainable forests and land management.
- Number of Integrated Watershed Management Plans (IWMPs) adopted by pilot sites.
- Number of hectares of forest under co-management (community forests).
- Number of hectares under Sustainable Agricultural Land Management (SALM) practices.
- Lessons learned are documented and distributed to potential investors/stakeholders through publications, videos and project website.
- Excepted for Bombain, the capacity factor of the other 3 power stations proposed for construction is about 50%. However, for Bombain, the factor is only 28%. Hence, by implementing the SLFM, the project will increase rainfall in the catchment area, thereby increasing the annual flow for the Abade River on which the power station will be located. This, in term, will increase the capacity factor of Bombain to 50% and maybe more. For the other 3 power stations, the capacity factor is also expected to increase.

Detailed indicators are provided in the Project Results Framework. The table below details the indicators for SLFM outputs and outcomes.

INDICATOR	EXPLANATORY NOTE
At objective level: To assist the Government in adressing the barriers to significantly increase grid/isolated-grid-connected mini/small hydropower capacity and to sustainably manage the watershed with an integrated approach.	
1. Number of Integrated Watershed Management Plans (IWMPs) adopted by pilot sites	▪ IWMPs are a key tool for ensuring the success of the project strategy. ▪ The greater the number of plans that are developed and adopted by communities early in the project the greater are the chances of the project objective being realised – both with respect to the forest and land conservation aspects and the hydropower development aspects.
2. Carbon stock enhancement in CFs effectively managed	▪ Secondary forests are not managed yet in STP: there is no management plans. The project will introduce and developped Community based Forestry Management. This include a participative management plan. ▪ During the inception of the project, forest inventories will be performed in each watershed. This initial data collection in the field will give the initial biomass stock (and then the carbon stock) of the forest. The "business-as-usual" (BAU) scenario is a yearly decrease of this stock at a conservative rate of 0,25% (Duveiller at al. 2008). ▪ According to the FRA 2010, the carbon stock in the forest of STP is 27 TC/ha (equivalent to 101 tCO2 / ha). As the project sites cover 6,000 ha of forests, it represents a stock of 606,000 tCO2. According to the BAU scenario this stock will loose 1,515 tCO2 every year. This is a total of 30,300 tCO2 losen during the 20 years lifetime. ▪ At the end of the project, data from forests inventories will be collected and compared to data at the beginning of the project. Then the indicator of Carbon stock enhancement will be calculated. Finally, project scenario (biomasse / carbon stock) will be compared to the BAU scenario. A global stock enhancement indicator will be calculated.
3. Number of hectares under Sustainable Agricultural Land Management	▪ At least 4,000 farmers will be trained for SALM practices implementation. Through a partnership with AgriSud International, farmers's plot under SALM will be monitored. Data (plot, surface, type of SALM practices implemented) will be referenced in the Monitoring database. ▪ This indicator is easy to track as it will be verified with the watershed database and the project's documents.
4. CO2 sequestration with trees plantation / forest rehabilitation.	• Trees will be planted at large scale in the pilot watersheds, mainly in cocoa agroforestry ecosystems (7,000 ha of rehabilitation of shade forests). Also 1,000 ha of savannah will be replanted. Surfaces of forest rehabilitation will be monitored (GPS localisation) by the Monitoring and Evaluation team (and reported in the watershed database), and corresponding tCO2 will be calculated. • The data provided by the international research center
At outcome 1 level **–** 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.	

5. Appropriate policy and framework arrangements are in place and operational: the Forestry Management Master Plan is updated and validated, legal texts for CF are designed and validated, Integrated Water Resource Management Law is validated and promoted, IWMP framework is designed, a specific environmental saveguards framework is validated.	• The Forestry Management Master Plan, drafted in 2002, will be updated at the beginning of the project and validated. • Legal texts for co-management of natural resources (Community Forest) will be designed and validated. • The integrated water resource management law, drafted at the time of the PPG, will be validated (if needed) and promoted. • A generic IWMP will be designed and validated by autorities and communities. • A specific environmental seveguards will be developed and validated. • This indicator is easy to track as it will be verified with the published documents.
6. (a) Number of staff belonging to DG Agriculture and Forestry, and key representatives of the five chamber districts and the Regional Delegation of Principe trained, and (b) A protocol for institutional cooperation between above institutions agrred and in place.	• During the PPG, the need for increased capacities was expressed by stakeholders at differents level: national in the Ministries, districts, communities, etc. The project will support trainings of staff. The indicator will be the number of staff sucessfully trained. A short evaluation at the end of the training should determined the success of a training for each staff who benefits from it. • A framework protocol will be drawn up between the 2 key Ministries responsible for the IWM: MPWINRE and MEFRD. This will facilitate the drafting and approval of IWMPs and validation of laws. Secondly, it will allow the establishment of working relationships and collaboration agreements at all levels (national to local) between Ministries, Districts and Project implementation. • The effectiveness of the protocol can and should be independently evaluated, although this will not be part of the Strategic Results Framework. • A inter-sectoral database for SLFM at the watershed level is one common project lead under the protocol. Its achievement sould highlight the effectiveness of the collaboration.
At outcome 3 level **–** Integrated land use, sustainable forest management and natural resource management provide social benefits and sustain environmental services at the watershed level.	
7. Carbon & Water flows indicators in selected watershed: enhancement of carbon stocks (tCO2/ha), reduced water deficiency, reduced erosion, increased sediment	• The choice of these indicators is preliminary and not representative of all watersheds. • Yet, they have been chosen for now, due to experience of the ongoing project in Rio Provaz. • More thorough assessments, including for the definition of the baselines will need to be carried out upon project inception. • Additional indicators will be identified as part of the Carbon & Water Monitoring Scheme.

retention, increased dry season stream flows	
8. Number of hectares of secondary forest covered by participative management plans.	• There is no management plans for secondary forests in STP. The project will develop participative management plan in the framework of Community Forests (itself belonging to the IWMP). • It is hence a useful indicator and easy to track.
9. (a) Number of farmers trained on good practices, (b) Increased of yield for crops under SALM.	▪ Dissemination of conservation farming practices will be done through trainings of farmers. Through a partnership with AgriSud International, farmers's plot under SALM will be monitored. Number of farmers trained will be reported as indicator. ▪ Moreover, period sampling of soil will also be collected and analyzed. Measure of increases in carbon content will be reported. Productivity data for crops planted in soils managed with proper practices will be monitored through survey. in parallel to measure the effectiveness of the technique in different types of soils for different crops. ▪ This indicator is easy to track as it will be verified with the watershed database and the project's documents.
10. (a) Number of ha reforested /forest rehabilitated.	• The project will support large trees planting actions in order to restore watershed lands functions (such as providing resources, alternatives incomes and environmental services). • Most trees will be planted in cocoa agroforestry systems (thus the approriate term *forest rehabilitation* is used). Trees plantation will be done in partnership with current actions of other stakeholders in the watershed (e.g. SATOCAO). • Surfaces of forest rehabilitation will be monitored (GPS localisation) by the Monitoring and Evaluation team (and reported in the watershed database), and corresponding tCO2 will be calculated (and will give the indicator of project's objective).
10. (b) Number of Ecological Perimeters established. Percentage of the increase of households' incomes.	• Ecological Perimeters (or EPs) are a new concept at the national level. A few are already established, e.g. within the framework of development projects. • Well managed EPs underpin the project strategy under this outcome because they allow for sustainable exploitation of natural resources, complementary to conservation efforts invested by villagers in the CFs.
10. (c) Increase of households' incomes.	• During the inception of project (first stage of the IWMP design), socio-economic data will be collected in each watershed. It will include yields and revenus from main crops (e.g. for the main crop, maize, average yield is about 2 tons per hectare – International Cooperation and Development Fund ICDF). Training on good cultivation techniques (output 3.3) will raise average yields compared to current level.This increase will be quantify thanks to this indicator. • With the implementation on activities under output 3.3, incomes generating activities will be developed. Socio-economic survey will be conducted at midterm and at the end of the project in order ti evaluate the increaseod households' incomes.

11. Amount of money (USD) collected every year in the Community Trust.	• The Community Trust (belonging to the FSM) is a simple mecanism based on PES which aims at securing financing for SLFM in the watershed in the long term. • The effectiveness of this mecanism will evaluated by amount of money in the Community Trust and disbursed every year for supporting communities's projects.

Assumptions

The assumptions are outlined in the Project Results Framework below.

Risks

The project presents some risks which are discussed in the Table 8 below:

Table 8: 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	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

from production sectors such as infrastructure, agriculture, and local communities.		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/Wildlife	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	

Financial modality

The project is aimed at policy development, capacity building, technical assistance and the provision of financial incentives to catalyse private sector investment in mini/small hydropower electricity generation. A substantial part of GEF climate change resources will be allocated to a Financial Support Mechanism (FSM) that would "protect" private sector investors in case of payment default by EMAE for energy already supplied to the grid. The FSM will be initially capitalised in the amount of $ 1,000,000 from GEF funds and $ 200,000 from UNDP. The FSM will be a non-grant mechanism and the funds will be deposited with the Central Bank. 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 and the transfer of funds to project developers will be conditional upon GHG reductions having actually been realised The project objective will be attained through technical assistance and facilitating third parties' investment in mini/small hydropower for electricity generation. No loan or revolving-fund mechanisms with GEF funds are considered appropriate, and, therefore, grant-type funding is considered as the most suitable to enable successful delivery of the project outcomes.

Cost-effectiveness

As indicated under the heading "The Economics of Electricity Generation from Mini/Small Hydropower in Sao Tome and Principe" on page 12, 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.

The project is expected to be approved in time to commence activities in early 2015. Under this scenario, 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 in March 2016, i.e. 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 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 in January 2017. Hence, by July 2017, 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 tCO_2/MWh (Ref. Second National Communication to UNFCCC). Consequently, during the 5-year project period, slightly over 45,400 tons of CO_2 would have been avoided as a direct result of hydropower electricity generation. Including SLFM activities, an additional 115,800 tons of CO_2 would be avoided, giving a total of 161,200 tons of avoided CO_2 or equivalent to $ 32.7 of GEF funds per tCO_2 ($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 CO_2 reduced of 1,018,200 (857,000 + 161,200) tons, including the CO_2 reduction related to sustainable land and forest management; this is equivalent to $ 6 of GEF funds per tCO_2 ($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 CO_2 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 CO_2.

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 Principe, 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 tCO_2.

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: SATOCAO) 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 Bank, 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 programmes indicate 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 tCO_2/year.

Table 6 below summarises the global environmental impacts, including direct and indirect total CO2 emissions reduction, achieved during implementation of the project and beyond.

