REQUEST FOR CEO ENDORSEMENT

PROJECT TYPE: FULL-SIZED PROJECT

TYPE OF TRUST FUND: THE GEF TRUST FUND

PART I: PROJECT INFORMATION

Project Title: Developing a market for Biogas Resource Development and Utilization in Guinea			
Country:	Republic of Guinea	GEF Project ID:	5289
GEF Agency:	UNDP	GEF Agency Project ID:	4780
Other Executing Partner(s):	Ministry of Environment, Water and Forests, National Environment Committee, Ministry of Energy and Hydraulics, Ministry of Agriculture, Ministry of Livestock and Animal Production, and CERESCOR.	Submission Date: Resubmission Date: Resubmission Date:	12 February 2015 04 May 2015 15 May 2015
GEF Focal Area(s)	Climate Change	Project Duration (Months)	48
Name of Parent Program (if applicable):	n/a	Project Agency Fee ($):	251,532

A. FOCAL AREA STATEGY FRAMEWORK

Focal Area Objectives	Expected FA Outcomes	Expected FA Outputs	Trust Fund	Grant Amount ($)	Cofinancing ($)
CCM-3	Promote Investment in Renewable Energy Technologies.	Renewable energy capacity developed and installed.	GEF TF	2,647,706	11,000,000
		Total Project Cost		2,647,706	11,000,000

B. INDICATIVE PROJECT FRAMEWORK

Project Objective: Establish a functioning and effective market for the widespread use and commercialization of biogas technologies in Guinea.

Project Components	Grant Type	Expected Outcomes	Expected Outputs	Trust Fund	Grant Amount ($)	Confirmed Co-financing
1. Policy, institutional, legal and regulatory framework for the use of biogas as a sustainable source of renewable energy.	TA	Streamlined and comprehensive energy policy and legal/regulatory framework for the use of biogas as a sustainable source of	1.1 Appropriate policy and legal/regulatory framework on biogas production and utilisation formulated and operational. 1.2 Capacity of decision-makers and	GEF TF	350,000	1,500,000

		renewable energy.	stakeholders developed and strengthened to lead efforts to manage a biogas development and utilization programme in an integrated manner. 1.3 Comprehensive market assessment of the country's biogas resource potential completed and options for biogas and slurry utilisation developed.			
2. Business supply chain for sustainable and affordable biogas technology.	TA/INV	Promotion of investment in biogas technology through appropriate catalytic financial incentives to project developers.	2.1 Financial Support Mechanism established to support investment in biogas technology at the household, commercial and industrial levels. 2.2 MOU signed with ANAMIF to set out the objective, funding mechanism, administration rules governing the FSM. 2.3 Financial and other incentives for biogas technology applications developed and implemented for its use as a substitute for woody biomass and chemical fertiliser. 2.4 Up to 2,000 small (6 m3) family sized units constructed and installed. 2.5 Up to 10 large (20 m^3 or larger) bio-digester units constructed or installed by targeted commercial or institutional clients (Slaughter house,	GEF TF	1,000,000 (INV) 820,000 (TA)	7,500,000

			Health Centres and Professional Training Centre). 2.6 Specific indicators developed for monitoring and evaluating project impacts on volume of wood fuel/charcoal and diesel fuel displaced by biogas production and consumption, the amount of avoided GHG resulting from the increased use of cow dung, kitchen waste, etc. for biogas production and on opportunities for job creation in the biogas sector.			
3. Increased capacity/awareness of MFIs and consumers to adopt biogas technology to capitalise on the economic and environmental benefits that it provides.	TA	Programme to sustain a growing market of suppliers and users of biogas and its effluents, leading to overall improved livelihoods.	3.1 Developed capacity of MFI's/lending institutions to provide credit to consumers (farmers)/owners of household digesters and of larger units. 3.2 Training modules designed for key beneficiaries (bio-digester builders, component producers and service technicians), including certification, and comprehensive training packages delivered. 3.3 Developed capacity of farming households, commercial and industrial institutions to operate and maintain biogas digesters and to process bio-digester	GEF TF	357,706	1,650,000

			slurry into valuable products. 3.4 Sensitized key value chain actors through public awareness campaign of the value of biogas and its applications.			
				Subtotal	2,527,706	10,650,000
				Project Management Cost	GEF TF	120,000	350,000
				Total Project Cost		2,647,706	11,000,000

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

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

Sources of Co-financing	Name of Co-financier	Type of Co-financing	Amount ($)
National Government	Ministry of Environment, Water and Forests (through Ministry of Finance)	Cash	200,000
		In kind	300,000
National Government	Ministry of Energy and Hydraulics (through PRONIASE)	In kind	7,500,000
National Government	CERESCOR	In kind	500,000
National Government	University of Conakry	In kind	500,000
Private Sector	Microfinance Institutions	Cash	1,500,000
GEF Agency	UNDP	Cash	500,000
Total Co-financing			11,000,000

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

GEF Agency	Type of Trust Fund	Focal Area	Country Name/Global	Grant Amount ($) (a)	Agency Fee ($) (b)[2]	Total ($) c=a+b
UNDP	GEF TF	Climate Change	Guinea	1,786,484	169,716	1,956,200
UNDP	GEF TF	Land Degradation	Guinea	861,222	81,816	943,038
Total Grant Resources				2,647,706	251,532	2,899,238

E. DOES THE PROJECT INCLUDE A "NON-GRANT" INSTRUMENT? No.

PART II: PROJECT JUSTIFICATION:

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

1. The EU formulated a $ 4.15 million National Programme for household biogas in Guinea (Programme National de Biogaz Domestique en Guinée) that was scheduled for implementation during the period 2013 -2016. The objective of the programme was to improve access to modern energy services through the use of household biogas, resulting in the advancement of women, education, health and sanitation, agricultural productivity, income generating/employment benefits and a reduction in deforestation and GHG emissions.

ECOWAS, in collaboration with UNDP PREP (Regional Energy-Poverty Programme) and support of the European Union, formulated the $ 140-million PRONIASE (Programme National Intégré d'Accès aux Services Energétiques – National Programme for Integrated Access to Energy Services) to address the issue of access to modern energy services, targeting 15 of the poorest 33 Prefectures in the country, plus 2 of the 5 Conakry Urban Communes. PRONIASE was sub-divided under 6 sub-programmes covering access to modern energy services for agriculture, education, health, Multi-Functional Platforms, energy efficiency and fuels for household use. PRONIASE also envisaged, as a component of its activities on access to modern energy services, the construction of 2,000 pilot small scale biogas digesters (6 to 8 m^3) during the 4-year implementation of its first phase from 2013 to 2016. This timeframe was selected to be synchronised with activities aimed towards achieving the Millennium Development Goals and to contribute to Sustainable Energy for All (SE4ALL), including biogas for economic development. Specifically, under SE4ALL, the Government's objective is to develop biogas technology to meet the needs of 2,000 households by 2015 and 15,000 households by 2020.

When the project concept and design for the present GEF-funded project was initiated some 18 months ago, the PIF was formulated on the premise that construction of the 2,000 pilot small scale biogas digesters under the PRONIASE programme would proceed as planned and, as such, these digesters were assumed to be part of the baseline. Hence, the decision was made that the PIF would focus exclusively, in addition to dealing with policy, regulatory, institutional issues, etc., on larger size digesters (20 m^3 or larger) for commercial/industrial (cottage industries, slaughter houses, agro-industries) and institutional (hospitals, prisons, schools) clients.

Unfortunately, the partnerships on which PRONIASE was counting did not materialise, with the result that no resources have been mobilised yet. In addition, with only 2.5 years remaining, it is difficult to envision as to when the Programme will mobilise sufficient resources for it to start. Therefore, with a programme that has not yet started, completion of the installation of the 2,000 household digesters that would have constituted the baseline for the UNDP-GEF project remains very uncertain, as of now.

Consequently, the present status is that there is no experience in the country with household biogas digesters, although some experience exists/existed with institutional ones (see below), but the bottom line is that there is hardly any biogas digester, whatever be the size, that operates in the country at the present time. This point was highlighted during the Project Inception Workshop held in Conakry on 7 May 2014 and the approx. 50 participants from Government institutions, the private sector, micro-finance institutions, NGOs, etc. unanimously requested that the present project include household biogas digesters to compensate for the 2,000 that were planned for construction under the PRONIASE programme, but which may never materialise.

Household biogas digesters (6 m3 capacity) can meet the needs of rural families for cooking and lighting while the slurry from the digester provides an excellent source of organic (bio) fertiliser for use in growing vegetable or farming. Biogas eliminates the use of fuelwood/charcoal for cooking, thus contributing to reducing deforestation. The digesters themselves will be the fixed-dome type made of bricks and the gas produced will be utilised in gas stoves and lamps. Large-sized digesters are designed to meet the heating and electricity (albeit, partially) needs of institutional/commercial consumers.