Table 9: 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		
Component 2 (CCM): 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	

GEF Investment Element	Total	Aprox. GEF investment per unit ($)
Components 3 (LD & SFM impact on CCM): Expected emissions reduction and sequestration from the Component 3 investment	115,800 tCO_2 up to the project completion + 579,000 tCO_2 over the next 20 years = Total of 694,800 tCO_2	
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..

Sustainability

From a technical point of view, the viability of mini/small hydropower for electricity generation has been proven in the international market, both in the context of developed and developing countries. By addressing the non-technical barriers that impede the development of mini/small hydropower in STP, the project will assist in creating

a sustainable niche through strengthening the policy, institutional, legal, regulatory and operational capabilities of the key national institutions, supporting the development of mini/small hydropower through a market-driven approach, developing national capabilities and disseminating information. These efforts should ensure the long-term sustainability of mini/small hydropower for electricity generation in the country.

With regard to the financial sustainability of the 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, it will provide its services to project developers on a cost-recovery basis. This, it is expected, will generate a constant stream of income to sustain the operations of the Special Unit after project completion.

From a financial point of view, the project will help introduce transparency by developing a competitive institutional model for the selection/award of project sites for development. Furthermore, the project will support the integration of local industries into the hydropower sector. This will be achieved through the provision of focused support to farmers involved in agriculture/forestry for sustainable watershed management, local engineering firms/specialised engineering workshops for construction, installation, operation, maintenance and repair of equipment. With the increase over time in mini/small hydropower installations, it is envisaged that such efforts will intensify with opportunities being created for additional players to provide such services.

Environmental sustainability issues related to the development of the Integrated Watershed Management model and the implementation of Community Forest (CF) and Sustainable Agricultural Land Management (SALM) practices are addressed directly by a number of project activities, in particular:

- Integrated Watershed Management Plans (IWMPs) will provide the strategy and the action plan of the watershed to protect land, forest and ecosystems, and its environmental services such as water quality & quantity regulation;
- Local agreements for co-management of natural resources will be negotiated for long term management;
- The Water & Environmental Monitoring Scheme will monitor trends in water flows within the watershed and will support the implementation of the Financial Mechanism based on Payment for Environmental Services.

Sustainable income-generating options will be developed, including mushrooms, ecotourism, honey, fruits and medicinal plants production, and fish farming will be experimented; all these will be coordinated under the IWMP. Ecological Perimeters will be established in each community for gardening, medicinal plant growing and large-scale tree plantations on the watershed lands; this in turn will reduce human pressure on natural resources. Co-management will be encouraged, thereby reducing fire risks and human pressure on land and biodiversity. Sustainable agricultural practices implementation and integration will also contribute to better management of available land. Last but not least, it is expected to roll out hydro energy production in communities of the watershed.

As regard the financial sustainability, this project will demonstrate that the Integrated Watershed Management model can produce tangible benefits for communities while maintaining the flow of environmental services from the ecosystems on which they depend. A Financial Mechanism will be set up and fuelled by payment from the IPPs based on sharing benefit scheme of the energy proceeds. This Community Trust will collect about 150,000 USD and will co-finance local activities for sustainable forest management and income generating activities. The results and impacts on local communities of sustainable economic activities carried out in the watershed lands will provide the stimulus to create new businesses and enterprises, increase demand for public and private services and promote the establishment of new agricultural and artisanal industries.

As regard the institutional sustainability, the MPWINRE and the MAFRD are the two institutional pillars of the present project. They are both fully committed to the project and their ability to sign and implement strong partnerships with different departments will be of critical importance to ensure overall project sustainability (this aspect is covered under Output 1.7.).

Replicability

The Project's potential for replicability within Sao Tome and Principe is very good since the project will adopt a bottom-up approach within the overall policy/investment framework that is envisaged to be developed to promote mini/small hydropower for electricity generation. Technical assistance for barrier removal and institutional strengthening to be provided under the FSP will facilitate such replicability since it will create the required institutional, policy, and technical conditions to enable the generation of renewed investor interest for the development of additional hydropower projects. Moreover, the lessons learned will be of great value to the neighbouring and SIDS countries sharing similar resource base, should they decide to tap into their respective mini/small hydropower resources for on/isolated-grid electricity generation.

Coordination with other GEF-related 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 a 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 – 2010, 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 CEREEECA (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.

3. PROJECT RESULTS FRAMEWORK

This project will contribute to achieving the following Country programme Outcome as defined in CPAP or CPD:
Outcome No. 4: By 2016, the Government and districts, as well as the population, adopt techniques and behaviour that promote a sustainable environment and ensure better prevention and management of risks and natural disasters.

Country Programme Outcome Indicators:
Indicator 1: Number of mini/small hydropower projects for electricity generation.

Primary applicable Key Environment and Sustainable Development Key Result Area (same as that on the cover page):
Promote the use of renewable energy and alternative sustainable habitats.
Mainstream environment and energy.

Applicable GEF Strategic Objective and Programme: To promote investment in renewable energy technologies.

Applicable GEF Expected Outcomes: Total avoided GHG emissions from utilisation of mini/small hydropower stations for electricity generation.

Applicable GEF Outcome Indicators: Avoided GHG emissions from utilisation of mini/small hydropower stations for electricity generation (tons CO_2) and \$/t CO_2.

	Indicator	Baseline	Targets End of Project	Sources of Verification	Risks and Assumptions
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. 2. Hydro-electricity generation Reduction of tons of CO2 over the 5-year	GHG emissions in the electricity generation sector has increased from 79,080 tons in 1998 to 101,480 tons in 2005. This increase is getting bigger due to a sustained increase in diesel fuel use for electricity generation. The present contribution of hydropower in the	Hydro-electricity generation of 51,921 MWh, resulting in direct reduction of 137,200 tons of CO_2 over the 5-year FSP project life cycle. Subsequent generation of 15,871 MWh/year and reduction of 874,200 tons of CO_2 over the remaining lifetime of the plants.	Project's annual reports, GHG monitoring and verification reports. Project Terminal Evaluation report.	Continued commitment of project partners, including Government agencies and investors/developers.

	FSP project life cycle. Subsequent generation MWh/year and reduction of CO2 over the remaining lifetime of the plants. 3. Three (3) Integrated Watershed Management Plans (IWMPs) are adopted, and 23,000 ha are under SLFM practices.	electricity generation mix of the country was a mere 8 % in 2013. No investment taking place in the grid/non-grid-connected mini hydropower sector. No IWMPs are yet developed in the country. No lands restoration techniques implemented in STP. A loss of approx. 1,515 tCO2 every year in the 6,000 ha of forest in the project sites. No large-scale reforestation driven by the GoSTP (private initiative exists, for a commercial purpose).	Estimated cumulative indirect GHG emission reduction of 4.8 million tons of CO_2 by 2035 on the basis of a conservative policy scenario and a GEF causality factor of 80%. At least 3 IWMPs for project sites have been successfully developed, adopted (endorsed) by communities and under implementation. 10,000 ha of lands under good management practices. At least an enhancement of 144,000 tCO2 during the 20 years lifetime. At least 35,000 tCO2 sequestered during the 20 years lifetime. 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 6,995 inhabitants from 58 communities in	Project's yearly reports. Project site visits and evaluation for verification	

			sustainable forests and land management.		
Outcomes					
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.	Frameworks finalized and available for consultation by potential investors and by watershed stakeholders.	None available at the present time.	To be completed within 12 months of project initiation and approved by Government early in Year 2.	Published documents. Government decrees/laws.	Commitment of the various Government institutions.
Output 1.1: Appropriate policy and legal/regulatory framework established and operational, for (A) energy sector and for (B) integrated watershed management.	Appropriate policy and framework arrangements are in place and operational: (A) For energy: Policy document outlining legal/regulatory framework that will guide private sector investment in hydropower drafted and operationalised. (B) For SLFM: Forestry Management Master Plan updated and validated, legal texts for CF designed and validated, Integrated water resource management law promoted, IWMP framework designed, specific	None available at the present time.	To be completed within 12 months of project initiation and approved by Government early in Year 2.	Published documents.	Commitment of the various Government institutions.

	environmental safeguards framework validated.				
Output 1.2: Technical report on grid capacity requirements to enable feed-in for grid-connected mini-hydro systems followed by development of an updated grid code.	Present grid code updated to ensure safe and secure switching in and out of hydropower stations, without disruption in quality of electricity supplied.	Not available at the present time.	To be completed within 12 months of project initiation and approved by Government early in Year 2.	Published documents.	Commitment of the various Government institutions and project developers.
Output 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	Standardised bidding documents for sites and PPAs drafted, and approved by Government authorities.	Not available at the present time.	To be completed within 11 months of project initiation and approved by the Government by the end of year 1. Competitive bidding for sites/concession areas completed by the end of year 1. PPAs for at least 4 MW of mini-hydro capacity signed by the end of the second year after project start.	Published documents. Documents awarding sites to private developers available. Signed PPAs available.	Continued investor interest.
Output 1.4: Setting up of a one-stop shop for issuance of construction licenses and permits to hydropower developers.	One-stop shop is established and operational. Information brochure and website are available.	Under the business-as-usual scenario, the average time to secure all required construction licenses and permits can take up to several years. None at the present time.	All construction licenses and permits are issued within 4-6 months of submission of documents.	Signed documents.	Continued investor interest.

Output 1.5: Standardised environmental methodology developed for evaluating hydropower projects, and economic and financial evaluation methodology for calculating small hydropower tariffs to be paid to IPPs.	Standardised methodologies developed and operationalized for environmental and ecofin analyses, and for determining feed-in tariffs.	None at the present time.	To be completed within 10 months of project initiation and applied by Government thereafter.	Project documentation.	Cooperation of Government entities and staff.
Output 1.6: Capacity developed within EMAE, local banks and key national actors such as Ministry of Public Works, Infrastructure, Natural Resources and Environment to appraise mini/small-hydro projects for development.	Proposed installed capacities/number of projects appraised for development.	None available at the present time.	4 MW of projects evaluated by Government staff by the end of year 1. Six Government staff trained during first 12 months of project.	Training modules/number of staff trained. Project report.	Concerned institutions willing to release staff for training.
Output 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.	Number of staff belonging to DG Agriculture and Forestry, and key representatives of the five chamber districts and the Regional Delegation of Principe trained on SLFM. Protocol for institutional cooperation between above institutions agreed and in place. A coordinated inter-sectoral database for SLFM at the watershed level is in	None available at the present time. None available at the present time. None available at the present time.	At least 50% of the staff is trained. To be completed within 10 months of project initiation and applied by Government thereafter. To be completed within 18 months of project initiation and applied by Government thereafter.	Training modules/number of staff trained. Protocol. Periodic project report.	Commitment of the various Government institutions.

	place.				
Outcome 2: Promotion of investment in mini/small-hydro through appropriate catalytic financial incentives for project investors.	Document outlining incentives drafted, approved and available to investors.	No comprehensive document available at the present time.	To be completed within 12 months of project initiation and applied by Government thereafter.	Project documentation.	Cooperation of Government entities.
Output 2.1: Financial Support Mechanism (FSM) established and capitalized to support private investment in grid/isolated-grid-connected mini/small-hydro.	Financial Support Mechanism (FSM) within the Central Bank of Sao Tome and Principe established and operationalised.	Not available at the present time.	To be completed within 12 months of project initiation and applied by Government thereafter.	Project report.	Cooperation of Government entities and staff.
Output 2.2: MOU signed with Central Bank of Sao Tome and Principe setting out the objective, funding mechanism and administration rules regarding its participation as fiduciary agent of the FSM.	MOU drafted, finalised and signed with the Central Bank of Sao Tome and Principe.	None available.	To be completed within 12 months of project initiation and applied by Government thereafter.	Project documentation.	Cooperation of Government entities and staff.
Output 2.3: Financial and other incentives to be provided to project developers.	Incentives to be provided by Government to project developers approved and operationalised.	No comprehensive document available at the present time.	To be completed within 12 months of project initiation and applied by Government thereafter.	Project documentation.	Cooperation of Government entities.
Output 2.4: Reports on financial closure with identified investors.	Documents on financial closure for at least 4 MW of hydro drafted and finalised with investors.	Not presently available.	Completed within 12 months of project start.	Project reports.	Continued investor interest.

Output 2.5: Report on completion of construction of at least 4 MW of on-grid/isolated-grid hydropower commissioned at various sites by end of project.	At least 4 MW of hydropower stations constructed and operational, either supplying the grid or isolated mini-grids.	No construction is being undertaken at the present time.	At least 4 MW of mini/small hydropower stations constructed by the end of project. 15,871 GWh of electricity generated annually at project end.	Site visits and project reports.	Supportive institutional, legal and regulatory framework.
Outcome 3: Integrated land use, sustainable forest management and natural resource management provide social benefits and sustain environmental services at the watershed level.	Number of ha under SALM practices. Carbon stock enhanced in the forests. CO2 sequestration with trees plantation / forest rehabilitation.	No lands restoration techniques implemented in STP. A loss of approx. 1,515 tCO2 every year in the 6,000 ha of forest in the project sites. No large-scale reforestation driven by the GoSTP (private initiative exists, for a commercial purpose).	10,000 ha of lands under good management practices. At least an enhancement of 144,000 tCO2 during the 20 years lifetime. At least 35,000 tCO2 sequestered during the 20 years lifetime.	Project's yearly reports. Project site visits and evaluation for verification Monitoring scheme.	Political support to the integrated approach at the watershed level remains very high, supporting national level reforms (removal of barriers) and development of private investments.
Output 3.1: 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.	Carbon & Water flows indicators in selected watershed: enhancement of carbon stocks (tCO2/ha), reduced water deficiency, reduced erosion, increased sediment retention, increased dry season stream flows	No comprehensive monitoring scheme exists at the present time.	At least 3 monitoring schemes providing sets of monthly data in each of the watershed.	Project Monitoring System (output 1.7).	Cooperation of Government entities, the communities and private sector.
Output 3.2: Integrated managed lands in watershed include a CF	Number of hectares of secondary forest covered by	0 hectares of secondary forest are covered by a	At least 6,000 ha of Community Forests established and covered	Project reports. Project Monitoring System.	Adoption of CF legal framework.

managed effectively for sustainable resource conservation.	participative management plans.	management plan in the country.	by a management plan among the project sites.		
Output 3.3: New methods and techniques of agroecology (conservation farming practices) reduce lands degradation in watershed.	a. Number of farmers trained on good practices. b. Increased of yield for main crops under SALM.	No training on SALM at the date of PPG (PAPAFPA project will initiate training in the next months).	At least 4,000 farmers are trained. At least 20% of yield increase for main crops under SALM.	Training reports. Survey reports.	Communities will change behaviour and commit to new practices if provided with alternatives and support to implementation.
Output 3.4: Watershed lands function to provide resources, alternative incomes and sustainable environmental services.	Number of ha reforested /forest rehabilitated. Number of Ecological Perimeters established. Percentage of the increase of households' incomes.	No large scale reforestation activities driven by the GoSTP. No Ecological Perimeters including IGA (the concept is new)	At least 7,000 ha are reforested / rehabilitated. At least 50 ha of EP under sustainable management. 20% increase in households' incomes.	Project reports. Baseline and follow-up surveys of rural livelihoods, EP production and IGA.	Communities will change behaviour and commit to new practices if provided with alternatives and support to implementation.
Output 3.5: Community trusts for re-investment of energy proceeds into community lands conservation are established and implemented.	Amount of money (USD) collected every year in the Community Trust.	No benefit sharing scheme established and operationalized in the country.	At least 100,000 USD collected every year from the 3rd year of project.	Project reports. FSM and Community Trust reporting documentation.	Investments of IPPs within the 2 years after project initiation. Cooperation of Government entities and private sector.
Outcome 4: Outreach programme and dissemination of project experience/best practices/lessons learned for replication throughout the region/among SIDS countries.	Outreach programme formulated. Project experience compiled, analysed and disseminated.	Lack of sufficient information to pursue programme.	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.	Growth of programme will be sustained.

Output 4.1: National Plan to implement outreach/promotional activities targeting domestic (and international) investors.	Plan available and operationalized.	No such plan available.	Completed within 18 months of project initiation.	Project documentation.	Expected expansion of programme.
Output 4.2: Capacity development of MPWINRE /EMAE and MAPRD to monitor and document project experience.	Capacity development material prepared. Data on project experience compiled.	No capacity development programme. None at the present time.	6 Government staff trained by the end of project. Completed within 6 months of project end.	Project reports.	Designation of staff by relevant Ministries.
Output 4.3: Published materials (including video) and informational meetings with stakeholders on project experience/best practices and lessons learned.	Project experience and best practices compiled, published and available on website.	Lack of information on best practices and lessons learned.	Completed within 6 months of project end.	Project documentation and web site.	Continued interest of stakeholders.

Total Budget and Work Plan

Award ID:	00087589	**Project ID(s):**	00094537
Award Title:	Sao Tome Land, Forest, Energy & Climate		
Business Unit:	STP10		
Project Title:	Promotion of environmentally sustainable and climate-resilient grid/isolated grid-based hydroelectric electricity through an integrated approach in Sao Tome and Principe.		
PIMS no.	4602		
Implementing Partner (Executing Entity)	Ministry of Public Works, Infrastructure, Natural Resources and Environment (MPWINRE).		

Fund ID	Resp. Party / Impl. Agent	Donor Name	Atlas Budgetary Account Code	ATLAS Budget Description	Amount Year 1 (USD)	Amount Year 2 (USD)	Amount Year 3 (USD)	Amount Year 4 (USD)	Amount Year 5 (USD)	Total (USD)	Notes
62000	MPWINRE	**GEF**	71200	International Consultants	65,000	25,000	15,000	15,000	15,000	135,000	a
			71300	Local Consultants	60,000	30,000	15,000	15,000	15,000	135,000	b
			71600	Travel	8,000	2,000	2,000	2,000	2,000	16,000	c
			74200	Audio Visual & Print Production cost	7,500	7,000	7,000	7,000	7,000	35,500	d
			72100	Contractual Services-Companies	73,000	15,000	10,000	10,000	10,000	118,000	e
			74500	Miscellaneous	10,000	5,000	5,000	5,000	5,000	30,000	
			75700	Workshop	3,000	0	0	0	0	3,000	f
				Total Outcome 1	**226,500**	**84,000**	**54,000**	**54,000**	**54,000**	**472,500**	
62000	MPWINRE	**GEF**	71200	International Consultants	50,000	25,000	25,000	25,000	25,000	150,000	g
			71300	Local Consultants	10,000	10,000	10,000	10,000	10,000	50,000	h
			71400	Contractual Services–Individuals	50,000					50,000	i
			71600	Travel	5,000	5,000	5,000	5,000	5,000	25,000	j
			72100	Contractual Services-Companies	1,000,000					1,000,000	k

Fund ID	Resp. Party / Impl. Agent	Donor Name	Atlas Budgetary Account Code	ATLAS Budget Description	Amount Year 1 (USD)	Amount Year 2 (USD)	Amount Year 3 (USD)	Amount Year 4 (USD)	Amount Year 5 (USD)	Total (USD)	Notes
			72200	Equipment and Furniture	10,000	9,160				19,160	l
			72800	Information Technology Equipmt	20,000					20,000	m
			74500	Miscellaneous	2,500	2,500	2,500	2,500	2,500	12,500	
				Total Outcome 2 (GEF only)	**1,147,500**	**51,660**	**42,500**	**42,500**	**42,500**	**1,326,660**	
4000		**UNDP**	72100	Contractual Services-Companies	**200,000**					**200,000**	**n**
				Total Outcome 2 (UNDP + GEF)	**1,347,500**	**51,660**	**42,500**	**42,500**	**42,500**	**1,526,660**	
62000	MPWINRE	**GEF**	71200	International Consultants	90,000	35,000	50,000	5,000	5,000	185,000	o
			71300	Local Consultants	30,000	30,000	30,000	30,000	15,000	135,000	p
			71400	Contractual Services–Individuals	122,200	136,600	151,000	165,400	165,400	740,600	q
			71600	Travel	11,500	11,500	12,000	12,000	12,000	59,000	r
			72100	Contractual Services-Companies	80,000	115,000	136,000	125,000	120,000	576,000	s
			72300	Material and goods	70,000	320,182	330,000	300,000	300,000	1,320,182	t
			72200	Equipment/Software	12,000	20,000	20,000	20,000	20,000	92,000	u
			72800	Information Technology Equipmt	0	20,000	0	0	10,000	30,000	v
			74500	Miscellaneous	0	0	0	0	0	0	
				Total Outcome 3	**415,700**	**688,284**	**729,000**	**657,400**	**647,400**	**3,137,784**	
62000	MPWINRE	**GEF**	71200	International Consultants	10,000	10,000	10,000	10,000	10,000	50,000	w
			71300	Local Consultants			10,000	10,000	10,000	30,000	x
			71600	Travel				5,000	5,000	10,000	y
			74200	Publications	2,000	2,000	2,000	2,000	2,000	10,000	z
			74500	Miscellaneous						0	