There may be a misconception that household biogas does not work beyond project completion. Unfortunately, this is a lingering perception that is nowhere close to reality in present-day household biogas. Yes, experience over several years in developing countries have in the past shown that household digesters installed under 100% technical assistance programmes have generally failed after project completion; the same situation was experienced in Guinea during 1977-1999 with community-size digesters. However, this negative picture has drastically changed since SNV started the Dutch-funded household biogas programme in Nepal over 20 years ago. What has made the difference was that households we not given free digesters, like under programmes in the past, but were required to pay for them utilising savings for not having to spend on fuelwood/charcoal or time in collecting fuelwood: households now have to contribute some 10% of the upfront installation costs (this may be cash or in kind or a combination thereof) and take a loan for the balance; admittedly, a subsidy of about 20% is still being provided to jumpstart the market, but only in countries with new household biogas programmes. This has turned around the market in many countries in Asia, Africa and Latin America, as mentioned later in this document. Interestingly, in Asia, KfW/BMZ/GIZ have jumped on the bandwagon; in Nepal, AsDB provided loans for household digesters through the Agricultural Development Bank of Nepal.

In addition, the World Bank has since 2008 supported the China Eco-Farming Project with a $ 120 million loan which "has benefited around 500,000 rural households in 64 counties in five provinces – Anhui, Chongqing, Guangxi, Hubei, and Hunan - with 8 -10 m^3 digesters. Through the project, biogas digesters and stoves were installed in homes, animal sheds, toilets and kitchens built or rehabilitated to accommodate the system". Finally, there are over 500,000 household digesters operating under the "SNV" modality and this, from the point of view of GHG emission reduction, is in line with GEF's objective[1].

2. The PIF envisaged development and validation of a standardised baseline to facilitate and reduce transaction costs of biogas technology development under the CDM mechanism. When the PIF was formulated some 1 years and a half ago, the carbon market was doing well, enabling developing countries to capitalise on additional financial resources to advance their development agenda. However, the carbon market has since then almost "crashed", given the lack of demand for certified emission reduction units, and the situation is somewhat similar regarding the voluntary carbon market. Therefore, it does not make much economic and financial sense to focus on this issue at the present time. If, however, the carbon market happens to recover during implementation of the project, this issue will get re-visited under UNDP's adaptive management procedures and all efforts will be made to tap into it in order to access additional resources that the Government could use to expand development activities in the biogas sector.

3. As recommended by STAP during its review of the PIF, a separate set of activities have been included to develop specific indicators for monitoring and evaluating project impacts on the volume of wood fuel/charcoal and diesel fuel displaced by biogas production and consumption, the amount of avoided GHG resulting from the increased use of cow dung, kitchen waste, etc., for biogas to be used aa a substitute fuel for cooking and lighting, and on opportunities for job creation in the biogas sector.

A.1 NATIONAL STRATEGIES AND PLANS:

The Republic of Guinea is in West Africa, with Conakry as its capital. It is bordered by Guinea-Bissau, Senegal, and Mali to the North, Liberia and Sierra Leone to the South, Côte d'Ivoire to the East, and the Atlantic Ocean to the West and has 300 km of Atlantic coastline. It is sometimes referred to as Guinea-Conakry to distinguish it from 2 other countries bearing somewhat similar names: its northern neighbour Guinea-Bissau and the Republic of Equatorial Guinea which lies farther south-east in the Atlantic Ocean. It has a population of 10.7 million inhabitants (2013 Census preliminary results) consisting of 64% rural and 36% urban, living in an area that covers 245,857 km^2.

With a per capita GDP of $ 436 (National Institute of Statistics, 2013**),** Guinea is considered a low income country; in 2013, 55.2% of the population lived in poverty. It is heavily dependent on resources from the MFI, via its Extended Credit Facility, and other donors, to help reduce macroeconomic imbalances. In 2012, despite the international crisis, economic activity remained strong, supported by higher investments in agriculture and the mining sector. Real GDP grew by 3.9% in 2011 to reach 4.8% in 2012, compared with 1.9% in 2010 and inflation is presently 11.9% compared to 12.8% in 2012. However, electricity supply difficulties continue to adversely affect economic activities.

[1] More info on this is available at www.snvworld.org/en/biogas

Guinea is comprised of 4 natural distinct regions: la Guinée Maritime (West), la Moyenne Guinée (North), la Haute Guinée (North-East) and la Guinée Forestière (South-East). These areas have different geo-structural and ecological characteristics, with each corresponding to particular climatic conditions depending on the type of soil, fauna, flora, temperature, rainfall, etc. Water resources are abundant in Guinée Maritime and Moyenne Guinée, average in Haute Guinée and below average in Guinée Forestière.

The country is largely dependent on agriculture and mineral production (mainly bauxite and alumina, although diamond and gold are also mined), with the former sector highly vulnerable to climate change.

Fig. 1: Map of Guinea

Agriculture is the main activity for almost 80% of the population of Guinea and the main livelihood for 57% of rural inhabitants. As is the case in most African countries, agriculture is essential for the attainment of the goals of poverty reduction and food security. Guinean agriculture is extensive, dominated by a traditional farming system and highly dependent on rainfall for 95% of the area under crops; the area of irrigated land is insignificant (30,200 hectares). Agriculture contributes less than 20% of GDP and its share has declined steadily in recent years.

Most of the population (more than 80%) works in the agriculture and livestock sector. The livestock population is estimated to be 28 million in 2013 with 5.8 million of cattle, 1.5 million of sheep, 2.4 million of goats, 0.13 million of pigs and 19 million of poultry. Half of the cattle population is concentrated in the north of the country where animal husbandry is a more important form of land use. In that region, the average heads of cattle per household is 10, and even up to 15 in some places. The farming system is intensive during the rainy season and extensive during the dry season. Most of the farming systems are mixed, with livestock always associated with agricultural activities (the production of food crops). Agriculture is the dominant economic sector across the entire country. The farming growth rate is 8% per year.

Guinea has considerable untapped agricultural potential, with natural conditions suitable for cultivation of a wide range of agricultural products. It is estimated that there are 6.2 million hectares of potential arable land, of which 25% are farmed and less than 10% are cultivated on an annual basis. The rainy season generally lasts from April through October when rainfall is abundant in certain parts of the country, ranging from 1,100 mm in the north to 4,000 mm in the Conakry region. With its by-products from agriculture and livestock used for traction, milk and meat production, the country has a sizeable resource of animal dung and crop residues for biogas production to relieve pressure on its natural biomass resources. In December 2012, the Guinean Government adopted the National Agricultural Investment and Food Security Plan (PNIASA), whose main goal is to enhance food security by diversifying and increasing food and animal production to promote food sovereignty and to increase agricultural revenue by developing economic opportunities and improving market access, as well as by developing cross-cutting support measures to guarantee effectiveness of investments (Source: World Bank). PNIASA consists of 6 programmes, viz:

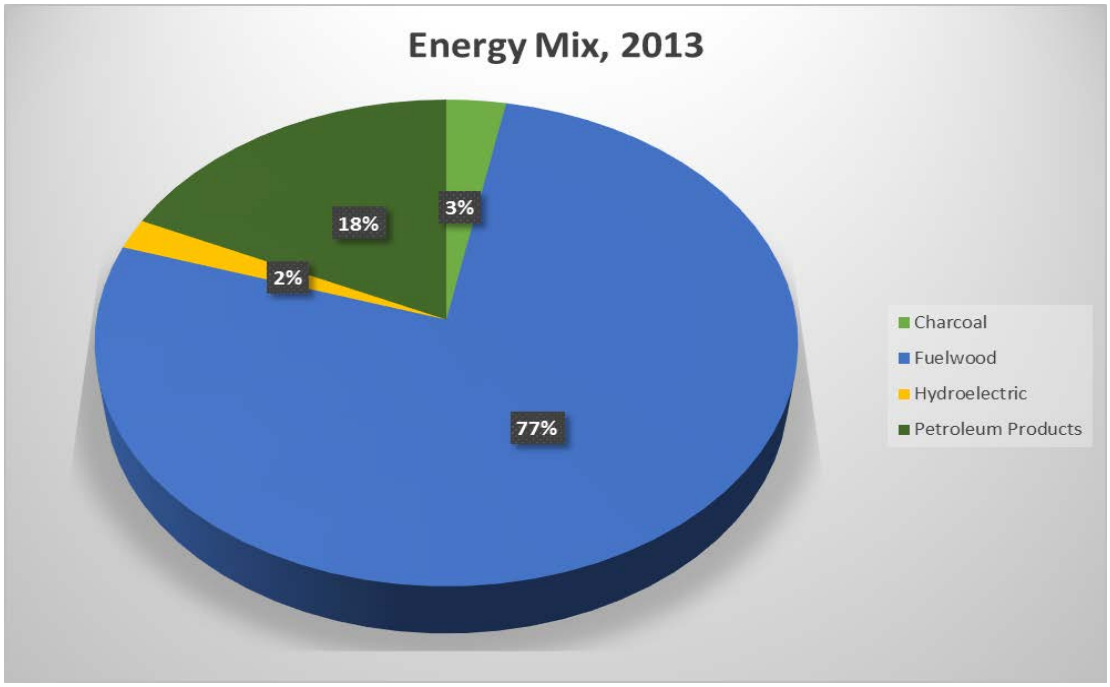
1. Sustainable rice farming through water management;
2. Diversification of food production and nutrition improvement of the population;
3. Export promotion of agricultural/agro-business products;
4. Sustainable management of natural resources;
5. Improvement of the quality of agricultural services and support to producers; and
6. Institutional strengthening for implementation of PNIASA.

PNIASA was scheduled for implementation during 2013 – 2017 with a budget of just over $ 1 billion. However, it is still awaiting the allocation of financial resources to commence activities.

Guinea also has a very good hydroelectric potential, estimated at over 6,000 MW, so much so that the country could meet its domestic needs, including those of the mining sector, and export electricity to neighbouring countries. Electrification, however, is currently estimated at 17%, including only 3% for rural areas. Despite this considerable hydro potential, thermal power generation constituted 62% of the total generation capacity in 2013, including self-producers operating in the mining sector. This ratio of thermal generation will increase to 71% at the end of 2014, with the addition of another 100 MW of capacity. Presently, the installed generating capacity in the country is 340 MW, of which 220 MW is managed by Électricité de Guinée (EDG) (almost 128 MW of which is hydro-based) and the remaining 120 MW are owned by the mining companies. In 2011, Guinea's urban electricity production capacity was 130 MW but demand was estimated at 240 MW, resulting in frequent and fairly lengthy power outages of up to 18 hours/day in the capital, Conakry and other main cities; unfortunately, this situation is still the same at the present time. EDG has been for several years facing enormous difficulties because of ageing infrastructure, lack of investment and maintenance (technical losses), electricity theft and unpaid invoices (non-technical losses); together, they constitute almost 50% in terms of financial losses.

The primary energy supply of Guinea consists of 80% biomass, 18% petroleum products and 2% hydro (Fig. 1), despite the huge potential of hydro in the country, as stated above. The country's greatest renewable energy potential resides in biomass and hydro followed by wind and solar – ocean/wave energy also presents a huge potential, but cost-effective technologies to tap this energy source do not exist at the present time.

Fig. 1: Primary Energy Supply (2013)



Biomass, in the form of fuelwood and charcoal, represents the single most important renewable energy resource that is utilised as a primary source of household energy for cooking. In the peri-urban and rural areas, households mainly use charcoal or wood, and sometimes side by side a charcoal stove and a wood stove, for cooking. Charcoal is also widely used in the urban areas, as the supply of electricity and the availability of bottled gas tend to be erratic. As per available data (2012), almost 100% of rural households use exclusively fuelwood and 20% of urban households use fuelwood and/or charcoal for cooking and this massive use of biomass contributes to rapid depletion of the country's forestry resources, leading to increased deforestation. The introduction of improved biomass cook stoves in 1995 and its dissemination over the years have resulted in a 6% reduction in the volume of woody biomass utilised in the country; however, there are no reliable data on the percentage of the population that use them. In addition, only 1%

of the population has access to clean fuels (electricity and bottled gas) for cooking and very little cooking (and lighting) is done with kerosene. In fact, kerosene used to be the fuel of choice for lighting in the rural areas, but is being replaced by disposable battery-operated LED lamps, commonly known in the country as "Chinese lamps", reflecting their country of manufacture.

The biomass situation gets compounded due to the slash and burn process to transform forest land into agricultural land and land clearing for mining and logging activities, including that of charcoal production. As per the "Plan d'Action National d'Adaptation aux Changements Climatiques", (PANA, July 2007) (National Adaptation Programme of Action for Climate Change), the forest cover in the country decreases by an average of 35,000 ha/year. As such, the dense humid forest that covered 14 million hectares in 1967, covered only 7.3 million hectares in 1990 (FAO, 2010) and, by 2010, had decreased to 6.5 million hectares. As per FAO, this loss in forest cover is a result of several factors, including "absence of planning in expansion of cities, demographic explosion, poverty and poor governance". This reduction in forests also results in reducing the animal habitat, exposing the soil to erosion and seriously affecting water resources.

Table 1: Annual Biomass Consumption (tons)

Year	2008	2009	2010	2011	2012	2013	2014
Consumption	9,420,946	9,703,574	9,994,681	10,284,527	10,582,778	10,889,679	11,205,480

Source: National Institute of Statistics/Estimate for 2014.

Charcoal production and fuelwood are estimated to account for almost 10% of the total annual deforestation. Charcoal is produced in forest areas in traditional kilns and once the carbonisation process starts, it takes 5-6 days to complete. Charcoal and fuelwood are retailed by weight, with the former packaged in 25-kg bags for transportation. The retail prices in peri-urban and rural areas are provided in Table 2 below:

Table 2: Price of Fuelwood and Charcoal

Household	Fuelwood (US cents/kg)	Charcoal (US Cents/kg)
Peri-urban	30	57
Rural	17	29

In 2014, the average 6-person household daily used 1 kg of charcoal or 3.3 kg of wood or a combination thereof. Also, average monthly expenditures per household for charcoal are $ 17.25 in peri-urban and $ 8.62 in rural areas; the corresponding numbers for fuelwood are $ 30.19 and $ 17.25, respectively.

The Government is cognisant of the fact that the country's heavy reliance on forestry biomass for most of the energy needs of the population, both in the rural and urban/peri-urban areas, is not sustainable. Thus, there is a keen awareness among decision makers of the need to shift towards more sustainable and modern forms of energy. In view of the abundance of livestock manure, agricultural waste and other forms of non-forestry biomass, biogas technology utilising these agricultural by-products presents an interesting alternative, both as fuel for cooking and slurry for use as fertiliser. In addition, increased use of biogas, substituting for the use of forestry-based biomass, will reduce the pressure on the forest resources and unsustainable land use. Thus, the transformation of the household (and commercial) energy sector to an economically viable and environmentally friendly system requires a comprehensive and multi-faceted approach in the design of appropriate policy and planning frameworks, and incentives to fully integrate biogas technology into the country's energy mix.

The Renewable Energy Sub-sector is under the responsibility of 2 distinct but complementary institutions, with clearly spelled-out responsibilities:

- Ministry of Energy: It is entrusted with formulation of the sectoral policy and definition of standards for renewable energy technologies. In implementing this policy, it relies on the support of the National Energy Directorate that is entrusted with defining policy directions and follow-up on project implementation.

- Ministry of Higher Education and Scientific Research: It is entrusted with formulating and implementing Government's policy on renewable energy research. This is accomplished through the CERESCOR (Centre de Recherche Scientifique de Conakry-Rogbanè) Research Centre.

The Government adopted a National Energy Policy in 2007 with the following main priorities:

- Institutional reform of the Electricity Company of Guinea (EDG).
- Establish an institutional and organizational architecture to promote the use of renewable energies, the developments of biofuels and the access to energy services in rural areas.
- Develop an energy strategy in order to make energy available for the main urban areas.
- Private sector involvement in the production of decentralized and off-grid energy.
- Establish institutional measures to ensure consistency between energy development and the increasing demand of energy from households and industries (such as mining or processing industries).

The focus of the National Energy Policy was further elaborated in 2009 in a document entitled «Lettre de Politique de Développement du Secteur Energétique (LPDSE) » that was itself updated in May 2012 to incorporate elements of the "Sustainable Energy for All" initiative, in anticipation of its launch by the United Nations Secretary General in June 2012. The objectives of this initiative are "to ensure universal access to modern energy services", "to double the global rate of improvement in energy efficiency" and to "double the share of renewable energy in the global energy mix".

Strong support for renewable energy is an integral part of the country's energy strategy aimed at enabling the country to diversify and secure its energy supply. In fact, the implementation strategy for LPDSE presents a vision for a 20-year development of the sector, focusing on energy supply and demand and includes energy efficiency as well as renewable energy development.

The Strategy Document for Poverty Reduction (Le Document de Stratégie de Réduction de la Pauvreté (DSRP III) 2012-2015 builds upon DRSP I and DRSP II to strengthen democracy, macro-economic stability, human development and management of the environment. In order to meet the country's energy needs from biomass and renewable energy, DSRP III articulates the importance "to focus on interventions related to the rational use of forestry resources and a continuation of the improved cook stoves programme, promotion of renewable energy (biogas, solar). Implementation of rural electrification will be conducted through dissemination of the successfully-tested decentralized model".

With the support of the AfDB (African Development Bank), Guinea conducted a Nationally Appropriate Mitigation Actions (NAMA) formulation exercise that culminated in the NAMA report being published in July 2012. The report highlights sectors where Climate Change Mitigation is possible, Mitigation scenarios and provides a list of implementable projects with high mitigation potential. The NAMA formulation exercise focused on the following 6 sectors: Energy, Agriculture, Forestry (LUCF and REDD), Industrial Processes, Waste and Transport. Among others, NAMA recommends formulation and implementation of renewable energy development strategies and sound waste management practices in agricultural development through production and utilisation of biogas and the resulting slurry.