Fund ID	Resp. Party / Impl. Agent	Donor Name	Atlas Budgetary Account Code	ATLAS Budget Description	Amount Year 1 (USD)	Amount Year 2 (USD)	Amount Year 3 (USD)	Amount Year 4 (USD)	Amount Year 5 (USD)	Total (USD)	Notes
				Total Outcome 4	**12,000**	**12,000**	**22,000**	**27,000**	**27,000**	**100,000**	
62000		**GEF**	71400	Contractual Services–Individuals	47,520	47,520	47,520	47,520	47,520	237,600	aa
4000		**UNDP**	74599	Direct Project Cost	20,000	20,000	20,000	20,000	20,000	100,000	bb
				Total Management	**67,520**	**67,520**	**67,520**	**67,520**	**67,520**	337,600	
	SUB TOTAL GEF				**1,849,220**	**883,462**	**895,020**	**828,420**	**818,420**	**5,274,544**	
	SUB TOTAL UNDP				**220,000**	**20,000**	**20,000**	**20,000**	**20,000**	**300,000**	
			PROJECT TOTAL (GEF + UNDP)		**2,041,220**	**918,464**	**953,020**	**848,420**	**813,420**	**5,574,544**	

	Budget Notes
a	Partial costs of NR CTA and Int. Consultants for policy/reg. framework, IWMP design and environmental safeguards.
b	Policy and strategy documents, grid code, one-stop-shop, Forestry Master Plan, legal texts and specific training
c	International and domestic travel to project sites, Inception and training w/shops.
d	Publications of diffusion of the law, Strategy document, criteria/procedures.
e	Methodology and computer programme for database.
f	Inception workshop.
g	Partial costs of NR CTA and consultant for financial engineering for FSM.
h	Develop incentives to be provided to private investors.
i	Partial costs of NR CTA
j	International and domestic travel to project sites.
k	Contractual services - Financial Support Mechanism (FSM)
l	Equipment for business facilitation
m	Equipment for business facilitation
n	Contractual services - Financial Support Mechanism (FSM)
o	International consultancies for Community Forest and for experimentation of aquaculture.
p	Local consultants for Community Forest: (1) socio-economist, (2) cartographer.

	Budget Notes
q	Project core (long-term): Forestry & Water Engineer (5 years) + local communities agents (to be recruited progressively).
r	Domestic travel to project sites, international travel for IC, workshops.
s	Technical assistance for SALM techniques training and dissemination, and aquaculture experimentation monitoring.
t	Equipment for trees plantation (nurseries), forests protection. Material and equipment for the implementation of new soil management techniques.
u	Equipment for IGA in the communities.
v	IT for the project database creation and other uses: computers, printers, GPS, software.
w	Partial costs of N-R CTA and costs for mid-term review and Terminal Evaluation.
x	Local consultant for communication plan.
y	Domestic travels.
z	Publications - Communication tools and material, website.
aa	Project Personnel/management related cost.
bb	Others projects costs.

Summary of Funds:

	Amount ($) Year 1	Amount ($) Year 2	Amount ($) Year 3	Amount ($) Year 4	Amount ($) Year 5	Total ($)
GEF	1,821,220	898,464	933,020	828,420	793,420	**5,274,544**
UNDP (Cash)	220,000	20,000	20,000	20,000	20,000	**300,000**
UNDP (In Kind)	140,000	140,000	140,000	140,000	140,000	**700,000**
National Government	3,382,704	3,000,000	3,000,000	3,000,000	3,000,000	**15,382,704**
NGO (AgriSud International)	25,000	25,000	25,000	25,000	23,000	**123,000**
Banks (Afriland First Bank + EcoBank)	-	200,000	400,000	200,000	-	**800,000**
Private Sector (HidroElectrica, Renergia Ltd.)	-	1,000,000	1,400,000	1,000,000	-	**3,400,000**
TOTAL	**5,588,924**	**5,283,464**	**5,918,020**	**5,213,420**	**3,976,420**	**25,980,248**

4. MANAGEMENT ARRANGEMENTS

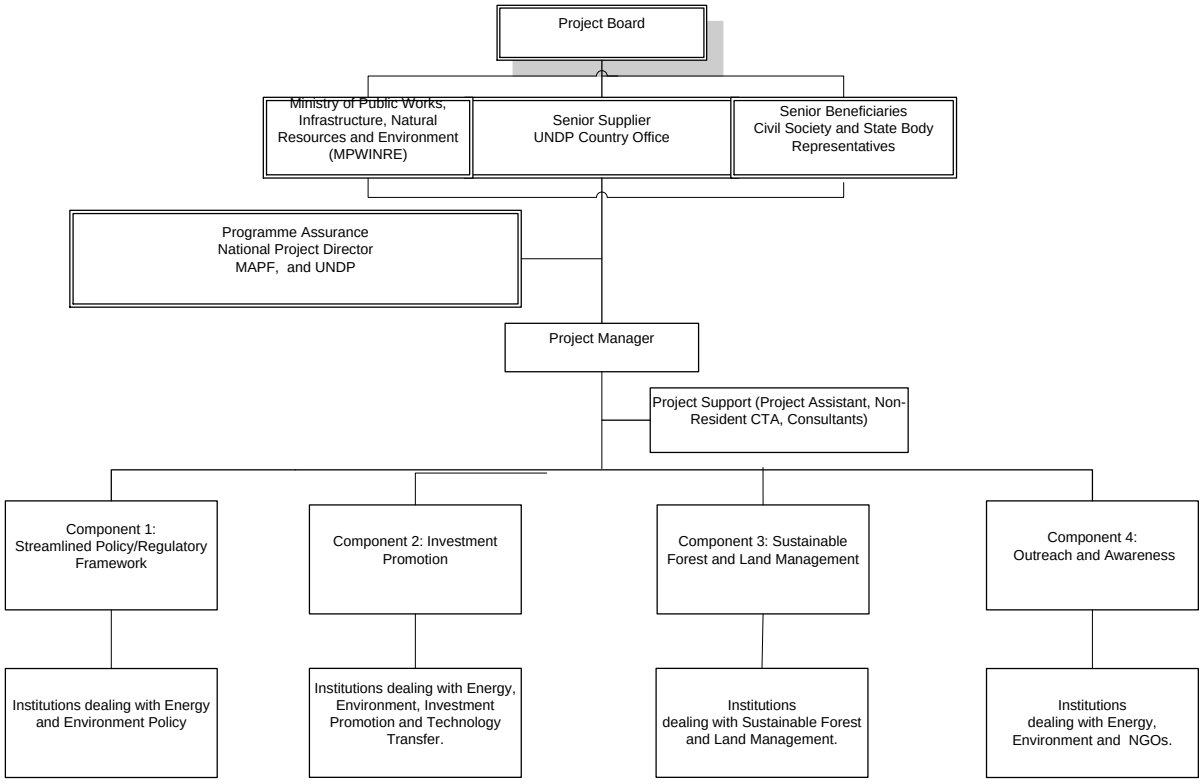
The project will be implemented through the NEX execution modality by the Ministry of Public Works, Infrastructure, Natural Resources and Environment (MPWINRE) as the National Implementing Partner (NIP). MPWINRE will provide office space to the project team as part of its contribution. The Ministry will assign a senior officer as the National Project Director (NPD) to: (i) coordinate the project activities with activities of other Government entities like the Empresa da Agua e Electricidade (EMAE – Water and Electricity Company), Ministry of Agriculture, Fisheries and Rural Development, Ministry of Finance, Central Bank of Sao Tome and Principe; (ii) certify the expenditures in line with approved budgets and work-plans; (iii) facilitate, monitor and report on the procurement of inputs and delivery of outputs; (iv) approve the Terms of Reference for consultants and tender documents for sub-contracted inputs; and (v) report to UNDP on project delivery and impact.

The National Project Director will be assisted by a Programme 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. In addition, a Project Assistant (PA) will be recruited to support the PM on administrative and financial issues. A technical staff / local agent will be stationed at each watershed of the project and will manage the field activities in collaboration with the communities. They will be recruited progressively during the project implementation. Furthermore, the need for additional staff for project implementation and supervision will be evaluated during the initial 6 months of the project.

The Project Manager will be supported by a non-resident Technical Adviser (TA), short-term international and national experts/consultants who will support implementation of specific technical assistance components of the project. 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. Contacts with experts and institutions in other countries that have already gained more experience in implementing mini/small hydropower projects, related policies and financial support measures are also to be established.

A Project Board, chaired by the Ministry of Public Works, Infrastructure, Natural Resources and Environment, will be established at the inception of the project to provide strategic directions and management guidance to project implementation. It will consist of representatives of the relevant ministries and Government departments (e.g. Empresa da Agua e Electricidade (EMAE – Water and Electricity Company), Ministry of Agriculture, Fisheries and Rural Development, Ministry of Finance, Central Bank of Sao Tome and Principe) participating in the project, the UNDP Country Office, the National Project Director as well as representatives of the NGO community. 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 Bratislava Regional Centre. Specific support services will include support for annual PIR review (project implementation review), mid-term review and Terminal Evaluation. An organogram representing the implementation arrangement is presented below.



Project implementation will be governed by the provisions of the present Project Document and Programme and Operations Policy and Procedure (POPP). UNDP Sao Tome and Principe will maintain oversight and management of the overall project budget, utilizing a direct payment modality. UNDP Sao Tome and Principe support services will be charged in accordance with the Agreement between the NIP and UNDP for the Provision of Services by UNDP. Governance of the Project will be supported through annual work planning as well as reporting and monitoring the delivery of results and impact on the basis of the results framework. The annual work plans as well as progress reporting will be the responsibility of the project management and will be approved by the NPD in close consultation with UNDP.

5. MONITORING AND EVALUATION

UNDP Sao Tome and Principe will be responsible for monitoring and evaluation (M&E), including organizing project evaluations, approving annual implementation work plans and budget revisions, monitoring progress, identifying problems and suggesting remediating actions, facilitating timely delivery of project outputs and supporting the coordination and networking with other related initiatives and institutions in the country and in the region.

During implementation, proper care will be exercised to have adequate communication and co-ordination mechanisms in place to ensure that areas of common interest can be addressed in a cost-efficient way.

The project will be monitored through the following M&E activities. The M&E budget is provided in the table below.

Project start:

A Project Inception Workshop will be held within the first 2 months of project start with those with assigned roles in the project organization structure, UNDP country office and where appropriate/feasible regional technical policy and programme advisors as well as other stakeholders. The Inception Workshop is crucial to building ownership for the project results and to plan the first year annual work plan.

The Inception Workshop should address a number of key issues including:

a) Assist all partners to fully understand and take ownership of the project. Detail the roles, support services and complementary responsibilities of UNDP CO and RCU staff vis-à-vis the project team. Discuss the roles, functions, and responsibilities within the project's decision-making structures, including reporting and communication lines, and conflict resolution mechanisms. The Terms of Reference for project staff will be discussed again as needed.
b) Based on the project results framework and the relevant GEF Tracking Tool, if appropriate, finalize the first annual work plan. Review and agree on the indicators, targets and their means of verification, and recheck assumptions and risks.
c) Provide a detailed overview of reporting, monitoring and evaluation (M&E) requirements. The Monitoring and Evaluation work plan and budget should be agreed and scheduled.
d) Discuss financial reporting procedures and obligations, and arrangements for annual audit.
e) Plan and schedule Project Board meetings. Roles and responsibilities of all project organisation structures should be clarified and meetings planned. The first Project Board meeting should be held within the first 12 months following the inception workshop.