With regard to GHG emissions, the First (Initial) National Communication to UNFCCC prepared in August 2002 (the Second National Communication is still under development) indicated that the energy sector was the one producing the main emission of greenhouse gases in the country, i.e. 11.24 million tCO_2 in 1994, with the total for the country being 14.27 million tCO_2. However, the absorption capacity of the country in the same year was 17.60 million tCO^2, making it a net absorber of greenhouse gas. In the absence of mitigation measures and with the increase in deforestation due to fuelwood consumption for cooking, it is natural that the absorption capacity of the forests will decrease further over the coming years; however, no forecast has yet been made for these years. Hence, use of biogas for cooking and lighting at the household level and for hot water/electricity generation at the commercial/industrial level, either for self-use or for supplying the grid in the case of electricity, where applicable, 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 household/commercial/industrial energy sector. In fact, the First National Communication proposed the following three major mitigation measures to reduce GHG emissions in the energy sector: Utilization of solar PV for lighting, Promotion of biogas in rural areas and Promotion of LPG in urban areas.

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

This project is fully consistent with GEF-5, Climate Change Objective 3: "Promote Investment in Renewable Energy Technologies". It will promote market for the utilisation of non-forest biomass for biogas production for household and commercial use. 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 utilising a renewable energy source (biomass) that will allow the country to cope with meeting the growing demand for energy services 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 with the adoption of the National Energy policy in 2007.

A.3 THE GEF AGENCY’S COMPARATIVE ADVANTAGE:

The proposed project is clearly within the comparative advantages of UNDP as stated in GEF Council Paper C.31.5 “Comparative Advantages of GEF Agencies”. UNDP is one of the few GEF agencies present in the country. It has the ability to mobilize and make available quality technical expertise to develop policies and strategies (particularly in climate mitigation and adaptation, social sectors, governance and environmental management and risk disasters); knowledge and ability to take into account the rights and basic needs of the most vulnerable segments of the population; the ability to partner, mobilize and empower the communities and individuals to identify and own their problems and come up with pragmatic solutions; the focus on capacity building in all areas of support; and confidence among populations and national and international partners. UNDP has also developed and implemented/is implementing several projects in Guinea related to Energy and Environment, among them 8 GEF projects dealing with adaptation and bio-diversity.

This project also fits under the UNDP-GEF EITT (Energy, Infrastructure, Technology and Transport) Signature program number 1 “SP1 – Clean Energy” Promoting access to clean and affordable energy systems and services. This signature programme aims at improving the energy access, use and supply through the promotion of distributed clean energy systems, based mainly on sustainable use of biomass and other renewable energies, delivering electricity, provide clean fuel for heating and cooking, promoting greater efficiency and the productive use of energy. It also directly links with the CleanStart approach based on microfinance. CleanStart (Microfinance Opportunities for a Clean Energy Future) is a new UNDP/UNCDF programme to help poor households and micro-entrepreneurs access financing from microfinance institutions coupled with technical assistance for low-cost clean energy applications. In Guinea, the project is in line with the United Nations Development Assistance Framework (UNDAF 2013-2017). UNDAF aimed to reduce poverty, the degradation of basic social indicators, and set the country on a pathway to sustainable development.

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

Biogas technology, besides supplying energy and fertiliser material, provides an excellent opportunity for greenhouse gas (GHG) emission reduction through substituting firewood for cooking, kerosene for lighting (very little of it is utilised in Guinea; instead, Chinese battery-operated LEDs are used), chemical fertiliser and through saving trees from deforestation. In line with this, the objective of the project is to contribute towards the reduction in the growth of GHG emissions from the household energy use sector. It will establish a functioning and effective market for the widespread commercialisation and utilisation of biogas technology in Guinea and it proposes to achieve this through the development of 3 distinct, but interconnected, markets. The first market is targeted towards small-scale family-sized (household) digesters. This will mainly focus on auto consumption and in-house feedstock management and this category consists mainly of farming households that have livestock. The second market is for large scale digesters for institutional, commercial and industrial applications where there is a need for heat and/or electricity. These are also essentially auto-consumers, replacing current energy carriers (like e.g. diesel or grid electricity) with a cleaner and cheaper alternative in their business process. Finally, the project will address the domestic market for digester manufacture and installation.

Large-scale production and distribution of biogas, either in bottled or canister form to supply the market with an alternative fuel for cooking is not envisaged. Nor will the project deal with the production of biogas for electricity generation to supply the national grid. However, these large-scale uses of biogas may become the subject of attention

in the future, once the production and utilisation of biogas technology have been successfully and convincingly demonstrated under this project.

The history of biogas in Guinea dates back to 1977 when experiments were conducted with 3 small digesters of 0.2 m^3 made of steel drums in Kindia and Macenta (2). In 1981/1982, 7 additional 10 m^3 digesters of Chinese design (fixed dome) were installed one each in Conakry, Boké, Dalaba, Beyla, Kankan and 2 in Forécariah. Subsequently, from 1983 through 1999, another 80 fixed-dome digesters with volumes ranging from 6 m^3 to 23 m^3. They were all installed under Guinea Government and/or donor-funded programmes to produce biogas for community use, such as schools and health centres, often in places where either the required agricultural/animal-based raw material (within the Guinea context, utilisation of human waste for biogas production is not culturally acceptable) and/or water for mixing the raw material was not readily available. This resulted in tremendous efforts being made to keep them operating as long as Government/donor funding was available. Once the "assistance" programme gradually ended, the digesters started being neglected for lack of funding and the result at the present time is that there is not a single biogas digester operating in the country. The main lesson learned from this "experiment" that lasted over 20 years is that any future biogas programme should adopt a paradigm shift, with the Government creating the environment for the private sector (households, commercial or industrial enterprises) to build and operate their own biogas digesters.

Biogas digesters can process different feed stocks (cow dung, agricultural residues, kitchen waste, etc.) and be implemented in a variety of situations, including the following:

- Rural households with five or more cows, where the cattle dung can be collected fairly conveniently.
- Rural households with a diverse mixture of livestock such as pigs, chickens, and goats.
- Cattle farms where there is a large enough concentration of accessible cattle dung.
- Sheep, horse, chicken and other farms where there is sufficient supply of accessible animal dung.
- Institutions such as rural schools/hospitals with a fairly large number of users of sanitation and farming facilities, slaughter houses, etc.

Table 3 below provides information on livestock statistics in the country. The last livestock census was undertaken in 2005 and none has been held since; statistics for subsequent years are estimates.

Table 3: Livestock Statistics

	2005©	2006(e)	2007(e)	2008(e)	2009(e)	2010(e)	2011(e)	2012(e)	2013(e)
Cattle	3 787 974	4 003 876	4 232 589	4 474 909	4 731 680	4 981 513	5 244 537	5 521 448	5 812 981
Sheep	1 058 381	1 109 744	1 164 978	1 224 388	1 288 301	1 343 440	1 400 940	1 460 900	1 523 426
Goats	1 399 666	1 496 194	1 599 714	1 710 752	1 829 877	1 949 185	2 076 272	2 211 645	2 355 844
Pigs	77 323	82 487	87 996	93 872	100 141	106 510	113 284	120 489	128 152
No. of Breeders	380 097	404 034	429 761	457 415	487 143	515 349	545 187	576 754	610 148
No. of poultry farms	-	-	-	236	263	293	327	364	406

Source : Ministère de l'Elevage/DNPRC/Division Statistiques ©: Census (e): Estimates

For household applications, the emphasis will be on those homes with five or more heads of cattle (or equivalent in terms of other ruminants), since the dung produced on a daily basis would be sufficient to feed a 6 m^3 biogas digester to supply all the cooking/lighting requirements of the household without any additional inputs of biodegradable resources to the digester. This is based on the widely practised livestock management system, where cattle graze in communal areas during the day and are penned (corralled) at night. A 6 m^3 biogas digester requires approx. 36 kg of dung from 5-6 cows (the estimated dung production in Guinea is approx.7 kg/cattle) and an equal amount of water by weight per day (i.e. 36 kg of H_2O equivalent to 36 litres) and the gas produced is sufficient to burn a stove and 2

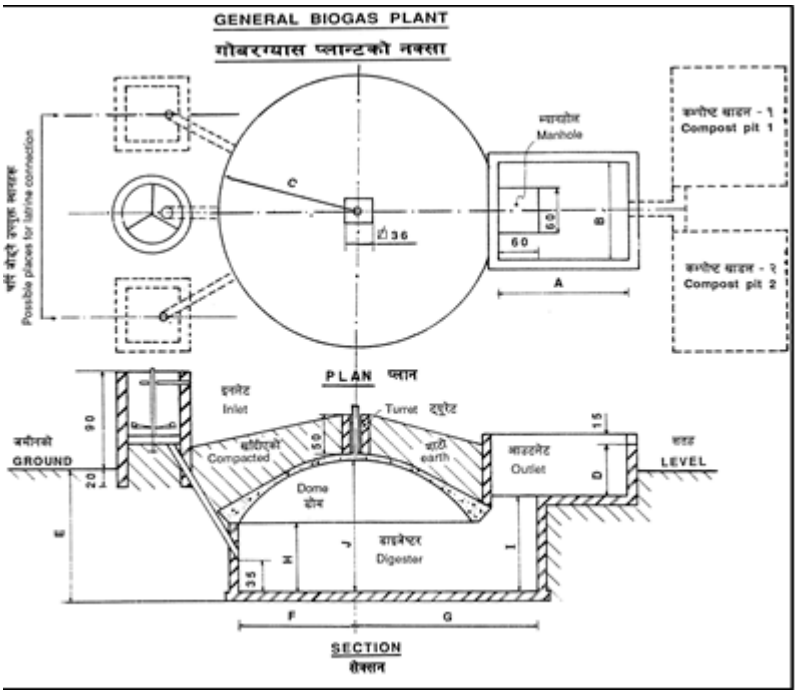
gas lamps for 3-4 hours daily. It is important to note that the size of the biogas plant is determined by the availability of dung and not on the size of the family.

A slurry is ejected after a period of anaerobic digestion within the plant digester (about 30 - 40 days); thus, it exits the digester sanitised, disinfected and with the nutrients turned into a form that is more absorbable by plants. The exiting slurry (often referred to as bio-slurry) is a thick liquid that comes out of the biogas plant outlet and then flows into a slurry pit from where it can be used either in liquid form or dried into compost. The bio-slurry is an excellent natural fertiliser that reduces the need for and expenses related to the purchase of chemical fertilisers. In Nepal, for example, where a household biogas programme has been implemented over the last 25 years, farmers have observed annual financial savings of over $ 20 per household from the use of the resulting slurry as organic fertiliser, as opposed to the purchase of chemical fertilisers[2]. Thus, a farming household who owns a biogas plant will have an advantage of a continuous supply of high quality bio-fertiliser for his crops, together with improved hygiene and living environment.

Biogas is a mixture of gas produced by methane-based bacteria acting upon biodegradable materials in an environment that is lacking oxygen. Biogas is mainly composed of 55 to 70 percent methane, 30 to 45 percent carbon-dioxide and traces of other gases. The gas is colourless and burns with a clean blue flame similar to that of Liquid Petroleum Gas (LPG) with virtually smoke-free combustion (Source: Nepal Biogas Programme). The bacteriological process inside the system requires an optimum temperature of 35 - 40 degrees Celsius for good fermentation; hence, biogas systems are well-suited for warm climates.

With regard to digester design, it is generally accepted that the fixed-dome GGC (Gobar Gas Commission) 2047, developed in Nepal and which has proved its performance and reliability in several Asian countries (Bangladesh, Cambodia, Laos, Vietnam, etc.) and is being promoted in several African countries (e.g. Benin (video available on you tube), Burkina Faso, Ethiopia, Mali, Niger, Rwanda, etc.) under the Biogas Initiative, with the participation of SNV of The Netherlands (since 1998, SNV has installed 500,000 such household digesters in several developing countries). A schematic diagram of the digester is depicted in Figure 2 below.

Figure 2: Schematic diagram of a fixed-dome biogas digester, Nepal.



[2] Source: The Nepal Biogas Support Program: A Successful Model of Public Private Partnership For Rural Household Energy Supply, 2005

The digester is normally built underground, with only the mixing chamber, inlet, overflow and gas delivery pipes showing aboveground. Once feeding has started, full gas production takes approx. 3 - 4 weeks, resulting, among others, a reduction in GHG emissions from deforestation; this emission reduction will continue over the digester's expected lifetime of 20 years.

With regard to feedstock at the household level, Guinea is already benefiting from PROGEDE (Sustainable Management of Globally Significant Endemic Ruminant Livestock in West Africa). It is a regional GEF funded project (biodiversity) and currently implemented by UNDP (implementing period: 2008 – 2016), covering The Gambia, Senegal, Mali and Guinea. PROGEDE aims at developing and implementing models for community based conservation and management of critical habitats for specific endemic ruminant livestock species (cow, sheep and goat) and to demonstrate strategies for preserving the unique genetic trait/habitat complexes that are of global importance. Some initiatives and programmes on biomass and biogas utilization are ongoing or planned. The most relevant ones are shortly described below:

PRONIASE: Guinea, as a member of ECOWAS (Economic Community of West African States), subscribes to the January 2006 White Paper for a Regional Energy Policy (adopted by the Heads of States and Governments of the 15 ECOWAS member states) geared towards increasing access to energy services for populations in rural and peri-urban areas for poverty reduction, on the understanding that its implementation would lead to an acceleration of the development process towards achievement of the MDGs. In this connection, the ECOWAS Renewable Energy Policy (EREP) formulated in October 2012 (final draft) proposes, among others, the implementation of biogas plants to "promote an efficient use of domestic energy (fuel wood as well as gas (biogas) and kerosene)" and "to power (electricity) mini-grids" under PRONIASE (Programme National Intégré d'Accès aux Services Energétiques Modernes) that would have directly covered 3.8 million inhabitants, i.e. 36% of the total population, divided between rural and peri-urban areas. Under Component 3 of PRONIASE dealing with fuels for household use and energy efficiency, UNDP developed 3 sub-programmes, viz: (i) Study on the bioenergy potential of Guinea; (ii) National strategy for the development of biofuels in Guinea: and (iii) National programme for household biogas in Guinea. However, as indicated above, PRONIASE never came off the ground due to its inability to develop partnerships and mobilise resources.

National Programme for Household Biogas in Guinea (Programme National de Biogaz Domestique en Guinée): The objective of the National programme for household biogas in Guinea was to reduce deforestation through the use of biogas for household purposes, the advancement of women, education, health and sanitation, agricultural productivity, income generating/employment benefits. A Phase 1 commenced in 1989 with the support of the Government of the People's Republic of China and consisted, among others, of the establishment of a National Centre for New and Renewable Sources of Energy that would house a bioenergy laboratory where the energy content of various species of plants could be determined. It also consisted of the construction of a pilot Chinese-type digester to produce biogas for cooking and lighting. At the conclusion to this Phase 1 in 1994, a Phase 2 was proposed, with joint China/Guinea funding, to convert the National Centre into a Regional Biogas Centre, to install 200 household/communal digesters and to establish the feasibility of utilising biogas for electricity generation and other productive uses. While approx. 90 communal digesters were built (see above), the feasibility study to establish the Regional Biogas Centre never materialised due to unavailability of financial resources and Phase 2 remained at the formulation stage with no implementation follow-up.

CERESCOR (Conakry-Rogbanè Research Centre): Established in July 1982 with the support of the former Soviet Union within the context of its Scientific Cooperation with the Republic of Guinea, it is entrusted with the mission to contribute to economic development of the country, through scientific and technical in Oceanography, Construction Materials and Energy. In collaboration with the University of Conakry, CERESCOR has worked on the design and certification of several programmes, ranging from improved cook stoves to various solar PV applications and biogas production for lighting and cooking in rural areas. Specifically on biogas, CERESCOR had installed in 1996, in collaboration with the University of Conakry, 2 pilot biogas digesters (8 m^3 and 12 m^3) under a 5-year technical assistance programme, with the support of the Wallonia Region in Belgium and the Montreal-based Agence Universitaire de la Francophonie (Francophone University Association), in the farming village of Tambama (some 15 km from Kindia, along the road to Mamou) to supply biogas for cooking and lighting to 10 households and the village mosque. They were provided free of charge to the village, were managed by a Village Committee and supplied biogas for either cooking or lighting, but not for both simultaneously. When the technical assistance programme ended after 5 years, these 2 digesters fell into disuse due to poor collective management and lack of maintenance, and were

abandoned. However, the successful operation of these 2 digesters over their initial years after installation led to the construction of another 30 biogas digesters under these same partnership, this time with the support of the Ministry of Energy. These, as indicated earlier, also fell into disuse and were abandoned once the technical assistance came to an end.

The role that CERESCOR and the University of Conakry could play when the present GEF project becomes operational could be to define the design and certification of bio-digesters that are adapted to the local context.

Microfinance Institutions in support of the Biogas Programme.

In Guinea, microfinance is recognised as a means of poverty reduction, as indicated in the national poverty reduction strategy (DSRP III). MFIs in Guinea are regulated under "Agence Nationale de la Microfinance" (ANAMIF) that reports to the office of the President. The role of ANAMIF is to promote the development of microfinance for poverty reduction, to analyse services provided by MFIs so as to appropriately meet the needs of the population, to bring more precisions to reinforce and improve the existing laws and to align systems and procedures with international standards. It manages the "Fonds National de Microcrédit" (National Microcredit Fund) in the amount of $ 18 million made available by the President's Office in 2013 "to support private initiatives of women and young Guineans", working through 13 MFIs in the country.