An Inception Workshop report is a key reference document and must be prepared and shared with participants to formalize various agreements and plans decided during the meeting.

Quarterly:

- Progress made shall be monitored in the UNDP Enhanced Results Based Managment Platform.
- Based on the initial risk analysis submitted, the risk log shall be regularly updated in ATLAS. Risks become critical when the impact and probability are high. Note that for UNDP GEF projects, all financial risks associated with financial instruments such as revolving funds, microfinance schemes, or capitalization of ESCOs are automatically classified as critical on the basis of their innovative nature (high impact and uncertainty due to no previous experience justifies classification as critical).
- Based on the information recorded in Atlas, a Project Progress Reports (PPR) can be generated in the Executive Snapshot.
- Other ATLAS logs can be used to monitor issues, lessons learned etc. The use of these functions is a key indicator in the UNDP Executive Balanced Scorecard

Annually:

- Annual Project Review/Project Implementation Reports (APR/PIR): This key report is prepared to monitor progress made since project start and in particular for the previous reporting period (30 June to 1 July). The APR/PIR combines both UNDP and GEF reporting requirements.

  The APR/PIR includes, but is not limited to, reporting on the following:
  - Progress made toward project objective and project outcomes - each with indicators, baseline data and end-of-project targets (cumulative)
  - Project outputs delivered per project outcome (annual).
  - Lesson learned/good practice.
  - AWP and other expenditure reports

- Risk and adaptive management
- ATLAS QPR
- Portfolio level indicators (i.e. GEF focal area tracking tools) are used by most focal areas on an annual basis as well.

Periodic Monitoring through site visits:

UNDP CO and the UNDP RCU will conduct visits to project sites based on the agreed schedule in the project's Inception Report/Annual Work Plan to assess first hand project progress. Other members of the Project Board may also join these visits. A Field Visit Report/BTOR will be prepared by the UNDP CO and UNDP RCU and will be circulated no less than one month after the visit to the project team and Project Board members.

Mid-term of project cycle:

The project will undergo an independent Mid-Term Review at the mid-point of project implementation around July/August 2017. The Mid-Term Review will determine progress being made toward the achievement of outcomes and will identify course correction if needed. It will focus on the effectiveness, efficiency and timeliness of project implementation; will highlight issues requiring decisions and actions; and will present initial lessons learned about project design, implementation and management. Findings of this review will be incorporated as recommendations for enhanced implementation during the final half of the project's term. The organization, terms of reference and timing of the mid-term review will be decided after consultation between the parties to the project document. The Terms of Reference for this Mid-term review will be prepared by the UNDP CO based on guidance from the Regional Coordinating Unit and UNDP-GEF. The management response and the evaluation will be uploaded to UNDP corporate systems, in particular the UNDP Evaluation Office Evaluation Resource Centre (ERC).

The relevant GEF Focal Area Tracking Tools will also be completed during the mid-term review cycle.

End of Project:

An independent Terminal Evaluation will take place three months prior to the final Project Board meeting and will be undertaken in accordance with UNDP and GEF guidance. The Terminal Evaluation will focus on the delivery of the project's results as initially planned (and as corrected after the mid-term review, if any such correction took place). The Terminal Evaluation will look at impact and sustainability of results, including the contribution to capacity development and the achievement of global environmental benefits/goals. The Terms of Reference for this evaluation will be prepared by the UNDP CO based on guidance from the Regional Coordinating Unit and UNDP-GEF.

The Terminal Evaluation should also provide recommendations for follow-up activities and requires a management response which should be uploaded to PIMS and to the UNDP Evaluation Office Evaluation Resource Centre (ERC).

The relevant GEF Focal Area Tracking Tools will also be completed during the Terminal Evaluation.

During the last three months, the project team will prepare the Project Terminal Report. This comprehensive report will summarize the results achieved (objectives, outcomes, outputs), lessons learned, problems met and areas where results may not have been achieved. It will also lay out recommendations for any further steps that may need to be taken to ensure sustainability and replicability of the project's results.

Learning and knowledge sharing:

Results from the project will be disseminated within and beyond the project intervention zone through existing information sharing networks and forums.

The project will identify and participate, as relevant and appropriate, in scientific, policy-based and/or any other networks, which may be of benefit to project implementation though lessons learned. The project will identify, analyse, and share lessons learned that might be beneficial in the design and implementation of similar future projects.

Finally, there will be a two-way flow of information between this project and other projects of a similar focus.

Communications and visibility requirements:

Full compliance is required with UNDP's Branding Guidelines. These can be accessed at http://intra.undp.org/coa/branding.shtml, and specific guidelines on UNDP logo use can be accessed at: http://intra.undp.org/branding/useOfLogo.html. Amongst other things, these guidelines describe when and how the UNDP logo needs to be used, as well as how the logos of donors to UNDP projects needs to be used. For the avoidance of any doubt, when logo use is required, the UNDP logo needs to be used alongside the GEF logo. The GEF logo can be accessed at: http://www.thegef.org/gef/GEF_logo. The UNDP logo can be accessed at http://intra.undp.org/coa/branding.shtml.

Full compliance is also required with the GEF's Communication and Visibility Guidelines (the "GEF Guidelines"). The GEF Guidelines can be accessed at: http://www.thegef.org/gef/sites/thegef.org/files/documents/C.40.08_Branding_the_GEF%20final_0.pdf. Amongst other things, the GEF Guidelines describe when and how the GEF logo needs to be used in project publications, vehicles, supplies and other project equipment. The GEF Guidelines also describe other GEF promotional requirements regarding press releases, press conferences, press visits, visits by Government officials, productions and other promotional items.

Where other agencies and project partners have provided support through co-financing, their branding policies and requirements should be similarly applied.

M&E Work Plan and Budget

Type of M&E activity	**Responsible Parties**	**Budget US$** *Excluding project team staff time*	**Time frame**
Inception Workshop and Report	▪ Project Manager ▪ UNDP CO, UNDP GEF	Indicative cost: 15,000	Within first two months of project start up
Measurement of Means of Verification of project results.	▪ UNDP GEF RTA/Project Manager will oversee the hiring of specific studies and institutions, and delegate responsibilities to relevant team members.	To be finalized in Inception Phase and Workshop.	Start, mid and end of project (during evaluation cycle) and annually when required.
Measurement of Means of Verification for Project Progress on *output and implementation*	▪ Oversight by Project Manager ▪ Project team	To be determined as part of the Annual Work Plan's preparation. 15,000	Annually prior to ARR/PIR and to the definition of annual work plans
ARR/PIR	▪ Project manager and team ▪ UNDP CO ▪ UNDP RTA ▪ UNDP EEG	None	Annually
Periodic status/ progress reports	▪ Project manager and team	None	Quarterly

Type of M&E activity	Responsible Parties	Budget US$ *Excluding project team staff time*	Time frame
Mid-term Review	▪ Project manager and team ▪ UNDP CO ▪ UNDP RCU ▪ External Consultants (i.e. evaluation team)	Indicative cost: 50,000	At the mid-point of project implementation.
Terminal Evaluation	▪ Project manager and team, ▪ UNDP CO ▪ UNDP RCU ▪ External Consultants (i.e. evaluation team)	Indicative cost : 50,000	At least three months before the end of project implementation
Project Terminal Report	▪ Project manager and team ▪ UNDP CO ▪ local consultant	0	At least three months before the end of the project
Audit	▪ UNDP CO ▪ Project manager and team	Indicative cost per year: 5,000	Yearly
Visits to field sites	▪ UNDP CO ▪ UNDP RCU (as appropriate) ▪ Government representatives	For GEF supported projects, paid from IA fees and operational budget	Yearly
TOTAL indicative COST Excluding project team staff time and UNDP staff and travel expenses		US$ 155,000 (+/- 5% of total budget)	

Audit Clause

The project audit will be conducted in accordance with applicable UNDP audit policies.

6. LEGAL CONTEXT

This document together with the CPAP signed by the Government and UNDP which is incorporated by reference constitute together a Project Document as referred to in the SBAA and all CPAP provisions apply to this document.

Consistent with the Article III of the Standard Basic Assistance Agreement, the responsibility for the safety and security of the implementing partner and its personnel and property, and of UNDP's property in the implementing partner's custody, rests with the implementing partner.

The implementing partner shall:

a) put in place an appropriate security plan and maintain the security plan, taking into account the security situation in the country where the project is being carried;

b) assume all risks and liabilities related to the implementing partner's security, and the full implementation of the security plan.

UNDP reserves the right to verify whether such a plan is in place, and to suggest modifications to the plan when necessary. Failure to maintain and implement an appropriate security plan as required hereunder shall be deemed a breach of this agreement.

The implementing partner agrees to undertake all reasonable efforts to ensure that none of the UNDP funds received pursuant to the Project Document are used to provide support to individuals or entities associated with terrorism and that the recipients of any amounts provided by UNDP hereunder do not appear on the list maintained by the Security Council Committee established pursuant to resolution 1267 (1999). The list can be accessed via http://www.un.org/Docs/sc/committees/1267/1267ListEng.htm. This provision must be included in all sub-contracts or sub-agreements entered into under this Project Document.

7. ANNEXES

Annex 1 – Offline risk log
Annex 2 – Terms of Reference
Annex 3 – TOR for the development of the Integrated Watershed Management Plans (IWMPs)
Annex 4 – Conservation farming practices: sustainable land management at the watershed level
Annex 5 – Global Environment Benefit of SLFM activities
Annex 6 – Terms of Reference for development of the Carbon & Water Monitoring Scheme
Annex 7 – Environment and social screening summary
Other Annexes – Tracking Tools (provided in separate file), Letters of Co-financing (provided in separate file)

ANNEX 1: OFFLINE RISK LOG

#	Description	Date identified	Type	Impact & Probability	Countermeasures/Mgt response	Owner	Submitted, updated by	Last Update	Status
1.	Political: A sudden change in Government could lead to delays in enacting any new legislation and implementing policies.	During PIF formulation.	Policy	P = 3 I = 3	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.	CO to monitor.			
2.	Institutional: Reluctance in some quarters of the Government to introduce the necessary policies/regulations in support of mini/small hydropower development.	During PIF formulation.	Institutional	P = 3 I = 3	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.	CO to monitor.			
3.	Flooding: Floods with watersheds can cause damages	During PIF formulation.	Technical	P = 1 I = 1	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	CO to monitor.			

#	Description	Date identified	Type	Impact & Probability	Countermeasures/Mgt response	Owner	Submitted, updated by	Last Update	Status
	in reforested areas and to mini/small hydropower installations.				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.				
4.	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.	During PIF formulation.	Operational	P = 3 I = 3	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	CO to monitor.			

#	Description	Date identified	Type	Impact & Probability	Countermeasures/Mgt response	Owner	Submitted, updated by	Last Update	Status
					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				
5.	Environmental/ Climate Change.	During PIF formulation.	Environmental	P = 3 I = 3	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.	CO to monitor.			
6.	Financial: Lack of commitment from private sector to invest in mini/small hydropower.	During PIF formulation.	Financial	P = 3 I = 3	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. In the	CO to monitor.			

#	Description	Date identified	Type	Impact & Probability	Countermeasures/Mgt response	Owner	Submitted, updated by	Last Update	Status
					unlikely event that investment does not materialize from these investors, alternative investors will be sought.				
7.	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.	During FSP formulation.	Operational	P = 3 I = 3	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, agro-ecology 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.	CO to monitor.			

P = Probability on a scale from 1 (low) to 5 (high). **I** = Impact on a scale from 1 (low) to 5 (high).

ANNEX 2: TERMS OF REFERENCE

1. Project Manager

Post title:	Project Manager (Full-time)
Office:	Project Management Unit (PMU)
Organisation:	Ministry of Public Works, Infrastructure, Natural Resources and Environment (MPWINRE)
Duration of Employment:	One year with possibility of extension
Duty station:	Sao Tome and Principe

II. Duties

- Lead, manage and coordinate the day-to-day activities of the PMU to be established within MPWINRE including administration, accounting, technical expertise, and actual project implementation and reporting;
- Facilitate the collaboration between MPWINRE and MAFRD, in particular for implementation of component 3.
- Lead the development of project design including preparation of consultants' and sub-contractors' terms of reference, identification and selection of national and international sub-contractors/consultants, cost estimation, time scheduling, contracting, and reporting on project activities and budget;
- Monitor and follow-up on the status of delivery by consultants, sub-contractors, etc.
- Coordinate activities of consultants including contract management, direction and supervision of field operations, logistical support, review of technical outputs/reports, measurement/assessment of project achievements and cost control;
- Assist in the design, supervision and outreach activities of the project;
- Provide technical support to mini/small-hydropower policy discussions and development;
- Act as a liaison/facilitator among the various stakeholders, including the private sector, international and national partners;
- Assume responsibility for the quality and timing of project outputs;
- Establish and maintain relationships and act as the key focal point with UNDP CO to ensure that all programming, financial and administrative matters related to the project are transparently, expediently and effectively managed, in line with established UNDP Rules and Regulations.
- Undertake other management duties that contribute to the effective implementation of the project.

III. Qualifications and Experience

Education:	• Master's degree or equivalent in engineering, economics, international development, social sciences, public administration or other relevant field.
Experience:	• Minimum of 5 years of experience in management, preferably in the energy field. • Proven ability to draft, edit and produce written proposals and results-focussed reports. • Proven experience working with Government, civil society, international organizations or donors in combination with the knowledge of economic and financial analysis, institutional, regulatory and policy frameworks. • Good knowledge of and experience with GEF Climate Change issues, operational modalities and familiarity with UNDP-GEF procedures would be an advantage; • Familiarity with UNDP rules, regulations and administrative procedures;

	• Prior knowledge and experience of the political, social and environmental factors and issues related to energy development and climate change mitigation in island countries; • Experience in the use of computers and office software packages (MS Word, Excel, etc.)
Language Requirements:	• Excellent Portuguese and English, both written and oral.

2. Project Assistant

I. Position Information	
Post title:	Project Assistant (Full-time)
Office:	Project Management Unit (PMU)
Organisation:	Ministry of Public Works, Infrastructure, Natural Resources and Environment (MPWINRE)
Duration of Employment:	One year with possibility of extension
Duty station:	Sao Tome and Principe

II. Functions

Under the overall supervision of the Project Manager, the Project Assistant will:

- Support the activities of international/national experts, potential investors and sub-contractors;
- Provide administrative support re. typing, filing, arranging visas for international experts/sub-contractors, maintaining project's financial records, etc.;
- Administer project accounting as per UNDP procedures;
- Assist the Project Manager in organising workshops, meetings of the Project Board and other events.
- Assist in procurement of goods and services;
- Draft letters of invitation and agendas for meetings of Project Board/workshops;
- Prepare background information, briefing materials, reports, etc., as required;
- Draft minutes of meetings, monitor/follow-up on actions required.

III. Qualifications and Experience

Education:

- Higher education in economics, management, accounting, finance or other related field.
- Specialized training in finance is desirable

Experience:

- 3 years of relevant administrative, accounting and financial experience at national and/or international level.
- Experience in the usage of computers and office software packages (MS Word, Excel, etc.).
- Previous experience of working for nationally executed programme (s) funded by bilateral/multilateral organisations.
- Practical experience in procurement will be an asset.

Language Requirements:

- Excellent Portuguese and English, both written and oral.

3. Technical Adviser

Post title:	Technical Adviser
Office:	Project Management Unit (PMU)
Organisation:	Ministry of Public Works, Infrastructure, Natural Resources and Environment (MPWINRE)
Duration of Employment:	30 weeks (over a 5-year period) (30 days per year including 2 missions of 5 days. Contracts for 12 months, renewable based upon performance). Duration of assignment to be reviewed within first 6 months of project implementation.
Duty station:	Home Office + Sao Tome and Principe

II. Duties

Under the overall supervision of the National Project Director, the non-resident Technical Adviser will:

- Work closely with the PM in coordinating and facilitating inputs of government agencies, partner organizations, scientific and research institutions, subcontractors, and national and international experts in a timely and effective manner;
- Provide guidance and assistance to the PM and project staff to ensure that the project activities conform to the approved project document;
- Assist the PM during the initial 2 months of the project, in the preparation of an "inception report" which will elaborate on the project Logical Framework Matrix and planned project activities, the 1st year Annual Work Plan and Budget, ToRs for key project staff, and an M&E plan;
- Assist the PMU in development of relevant ToRs and recruitment/mobilization of qualified national and international experts and organizations as needed to provide specific consultancy and engineering services;
- Support the implementation of Financial Support Mechanism (FSM), and write the procedures of the Community Trust;
- In close cooperation with the PMU and UNDP's Focal Point on Energy and Environment, and in consultation with the project partner organizations and stakeholders, prepare Annual Project Work Plans to be agreed upon by the Project Board (PB);
- Provide "on-the-job" technical guidance and mentoring to the PMU in order to strengthen their capacity to effectively implement the technical aspects of the project;
- Support the PM in reporting to the PB on the progress of project implementation and achievement of project results in accordance with the project's logical framework matrix;
- Support the PMU in project-related meetings, as required;
- Review reports of national and international consultants, project budget revisions, and administrative arrangements as required by UNDP/GEF procedures;
- Assist the PM in the development of a concrete Monitoring and Evaluation Plan at the outset of the project (within inception report);
- Support the PM in preparing project progress reports, information releases, as well as monitoring and review reports in accordance with UNDP/GEF monitoring and evaluation rules and procedures;
- Support the PM in the preparation and implementation of mid-term and final Independent Evaluation Missions (TOR's, identification and recruitment of appropriate candidates, organization of missions, joint field missions and discussion with evaluators, etc.);
- Support UNDP CO staff on their annual monitoring visits to project sites.

III. Qualifications and Experience

Education:	• Postgraduate degree in energy/renewable energy development.

Experience:	• Minimum ten years of experience in implementing renewable energy projects in combination with knowledge of economic and financial analysis, institutional, regulatory and policy frameworks; • Good knowledge of and experience with GEF Climate Change issues, operational modalities and familiarity with UNDP-GEF procedures would be an advantage; • Experience with integrated project Energy / Forest / Agriculture would be an asset; • Familiarity with UNDP rules, regulations and administrative procedures; • Prior knowledge and experience of the political, social and environmental factors and issues related to energy development and climate change mitigation in Small Islands Developing States; • Computer proficiency, especially related to professional office software packages; • Excellent drafting and communication skills.
Language Requirements:	• Excellent English, both oral and written. Knowledge of Portuguese will be an advantage.

Project Consultants

TECHNICAL ASSISTANCE	
LOCAL CONSULTANTS	
Component 1	
Position/Title	***Tasks to be performed***
Policy Consultant (s)	S/he will undertake the following activities: • Review existing policies regarding mini/small hydropower. • Support the formulation of policy to regulate mini/small hydropower for on-grid/isolated-grid electricity generation. • Support the drafting of document that clearly outlines the roles and responsibilities of Ministry of Public Works, Infrastructure, Natural Resources and Environment (MPWINRE) and Empresa da Agua e Electricidade (EMAE – Water and Electricity Company) in mini/small hydropower development. • Support international consultant to determine the staffing requirements, draft staff profiles and participate in capacity development of one-stop shop staff. • Assist in developing guidelines for mini/small hydropower development projects for development. Estimated person weeks: 60
Forestry expert n°1	S/he will undertake the following activities: • Review existing Forestry Management Plan.

	• Update the Forestry Management Plan. • Develop guidelines for Community based Forest Management in STP. Estimated person weeks: 12
Policy Consultant	S/he will undertake the following activities: • Review existing policies in forestry sector. • Support the formulation of policy to promote Community based Forest Management. • Draft guidelines for Community Forest implementation (roles and responsibilities of each stakeholders: communities, Camara, MAFRD, etc.) • Assist in validation and implementation of the legal text. Estimated person weeks: 30
Forestry Trainer	The consultant will train the local agents of the MAFRD for forests surveillance, data collection, forest management and inventories, but also on self-defence. Estimated person weeks: 12
Database expert	The consultant will build, manage and maintain a database with all key project data for all watershed stakeholders' use, and for later roll-out purposes. Estimated person weeks: 12
Component 2	
Consultant to promote investment in mini/small-hydro through appropriate catalytic financial incentives for project investors.	S/he will undertake the following activities: • Support the international consultant to formulate regulations for managing Financial Support Mechanism. • Support international consultant to develop regulations for FSM. • Support EMAE in drafting/negotiating PPAs with IPPs. Estimated person weeks: 25
Component 3	
Participative Forestry / LU Management Expert (s)	S/he will undertake the following activities: • Initial participative assessment of the project zones: mapping, clear delimitation of the upstream forests, identification of the biodiversity and the ecosystems services, identification of the uses and the users of the natural resources. • Facilitation of participatory process to select target activities. • Produce detailed GIS-based maps for each of the project sites. • Assessment of the potential income generating activities for the communities. • Support the leaders in the transfer of knowledge within their respective communities. • Collection of data needed for the design of participatory forest management plan. • Produce final version of the development of Integrated Watershed Management Plan. • Produce final version of the development of Community Forest Management Plan. Estimated person weeks: 100