Microfinance Institutions (MFIs) offer mainly credit, savings, money transfer and other payment services to their clients/members depending on their legal set-up. Financial services are mostly offered to low income people to increase and sustain their income generating activities, micro-enterprises and small businesses. They are grouped under the "Association Professionelle des Institutions de Micro Finance de Guinée" (APIMG). There are some 15 MFIs operating in the country, with the largest one being Crédit Rural S.A. that has a wide network of 200 service points throughout all the 8 Provinces in the country. They normally provide short-term credit for durations between 1 and 12 months at a monthly interest rate of 2% – 4%. However, longer-term loans are sometimes made for up to 42 months at a lower interest rate.

MFIs will be called upon to play a very important role in the biogas programme for rural households. It is estimated that a 6 m^3 household biogas digester that produces 3.5 m^3 of gas/day, together with a stove and 2 gas lamps, will cost approx. $ 800. And the project proposes to replicate the financing scheme that the above-referenced SNV has been using to support household biogas programmes in several countries in Africa, Latin America and Asia. To achieve this, the project will solicit SNV's collaboration during implementation. The components of this consumer/household financing scheme are as follows:

- A 10% down payment, either in cash or a combination of cash and in-kind.
- An investment grant (subsidy) of 20%.
- A loan of the remaining 70% from an MFI, repayable over 3-4 years.

Financial Support Mechanism (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 investment-intensive in terms of upfront costs, 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 project developers expect some form of financial support/risk-sharing to compensate them for taking on additional financial risks due to unfamialiarity with the technology being proposed. Consequently, in order to support the adoption and implementation of biogas in the country, the project will establish a Financial Support Mechanism (Investment Grant) and allocate a joint GEF-UNDP fund with an initial capital of $ 1.2 million, viz. $ 1.0 million from GEF funds and $ 0.2 million from UNDP. This amount is expected to be sufficient to cover support and promotion of the biogas programme during the 4-year project lifetime. Box 1 below provides a snapshot of how the FSM will be set up and operate.

The purpose of this investment grant to households is two-fold: first, it is designed to jump-start the market for utilising biogas for cooking and lighting through a reduced amount of loan required, resulting in a buy-down of the

total interest amount that would have been chargeable to them. As the project builds up experience and transaction costs go down, the percentage of grant/subsidy allocated to individual households will decrease until a point is reached when sufficient experience would have been accumulated that would provide confidence to enable other households to embark on new biogas projects based solely on their initial capital and a loan. When this point is reached, the subsidy would then be eliminated altogether. The second purpose is to initially minimise any potential risk on the part of MFIs in making loans for household biogas digesters, by shifting some risk of loss of capital to the investment grant. As they accumulate experience with such loans and repayments, the MFIs will have developed sufficient confidence in continuing making additional loans, even in the absence of any subsidy, thus incorporating loans for biogas digesters as a regular retail product in their loan operations.

For commercial/institutional investors in biogas technology, the FSM will support the preparation of feasibility studies/business plans (FS/BP) and partial investment for biogas projects. This will be achieved through the provision of a grant to eligible project developers, in an amount of up to 50% for each of the costs involved for the feasibility study and the investment grant, with a maximum per project allocation not exceeding $ 50,000. It will serve as an incentive to project developers to consider utilising waste generated from their business operations to meet, albeit partially, their energy requirements from non-fossil-based fuels. While these funds will be ear-marked for the developer, they will be paid directly to the consultants/consultancy group preparing the FS/BP and implementing the works, and disbursements in tranches would be made as per a set of established benchmarks.

Prior to allocating this grant, management of the FSM (see below) may request the project developer/private sector to provide evidence that it can bring in some 10 to 15% of equity capital in case its FS/BP qualifies it for consideration for debt financing. Disbursement of this grant will be in accordance with UNDP rules and regulations. A capacity assessment of ANAMIF will be conducted before and regularly during the implementation of the FSM.

It has been clarified above that the purpose of the investment subsidy is to jump-start the market and to buy down the initial investment required by the promoter/developer and, consequently, reduce the total interest amount payable. In discussions with project developers, this issue will be highlighted and the website will also make it clear that the subsidy is specifically earmarked for reducing transaction costs during the initial years of the project. This, it is hoped, will sensitise project developers to the fact that no more subsidies will be available upon completion of the project nor will they likely be necessary to enable them to achieve a reasonable rate of return on their investment.

There is, of course, a fundamental question of sustainability of resources available under the FSM for this financial support to small and large scale biogas digesters beyond the projects' lifetime of 4 years. Neither the project nor the Government wants such an important modality for reducing the country's import of fossil fuel through substitution with locally available biomass 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, with a target of a total of $ 5 million, so that the country can benefit from investment in sustainable biogas technology. Hence, for all practical purposes, the FSM is not expected to be a short-lived mechanism; instead, it is meant to be in operation until such time that project promoters/developers gain sufficient confidence that the risk of investing in biogas digesters has been minimised and/or eliminated through the project. When this happens, UNDP 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.

In other countries where similar FSMs have been implemented (e.g. Peru, Vietnam), it has been observed that local farmers producing biogas often scale up projects to entire neighbouring communities by giving them paid access, for a modest fee, to the surplus electricity they produce through the setting up of electrical mini-grids to provide electricity to homes and for street lighting for a few hours.

The project may also consider piloting an interesting incentive concept that SNV recently introduced in its household biogas programme in Vietnam. This constitutes in setting up a "Results-based Finance Mechanism (RFM)" under an FSM with the objective of preparing businesses active in digester construction "to compete in a fully operational, private sector biogas industry". Under the RFM in Vietnam, masons who successfully complete additional "business training" qualify for an incentive of $ 27 for each new biogas plant they install on smallholder livestock farms. This incentive compensates the masons for the additional risks they need to take to move further into the commercial market mechanisms such as end-user training and active promotion and sales. In the long term, the RFM is designed

to replace subsidising a household to install a biogas plant by encouraging "entrepreneurs to take new risks to further develop their enterprises by a guaranteed cover for the additional financial risks, upon delivery of successful results".

Operationalising the FSM

The FSM will constitute a grant mechanism and the funds will be deposited with the "Agence Nationale de la Microfinance" (ANAMIF) that, as indicated above, reports to the office of the President and already manages an $ 18 million Government-instituted microfinance fund. The funds themselves will be under the joint management of ANAMIF and UNDP and will be utilised to cover the initial investment subsidy required by biogas developers, both the household and commercial/industrial levels. As discussed above, disbursements of the investment grant/subsidy will be made when there is sufficient evidence that it is likely that the developer does qualify for credit either from an MFI or another lending institution. In any case, the grant will not be provided directly to the beneficiary, but through the builder of the digester of the household unit or through the consultants/consultancy group preparing the FS/BP and undertaking construction works on behalf of the commercial/industrial enterprise.

Box 1: FSM Snapshot

Financial Support Mechanism (FSM)

Purpose: (1) To support household biogas digesters by providing a 20% investment subsidy of $ 160 for a 6 m^3 digester (estimated total cost/per household digester: $ 800) to interested households. The subsidy will serve as an incentive to households for moving away from non-agricultural residue based resources (e.g. wood fuel, charcoal and fossil fuels) for cooking and lighting to utilising agricultural-based resources (e.g. cow dung, agricultural and bio-degradable household waste) for their household energy needs in terms of cooking and lighting and digester slurry as fertiliser in lieu of chemical fertiliser.

(2) For commercial/institutional investors in biogas technology, to support the preparation of feasibility studies/business plans (FS/BP) and partial investment for biogas projects through the provision of a grant to eligible project developers, in an amount of up to 50% for each of the costs involved for the feasibility study and the investment grant, with a maximum per project allocation not exceeding $ 50,000. It will serve as an incentive to project developers to consider utilising waste generated from their business operations to meet, albeit partially, their energy requirements from non-fossil-based fuels.

Initial Capitalisation: $ 1.2 million ($ 1 million from GEF and $ 0.2 million from UNDP).
Funds Host: Agence Nationale de la Microfinance" (ANAMIF – National Micro-Finance Agency)
Funds Managers: ANAMIF and UNDP.
Disbursement: Funds will be disbursed directly to the digester builder when a contract in due form is in place between him/her and the household and/or commercial/institutional investor.
Duration of FSM: During project lifetime of 4 years.
Disbursements: Initial contribution ratio to be maintained, i.e. 83% from GEF and 17% from UNDP.

Assuming that 2,000 household digesters will be built during the project, the total grant to households will be $ 320,000 (2,000 households x $ 160). In addition, under the assumption that all 10 commercial/industrial digesters will be built during the same timeframe and the maximum investment grant of $ 50,000/digester will be provided, the total investment grant will amount to $ 500,000. Thus, if no additional digester is built during the project timeframe, the FSM will have disbursed $ 820,000 out of the available $ 1.2 million. However, it is expected that the momentum generated during the initial 2 years of the project will result in the established targets of 2,000 household and 10 commercial/industrial digesters being exceeded, thus utilising the remaining balance of the FSM funds and additional funds raised to expand the biogas programme beyond project completion.