Component 4	
Consultant(s) on Outreach and Results dissemination	S/he will undertake the following activities: • Prepare report on project experience/best practices and lessons learned. • Disseminate project overall results, experiences and lessons learned through website, videos and publications. • Organize workshop(s) to present the lessons learned to stakeholders. Estimated person weeks: 70
INTERNATIONAL CONSULTANTS	
Component 1	
Position/Title	***Tasks to be performed***
Policy Consultant	S/he will undertake the following activities: • Support local consultant(s) in reviewing existing policies regarding mini/small hydropower. • Formulate policy to regulate mini/small hydropower for on-grid/isolated-grid electricity generation. • Determine the staffing requirements, draft staff profiles and participate in capacity development of one-stop shop staff. • Developing guidelines for the selection/award of hydropower sites for development. Estimated person weeks: 25
Participatory Environmental / Forestry / LU Management Expert	The consultant will: • Be in charge of designing the Integrated Watershed Management Plans (IWMP) methodology in close cooperation with MAFRD and MPWINRE. • Train the MAFRD agents for IWMP design and implementation. • Develop guidelines and train local consultants for IWMP design. See Annex 3. Estimated person weeks: 10
Environmental safeguards Expert	The consultant will undertake the following activities: • Produce specific environmental safeguards framework for the hydropower site installation. • Develop guidelines for the hydropower sites development. Estimated person weeks: 5
Component 2	
Consultant to promote investment in mini/small-hydro through	S/he will undertake the following activities: • Formulate regulations for managing Financial Support Mechanism. • Develop incentives to be provided to private sector investors. • Support EMAE in drafting/negotiating PPAs with IPPs.

appropriate catalytic financial incentives for project investors.	• Develop regulations for operationalising FSM. • Participate in the implementation of the capacity development programme. Estimated person weeks: 25
Component 3	
Community based Forest Management expert	For Output 3.1 Integrated managed lands in watersheds include a Community Forest managed effectively for sustainable resource conservation. The consultant will support the development of Community Forests in STP. He/she will undertake the following activities: • Formulate a practical guidelines describing the process of establishment of a Community Forests in STP • Design a Community Forest Management Plan methodology and a first example with a project site. • Train local agents of MAFRD Estimated person weeks: 15
Aquaculture & IGA expert	For Output 3.2 Watershed lands function to provide resources & alternative incomes based on sustainable management. The consultant will supply technical expertise and experience in other projects of sustainably intensive fish/shell farming in the specific context of a watershed with hydroelectricity production. His/her activities will include: assessment of the market potential, best access to market, technical support for experimentation of fish farms, training of local communities and NGO for follow up & dissemination of the experimentation. Estimated person weeks: 10
Waterflow & Carbon monitoring scheme	For Output 3.4 Waterflow monitoring in watershed providing information on natural resources and waterflow (quality and quantity) trends for adaptive management of conservation and sustainable exploitation. See ToR in Annex 4. Estimated person weeks: 20
Component 4	
Consultant on Outreach and Results dissemination	S/he will undertake the following activities: • Formulate plan to implement outreach/promotional activities targeting investors. • Prepare outreach/promotional material. Estimated person weeks: 20

Annex 3: TOR for the development of the Integrated Watershed Management Plans (IWMPs)

Terms of Reference for development of water basin-level Integrated Watershed Management Plans:

The project will facilitate the private investment for hydroelectricity production installation and will develop an Integrated Watershed Management approach in STP. Such an integrated landscape approach aims at improving livelihoods and protecting ecosystem functions, especially water resources regulation (for hydroelectricity production), in a context where ecosystems 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.

There is no overall vision or strategy for watershed management and planning for the needs of the future. For the project to achieve its objectives, it is essential to achieve such a vision and plan for land use allocation and management for different purposes at the watershed level. All users of the natural resources (in particular water) need to contribute to the IWMP.

The concept of Integrated Watershed Management in STP provides a framework to integrate natural resource management with community livelihoods improvement in a sustainable way. It involves better coordination of land, water and energy management and a village-scale approach to achieving sustainable development, biodiversity conservation and adaptation to climate change. 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 upstream. Watershed stakeholders will use and manage their available land to maximize production from agriculture, livestock and forestry on land allocated for these purposes. This will be done using appropriate forestry methods and improved agroecological practices.

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 communities 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.

An initial consultancy (1 year) will assist the project team in the development of a participatory methodology and model for Integrated Watershed Management Plan (IWMPs). This will be based on two principles:

- Sustainable natural resource management, land, forest and biodiversity conservation, water resource protection and climate change adaptation/ mitigation cannot be achieved at the watershed level without a shared and robust vision and plan for the watershed itself, which meets communities' and all stakeholders current needs for resources and for future development;
- With an overall shared vision, translated into a plan, each stakeholder can manage natural resources sustainably, sustain its production (e.g. hydroelectricity), take action for climate mitigation and also ensure long-term socio-economic development and the retention of young people in communities (slowing or stopping the current high rates of rural exodus).

The IWMP details a common vision on land & natural resource uses in the watershed and includes the specific use of lands which contribute to different functions and may require different forms of management. For example:

- ***Community Forests (CFs):*** the principal purpose is sustainable use of natural resources that do not compromise forests conservation and provision of environmental services (e.g. ecotourism, honey, other sustainable harvests). Where CFs are adjacent to the Ôbo National Park, they will also function to support biodiversity conservation in the PA (through providing a buffer zone, extension of habitat and/ or migration corridor).
- ***Hydroelectricity plant lands:*** it includes the plant itself, but also the water pool and the pipe. The project will test the feasibility to introduce aquaculture upstream and dowstream the hydroelectricity plants in order to generate more income to the communities.
- ***Ecological Perimeters (EPs):*** they provide food (vegetables, fruits), wood (fuel wood and other purposes), non-wood products, fruits, medicinal plants, vegetables and orchards, water supply, saplings for replanting degraded CFs, secondary forests and firebreaks, fish in the water basin;
- ***Shade forests:*** they are cacao or coffee plantations belonging to communities or private companies. Many of them need to be restored with high quality trees;
- ***Agricultural lands:*** they belong to smallholders or private companies. They are managed for crops and livestock, and need to get improved by agro-ecology (conservation) practices.

The consultancy will assist the project team and stakeholders to design, develop and implement IWMPs in an initial 3 watersheds, followed by dissemination of the method and experience to clusters of nearby watersheds.

In outline, the process will include the following stages:

- Stage 1: baseline/ reference surveys at watershed level. This will consist of participatory stakeholders meetings and workshops to build a comprehensive picture of the current watershed situation (who lives or works there; how long they have been there; what they do on which areas of land; what resources they need and are able to find/ exploit; what levels of satisfaction or dissatisfaction they record; whether they collaborate or compete with other nearby communities or stakeholders). Participatory mapping and other techniques will be used as required. Subjects will be covered in the order of greatest need/ priority as defined by stakeholders; this is critical to subsequent development of the plans to ensure that environmental issues (forest and land degradation) are made relevant to stakeholders.

- Stage 2: emergence of common vision and challenges of stakeholders toward natural resource in the watershed. In a similar participatory manner but with different groupings of stakeholders, stakeholders' use of the natural resource will be presented and their wishes for the future will be examined. What is their future vision for the watershed in 10 years' time? How do they see themselves/ their children/ newcomers fitting in that vision? Meetings will be driven by

stakeholders to ensure to ensure ownership of the process and commitment to the plan which will develop from it. This will also require a stage of reconciliation of different views and ideas (facilitated by a skilled moderator) to arrive at a shared and agreed vision for the future of the watershed.

- Stage 3: transformation of the vision & strategy into the Integrated Watershed Management Plan (IWMP), which will detail how sustainable use of watershed lands, natural resources and energy will help to implement the rural development vision. In this way, forest and land conservation (and then water resource flows regulation) become part of the solution (a means as opposed to an end). A detailed action plan will be developed from the agreed vision and adapted to each specific stakeholder's needs and availability of land and resources.

The consultancy will work in close collaboration with the community based forest management experts, as Community Forests is part of the Integrated Watershed Management.

Annex 4: Conservation farming practices: sustainable land management at the watershed level

During the PPG, the most suitable conservation farming practices have been identified. A partnership with AgriSud international, an NGO with large experience in SALM in Sao Tomé & Principe, has been discussed. The NGO has addresses a letter of co-financing, expressing his interest for collaboration. From the first assessment performed during the PPG, the project team, together with CIAT and AgriSud Internal, will build a training program promoting best practices under the component 3. Two categories of agroecological practices have been identified: (i) Farming techniques, (ii) Mechanical solutions. The assessment can be summarized in the following tables.

Farming technique	**Description and interest**	**Indicative Costs**
Agronomic practices		
Crop rotation	Nutrient management, nitrogen fixation	n/a
Cover crops and green manure	Nutrient management, nitrogen fixation, reduction of water erosion (splash effect) Implemented with Fabacea and Graminaea.	110 USD / ha
Intercropping	Nutrient management, nitrogen fixation, water efficiency	
Contour strip cropping	Herb strips are established according to the contour lines. They are efficient organic barriers. They contribute to water infiltration. They can be associated with zaï techniques, which have good results for food production, and lands restoration.	37 to 230 USD + 50 USD / year (maintenance)
Direct seedling under cover manure	With Mucuna pruriens and Tephrosia vogelii.	
Nutrient Management & soil fertility management		
Mulching	See Sustainable Agricultural Land Use Management (2002), World Bank.	
Improved fallows	Increase the biocarbon removal, and avoid hydro erosion thanks to a soil cover.	
Manures	Incorporated to an integrated agro-sylvo-pastoralism system.	
Composting	Compost is produced in small pitt. Green matters are put in the pitt for degradation.	34 USD / ha
Water management		
River bank protection	Reduction of hydro erosion thanks to trees plantation around the rivers.	
Tillage and residue management		
Residue management and “trashes lines”	At least 30% of the surface is covered by green waste after the harvesting (without burning). Reduced land erosion, better infiltration of water, conservation of soil humidity.	
Agroforestry		

Living fences / hedges tree planting / wind breaks	Wood production, reduce erosion, bring organic fertilization, and improve soil cover and nutrient management.	160 USD / ha
Agroforestry systems with multiple floors	High decrease of soil erosion. Coupled with an irrigation system and composting. Terrace of 0,5 m x 5 m, planted with calliandra calothyrus.	
Mechanical solutions	**Description and interest**	
Land Husbandry		
Anti-erosion dams	For slopes < 25%. Interception of rainwater in order to make better infiltration and reduce erosion.	140 to 175 USD / ha
Stone lines	Reduce water erosion, break water flow. In the contour lines, every 10 to 50 m.	80 to 300 USD
Terraces	With mud and stones. With a small slope to allow water infiltration. Efficient in STP context.	200 to 300 USD / ha
Water management		
Contour bunds and catchment strips	Break the water flows. Reduce hydro erosion.	80 to 300 USD
Half moon micro catchment	Half circle (4 m diameter, 20 cm deep) made in the slope. Better water infiltration.	100 to 300 USD / ha

Annex 5: Global Environment Benefit of SLFM activities

The project will mitigate greenhouse gas emission both through the promotion and adoption of SALM practices and through land-use change & forestry. The integrated watershed management (IWM) is the landscape participative framework, which aims at better planning the different land uses, and introducing solutions for field implementation. Three main solutions will be implemented:

- Community Forests (CF)
- Conservation farming (SALM)
- Afforestation / Forest rehabilitation

SLFM solutions	Cumulated GHG reductions within 20 years	Comments
Integrated Watershed Management (IWM)	The integrated watershed management (IWM) is the landscape participative approach which aims at better planning the different land uses, and introducing solutions for field implementation. => Indicator will be number of Integrated Watershed Management Plans.	
Community Forests (CF)	At least 6,000 ha of secondary forests will be co-managed with communities. This will enhance carbon stocks in the CF. => 144,000 tCO2 in 20 years.	See the methodological approach below.
Conservation farming (SALM)	At least 10,000 ha will shift from conventional practices to SALM practices under the project implementation. => 280,000 tCO2 in 20 years.	The methodology and assumption are presented below.
Afforestation / Forest rehabilitation	At least 7,000 ha will be planted (1,000 ha in savannah forest and 6,000 ha in shade forest) => 155,000 tCO2 in 20 years.	
Grand Total:	**579,000 tCO2 during 20 years**	

1/ Methodological approach for the carbon enhancement in the Community Forests (CF)

Preamble:

The aim of the PPG analysis was to calculate an approximate GHG emission reduction potential that will be generated by the project. Sao Tomé & Principe has very poor published data as shown in the FRA for

example. The PPG team did extrapolation works, but worked on published data for GHG emission reduction indicators.

For example, 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. Thus, for project's indicators design, the PPG team used the published rate of net deforestation in Central Africa (0.16% per year). Net degradation for the same region is 0,09% per year (Duveiller at al. 2008).

The quantification provided here is indicative only. A more detailed quantification will be presented in the monitoring plan of the Project, based on an approved baseline methodology and additional data collection. This work will be performed under output 3.1.

(a) Baseline scenario: quantification of the Baseline GHG emissions

Establishment of the baseline: An analysis of the current land-uses, the importance of the land-use drivers and motivations of the agents of change in the context of the project, suggests that land-use trends in the project areas are not expected to change significantly. No major shifts in land-use have been observed in recent years and no new land-use policies are expected to be implemented in the near future. However, an attention should be paid on large agri-business projects, such as palm oil.

As such, past land-use trends are expected to continue into the future. In this regard, historical processes of deforestation and degradation are most likely to continue into the future and would form the baseline for project.

Quantification of the baseline: To quantify the baseline, the project will need to make use of the historical trends from the project area and a reference area with the same legal classification and ecological characteristics as the project area.

As no forests inventories have been performed yet, it is impossible to quantify precisely secondary forests degradation. Thus no representative data exists for the pilot sites of the project. Note that forest inventories will be done as preliminary activities for CF development.

The published data available comes from the FRA. Within the 27,391 ha of secondary forests, 3,870,000 tC are stocked. According to Duveiller et al (2008) there is a decrease of this carbon stock at a annual rate of 0,25%.

Only the 6,000 ha of secondary forests that will be sustainably managed through a CF approach are considered now. The baseline scenario is a lost of 1,515 tCO2 every year, then a total of 30,300 tCO2 lost during the 20 years lifetime.

(b) Project scenario: quantification of the GHG emissions reduction

The quantification of avoided emission thanks to CF management :

There is no experience of CF in STP. Thus, as regards carbon stock enhencement, two hypothesis can be made:

- the CF achieved to reduce the trend of forest degradation reported by Duveiller et al (2008). Then the avoided emission are the emission that are not emitted every year because of forest

degradation. It is considered that there is no degradation thanks to CF. This approach appears to be very under-estimated as it doesn't take into account the biomassgrowth in the CF.

- 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 programs[14] 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.

The second hypothesis has been used as a proxi, with a conservative rate of carbon savings of 1.2 tons of CO2 / ha / year.

Carbon pools considered: For the purposes of these calculations only the Above-Ground Biomass (AGB) and Below-Ground Biomass (BGB) biomass were considered as these are the carbon pools that will be most impacted by the implementation of this project.

Approach for quantification: As secondary forests are not sustainably managed now and as there is no data from inventories, the PPG team used published data and made the two hypothesis presented above.

Project emission reduction potential:

A linear calculation over 20 years was made, based on the second hypothesis.

Thus a total of 144,000 tCO2 will be avoided thanks to implementation of Community Forest in STP.

2/ Methodological approach for the carbon benefits of the Conservation farming (SALM)

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. The main indicator of this objective will be the number of hectares under SALM practices.

The PPG team estimated the carbon benefits of the dissemination of conservation farming in the country. As no specific data exists for STP, published data have been collected during the assessment of SALM practices.

According to the World Bank[15], 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.

Thus a total of 280,000 tCO2 will be avoided thanks to implementation of SALM practices in STP.

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

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

3/ Methodological approach for the Sequestration in the trees biomass

This section quantifies the emission reduction based on the approach taken by the VCS (Voluntary Carbon Standard) because of the need of a recognized methodology for the calculation.

The quantification provided here is indicative only. A more detailed quantification will need to be presented during the project implementation, based on an approved baseline methodology and additional data collection (Monitoring Scheme).

At least 1,000 ha of savannah and 7,000 ha of shade forests will be restored. Surfaces of forest rehabilitation will be monitored (GPS localisation) by the Monitoring and Evaluation team (and reported in the watershed database), and corresponding tCO2 will be calculated. As wood species, location of plantation and model of plantation are not yet fully defined by the project (to be assessed by CIAT in collaboration with private sector), many approximation have been done. A full study needs to be done during the implementation of the project.

Calculation for the trees plantation in savannah ecosystems:

- Most (indigenous) trees planted in savannah ecosystems will be counted (only those which survived) by the Monitoring and Evaluation team, and corresponding t co2 will be calculated. This will be mainly Acacia, coconut, fruteira, etc.
- For this ecosystem, the data used as a proxy for the project is from *Acacia*. To account for this difference it was therefore necessary to convert the per hectare sequestration rate (tCO2/ha) into a per tree sequestration rate (tCO2/tree). This was done by dividing the sequestration rate per hectare by the tree density of a plantation with a spacing of 100 trees per hectare. This adjusted per tree sequestration rate was then multiplied by the total number of planted *Acacia* to achieve an estimation of the sequestration potential of this species.

  Thus the PPG team considered that reforestation in savannah ecosystem will allow a carbon sequestration of 0.25 tCO2 / ha / year. Thus a total of 5,000 tCO2 will be sequestred thanks to trees plantation in savannah ecosystems (Rio d'Ouro watershed).

Calculation for the trees plantation into shade forest:

Main trees will be planted into shade forests. This will be then forest rehabilitation. It will be mainly cacao plantations (Theobroma cacao) and coffee (Coffea sp.). This two species will be planted in association with Milicia excelsa, Cedrela odorata, Fagara macrophylla, Carapa procera. Also, Eritrina species.

According to Nair et al (2009) cocoa agroforestry system in Cameroon sequestered 5,9 tC/ha/year. According to Desmarais (2012), cocoa trees store 10 tCO2 / ha / year. However, forest rehabilitation activities of the project will shift from a degradated (unproductive) forest to a productive forest with an enhanced carbon stock. It means that more conservative sequestration rate should be taken, even if a young productive forest capture more CO2 than an old one (Bellasen, 2008). With a conservative approach, we consider then that reforestation in shade forest will allow a carbon sequestration of 1.25 tCO2 / ha / year. Thus a total of 150,000 tCO2 will be sequestred thanks to trees plantation in shade forest ecosystems.

Annex 6: Terms of Reference for development of the Carbon & Water Monitoring Scheme

The project will facilitate the private investment for hydroelectricity production installation and will develop an Integrated Watershed Management approach in STP. The Carbon & Water Monitoring Scheme will support the monitoring of environmental impacts of the project and the quantification of environmental services maintenance.

The concept of Integrated Watershed Management in STP provides a framework to integrate natural resource management with community livelihoods improvement in a sustainable way. It involves better coordination of land, water and energy management and a village-scale approach to achieving sustainable development, biodiversity conservation and adaptation to climate change. 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 upstream. Watershed stakeholders will use and manage their available land to maximize production from agriculture, livestock and forestry on land allocated for these purposes. This will be done using appropriate forestry methods and improved agroecological practices.

In order to sustain the Integrated Management of the Watershed, a financial mechanism will be set up by the project. 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 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 excpeted 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 project will establish and test a community-level Water & Environment Monitoring Scheme for the pilot watersheds included in the project. The Scheme will act as a tool for project monitoring, by measuring changes in key environmental indicators in watershed during the course of the project.

<u>Key Elements of the Water & Environment Monitoring Scheme</u>

- The Scheme needs to be appropriate for community-level implementation (use of recording and communication methods, (e.g. illustration, mobile phones) and existing networks/ methods of communication and transport available to villagers)

- The Scheme needs to be simple and replicable but based in good science, with choice of indicators, proxy and measurements which will answer specific questions about changes in environmental services (water regulation) over time and in response to conservation management and exploitation

- Indicators will need to be site-specific to answer questions about conservation impacts and to provide information on which to base adaptive forest & land management (e.g. adjustment of quotas and thresholds to maintain sustainable harvests or levels of intervention needed to enhance natural habitat regeneration).

- The level of survey and monitoring will vary according to the needs of each site (monitoring may need to be more intensive where it is designed to assess the impacts and sustainability of natural resource harvests or the success of specific conservation actions). All CFs will need a basic monitoring scheme with a minimum of 2 monitoring visits a year to assess condition of the site and to collect data. The basic scheme developed will be capable of replication to all watersheds in the country.

- Baseline levels will need to be established for indicators at all sites as early as is possible in project implementation.

- A system of centralized data collection and management (including feedback to communities managing sites and resources) will need to be established.

- Training and capacity building will be an essential part of setting-up the Scheme during the project (strengthening individual and network capacities – communities, MAFRD, MPWINRE, training, collaboration, joint working, exchange visits, setting up databases and recording systems etc.).

- Wherever existing monitoring schemes or ongoing research projects exist and are relevant to project sites, the Water & Environment Monitoring Scheme should link into these and draw on their data and expertise. For example they may provide biodiversity inventories, historical and baseline information about species and habitats of interest, specific research results about species which may be of interest for sustainable harvesting, etc.