Project Components

The Ministry of Environment, Water and Forests is the central body responsible for, among others, the design, formulation, and implementation of the Government's policy regarding environmental protection, rational management of natural resources and improvement of the quality of life, all within the context of sustainable development. As such, it is entrusted with the responsibility of putting in place policy, plans and programmes that govern the promotion and "rational utilisation of energy resources, development of renewable sources of energy" and

"to participate in the promotion of energy sources respectful of the environment". To achieve this, it has the support of its National Directorate for the Environment and Bureau for Strategy and Development.

This project aims to pioneer the functioning of an effective market for the widespread use and commercialisation of biogas technologies in Guinea via three interrelated components: 1) development of an appropriate policy, institutional, legal and regulatory framework; 2) a business supply chain for sustainable and affordable biogas technology, and 3) increased capacity/awareness of MFIs and consumers to adopt biogas technology to capitalise on the economic and environmental benefits that it provides. It will focus on biogas technology development and utilisation to substitute for forestry-based biomass used by the majority of Guinean households for cooking and imported fossil fuel used by certain commercial/industrial enterprises for heat and/or electricity generation required in their business processes. This is proposed to be achieved through the participation of the private sector at both afore-mentioned levels. This programme will not only benefit households/small farmers and commercial/industrial institutions, but will also connect financial institutions, technical training and local organisations to promote the establishment of distribution channels to develop the biogas market.

The project will also establish a Financial Support Mechanism (FSM) with the Government's Agency for Microfinance to support households/private investors with an investment grant aimed at jump-starting the market for biogas technology. Disbursements from the FSM will be made according to a set of criteria to be developed during project implementation.

The Ministry of Environment, Water and Forests (MEWF), which works in partnership with the Ministry of Energy in promoting renewable energy within the framework of mitigating the effects of climate change, will be entrusted with implementation of the present project. In doing so, it will work very closely with other Government Agencies, private sector and NGOs to ensure that the participation of the full range of stakeholders is secured and effective.

The project consists of three components as outlined below. It is recognised that on-the-job training will be provided by the recruited consultants, both local and international, during the normal course of their support to the relevant project activities and a communication strategy formulated to inform stakeholders on project implementation. This will be in addition to Components 2 and 3 that, respectively, deal with capacity development on financial and technical issues required by key clients 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 the Association for the Promotion of Renewable Energy, National Organisation for Professional Training, National Confederation of Farmer Organisations, Association of Microfinance Institutions, Association of Women for Sustainable Development, etc.

Component 1: To formulate and introduce a streamlined and comprehensive policy and legal/regulatory framework for the use of biogas as a sustainable source of renewable energy.

Outcome 1: Streamlined and comprehensive policy and legal/regulatory framework for the use of biogas as a sustainable source of renewable energy. The expected outputs under this component are:

- Streamlined policy and legal/regulatory framework on biogas production and utilisation formulated and operationalised. The 2007 National Energy Policy, which was updated in 2012 to incorporate elements of the "Sustainable Energy for All" initiative, advocates for private sector involvement in the production of decentralized and off-grid energy. However, it does not address the issue of an appropriate legal and regulatory framework on the use of biomass resources in an integrated manner, especially with regard to bio-digesters and biogas. The project will, therefore, review this policy to determine the issues that act as barriers to the private sector playing a role in biogas development 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 biogas development. The project will then seek the Government's approval to operationalise this whole set of documents.
- Capacity of decision-makers and stakeholders developed and strengthened to lead efforts to manage a biogas development and utilization programme in an integrated manner. In consultation with decision-makers and stakeholders, a training programme will be developed and training provided to bolster their capacity to formulate and management a biogas programme. This will focus, among others, on the opportunities to

provide clean biogas fuel for cooking/lighting purposes to rural/peri-urban households, to mitigate the drudgery of rural girls/women related to wood collection, to reduce pressure on forests and accentuate social benefits, to assist in combating the effects of climate change by reducing GHG emissions, etc.

- Comprehensive market assessment of the country's biogas resource potential completed and options for biogas and slurry utilisation developed. A country-wide survey will be undertaken to map the resource potential for biogas for household and commercial/industrial uses, and a phased plan formulated to eventually implement a comprehensive biogas programme throughout the country. In addition, options will developed for the use of bio-digested slurry in liquid, semi-solid and dried form as an upgraded source of soil enrichment and as a substitute for imported chemical fertilizers.

Component 2: To promote investment in biogas technology through appropriate catalytic financial incentives for project developers.

Outcome 2: Promotion of investment in biogas technology through appropriate catalytic financial incentives for project developers. The expected outputs are:

- Financial Support Mechanism established to support investment in biogas technology at the household, institutional, commercial and industrial levels. 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 ANAMIF to set out the objective, funding mechanism, administration rules governing the FSM. The MOU will outline the responsibilities of ANAMIF and UNDP as joint managers of the FSM, of ANAMIF 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.
- Financial and other incentives for biogas technology applications developed and implemented for its use as a substitute for woody biomass and chemical fertiliser. These will include: reduction/elimination of import duties/taxes on equipment and spare parts, income tax holiday for a specific duration, simplification of foreign exchange regulations, simplifying Environmental Impact Assessment (EIA) procedures that may be required for large-size biogas plants, etc. All these will be operationalised by MEWF in consultation with other Government Departments.
- Up to 2,000 small (6 m^3) family sized units constructed and installed. Construction of these digesters will start during Year 1 of the project and all 2,000 are expected to be constructed by Year 3, as outlined in para. B.3 below.
- Up to 10 large (20 m^3 or larger) bio-digester units constructed or installed by targeted commercial or institutional clients (Slaughter house, Health Centres and Professional Training Centre). These digesters will be constructed during Years 2 and 3 of the project, again as per schedule outlined in para. B.3 below.
- Specific indicators developed for monitoring and evaluating project impacts on volume of wood fuel/charcoal and diesel fuel displaced by biogas production and consumption, the amount of avoided GHG resulting from the increased use of cow dung, kitchen waste, etc. and on opportunities for job creation in the biogas sector.

The 2,000 small/household digesters (6 m3 capacity) will be owned by the individual homeowners and the gas produced will be used for cooking and lighting in gas lamps. Each household will be responsible for operating/managing her/his own digester. With regard to institutional (large-size) digesters, they will be managed by the institutions that own them. In both cases (household and large size), training will be provided to the owners/operators and trained technicians will be available in the villages to troubleshoot whenever necessary.

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 the gradual decrease of the investment grant and its eventual phase-out over time. The mid-term review will also ascertain the level of support, if any, that future project developers may require beyond completion of the project, while capitalising on the momentum that it has generated.

Component 3: To formulate a programme to sustain a growing market of suppliers and users of biogas and its effluents, leading to overall improved livelihoods.

Outcome 3: Programme to sustain a growing market of suppliers and users of biogas and its effluents, leading to overall improved livelihoods. The expected outputs are:

- Developed capacity of MFI's/lending institutions to provide credit to consumers (farmers)/owners of household digesters and of larger units. Training will be provided to the MFIs/lending institutions on how to utilise the criteria and guidelines developed under the project to technically appraise projects, determine the appropriate loan and repayment schedule for each individual client and the guidelines that local lending institutions may wish to follow in appraising larger biogas projects for lending.
- Training modules designed for key beneficiaries (bio-digester builders, component producers and service technicians), including certification, and comprehensive training packages delivered. In addition, the builders/masons will be provided with better general business skills to operate their small enterprises, as well as how to market biogas plants.
- Developed capacity of farming households, commercial and industrial institutions to operate and maintain biogas digesters and to process bio-digester slurry into valuable products. This will involve training on proper procedures to follow in the feeding the digesters with the correct resource material/water mixture, handling of slurry, maintenance procedures, safe utilisation of the gas produced, etc.
- Sensitized key value chain actors through public awareness campaign of the value of biogas and the resulting slurry, together with their usage for quality of life improvement. This will include the preparation of promotional materials, briefing sessions on costs involved, operation, maintenance and gas/slurry usage for potential digester owners, informational meetings with stakeholders on project experience/best practices and lessons learned, etc.

The following criteria were developed, during implementation of the PPG, for the selection of the regions/locations of the 2,000 household digesters to be installed during the 4-year project time-frame:

- Availability of raw material (cow dung) – census figures show higher livestock size per household in Moyenne Guinée (Mamou and Labé) and Haute Guinée (Kankan and Faranah).
- Availability of water throughout the year and ease of access to construction material.
- Interest of potential households in digester ownership. Experience from past programmes shows increased interest and motivation on the part of households in Moyenne Guinée and Haute Guinée than in the other 2 regions.
- Use of effluent by farmers – gardening/small-scale farming is well-developed in Kindia, Mamou and Labé. Hence, in these areas, there is a high potential for utilising digester effluents for food production, either as soil conditioner or as fertiliser in replacement of chemical fertilisers.
- The availability of other raw materials, e.g. pig/chicken droppings, discarded farm produce and palm oilcake in Guinée Forestière.
- Presence/interest of MFIs active in these regions and willing to consider offering a new loan product to homeowners/farmers for biogas development

Guided by the above criteria and on the basis of discussions with various stakeholders during implementation of the PPG, a list of regions/locations for the 2,000 household biogas digesters was established (Table 4). The following statement sums up the mind-set of potential farmers interested in biogas digesters: "Our cattle will not only provide traction power and produce meat/milk, but will also provide biogas for cooking and fertiliser for our fields".

Table 4: Location and number of household digesters to be installed.

Region/Location	No. of 6 m^3 digesters to be installed
Boké	150
Kindia	200
Mamou	350
Labé	400
Kankan	350
Faranah	300
N'Zérékoré	150
TOTAL	2,000

A similar exercise was undertaken for large size digesters (≥ 20 m3), with biogas proposed to be utilised mainly for lighting and water heating purposes at those facilities where these services are non-existent. During formulation of the PIF, it was felt that the prime candidates for the large size digesters would be "cottage industries, slaughter houses, agro-industries and institutional facilities, such as hospitals, schools and prisons". However, during implementation of the PPG, it was determined that cottage industries or agro-industries large enough to generate sufficient raw material that could be utilised in a digester did not exist in the country. In addition, hospitals, schools and prisons do not have farms/cattle around their perimeters; hence, the only raw material that can possibly be used in digesters would be human waste from latrines/toilets, together with kitchen waste. Unfortunately, within the context of Guinea, use of human waste for the production of biogas is not a socially acceptable option and would be rejected by the population. With regard to cattle farms, they consist of cooperatives regrouping several farmers, but only a small portion of the cattle herd being "sedentary", with the bulk being nomadic in search of fodder; hence, this makes the operation of large-size biogas digesters not feasible. Finally, with regard to slaughter houses, these are owned by Municipalities and operate during the day hours with the meat disposed of on the same day to butchers; thus, they do not have/require refrigeration facilities. Health Centres are also owned by Municipalities and they operate round the clock with the only source of electricity being a photovoltaic (PV) system used to power a medical refrigerator; for lighting, they rely on the battery-operated "Chinese" LED lamps mentioned earlier.

Information on the sites/locations of the pilot large scale biogas digesters is summarised in Table 5 below. In view of the absence of any operating biogas digester of any size over the last 10 years in the country, the pilot large-size digesters have been conservatively designed so as to enable the owners (private sector) to benefit from biogas while also gauging the additional uses that the gas produced could be put to. It is hoped that with the accumulation of experience, the private sector would venture into more productive uses of biogas utilising the raw material (biomass) it produces or is available as "waste" at/near its facilities and, in the presence of increased availability of resource material, expand biogas usage into such productive uses as electricity generation for mini-grids, refrigeration/air conditioning and water pumping through larger size biogas digesters. Finally, each of the institutions selected to host a pilot large scale digester is managed by a Management Committee that is empowered by its supervising Municipality to contract loans from lending institutions for infrastructure development and make repayments from income they generate as a result of services they provide to their respective community.

Safety Precautions

During installation and following completion of a digester construction, consumers will be trained in the safe utilisation of biogas. The 55-70% methane content in biogas can give rise to fires if the gas leaks and in the presence of a flame or spark. However, the hydrogen sulphide (H2S), which is itself very toxic, in the gas can quickly alert people of a leak, given its "rotten egg" smell and this prevents accidents from happening. At large-size installations, monitoring of gas leaks will be undertaken with the assistance of gas sensors. And, as a precaution, users will be trained not to enter any closed area where gas may be present without the appropriate personal protective equipment, which may include a self-contained breathing apparatus (SCBA). For household digesters, gas leakage monitoring will involve informing consumers to detect foul smell and to refrain from using the gas when this occurs. In this case, they should call a qualified technician, to be trained under the project, to check and rectify the problem. Finally, the risk of gas leakage will be minimised through quality installation by qualified technicians and training of users on safety measures to be observed when utilising biogas.

Table 5: Information on large size digesters (≥ 20 m^3) to be installed.

	Nature of Business	Location/Region	Raw Material/Size of digester (m^3)	Gas used for:	Cost of Installation (US $)	Slurry used as:	Number of heads of cattle available	Amount of dung/waste available daily (kg)
1	Slaughterhouse	Mamou	30	Electricity for lighting (1 kVA) and hot water.	10,000	Fertiliser for sale.	13 slaughtered + another 20 in pen, daily.	150 + animal waste
2	Health Centres (Centres de Santé)	CR Dounet	20	Gas lighting, Medical equipment sterilization and hot water for maternity wards.	7,000	Fertiliser for sale.	900	400
3		CR Soya	20	Gas lighting, Medical equipment sterilization and hot water for maternity wards.	7,000	Fertiliser for sale.	1,000	600
4		CR Saramoussaya	20	Gas lighting, Medical equipment sterilization and hot water for maternity wards.	7,000	Fertiliser for sale.	500	200
5		CR Dogomet	20	Gas lighting, Medical equipment sterilization and hot water for maternity wards.	7,000	Fertiliser for sale.	1,000	600
6		Poste Santé du District de Koolo	20	Gas lighting, Medical equipment sterilization and hot water for maternity wards.	7,000	Fertiliser for sale.	500	250
7		District Sebory	20	Gas lighting, Medical equipment sterilization and hot water for maternity wards.	7,000	Fertiliser for sale.	1,000	600
8		CR Mitty	20	Lighting Gas lighting, Medical equipment sterilization and hot water for maternity wards.	7,000	Fertiliser for sale.	200	130
9		District Linsan	20	Gas lighting, Medical equipment sterilization and hot water for maternity wards.	7,000	Fertiliser for sale.	1,500	870
10	Professional Training Centre	Higher Institute of Sciences and Veterinary Medicine, Dalaba Region.	40	Electricity for lighting (2 kVA), gas for cooking and hot water.	12,000	Fertiliser for sale.	20 at the Institute and 200 in surrounding areas.	400
	TOTAL	10						

CR: Commune Rurale (Rural Commune)

As a rule of thumb, a 1 m^3 digester daily requires 6 kg of dung.

It is expected that digester installation for both household and commercial/industrial use will commence within 12 months after project start and that all 2,000 household and 10 large size digesters will have been installed by project completion. Of course, it is hoped that the favourable environment that would have been created by the project would act as a magnet vis-à-vis other project developers and MFIs/lenders to unlock the potential of additional digesters of various sizes to be installed in the country, both within the project timeframe and beyond.

A.5 INCREMENTAL/ADDITIONAL COST REASONING

There is very limited experience in Guinea with biogas technology development. In fact, of the some 90 digesters of various sizes constructed during the period 1977 through 1999, there is none that is operational at the present time. Not only that, there simply seems to be no single biogas digester presently operating in the country. All the approx. 90 digesters were installed by the Ministry of Energy under "donor-driven" programmes funded either by the Government or external donors and the Ministry was responsible for their operation and maintenance. The communities provided the dung and, in return, had the benefit of utilising the gas produced for cooking free of charge. The communities never had a sense that the digesters belonged to them and that it was up to them to keep them operating. This "detached" attitude resulted in a situation where no community felt that it had ownership of the digesters and, when the donor funds dried out, the Ministry of Energy stopped all maintenance support; the digesters then fell into disuse, through nobody having responsibility to keep them operating.

The present project will provide a fresh start to biogas development and utilisation in the country, given the very promising potential that the technology has to drastically reduce deforestation (hence, increasing the availability of carbon sinks), reduce GHG emissions, prevent soil erosion and improve livelihoods of the population, especially of those 64% living in the rural areas. A novel approach will be applied through enabling the private sector (and that includes private individual households) to drive the initiative to develop and install biogas digesters in the country; the crucial role of the Government will be to create the appropriate environment for this private sector-driven modality to successfully move forward.

It is expected that this project will result to 161,100 tCO_2 as direct reduction and 864,900 tCO_2 as indirect reduction, giving a total of 1,026,000 tCO_2 (see Section B.3 below for more detail) over the 20-year lifetime of digesters installed. The Unit abatement cost is equivalent to $ 16.4 of GEF funds per tCO2 (direct) and $ 3.0 of GEF funds per tCO2 reduced (indirect).

In line with the foregoing, GEF intervention is needed to remove the legal, regulatory and market barriers which hamper realization of the Government plans to harness the relatively abundant biogas potential in the country. Some of the main barriers are:

- Institutional: The Ministry of Environment, Water and Forests (MEWF), as the Government Agency directly responsible for renewable energy development, is the central body responsible for formulating and implementing the Government's policy in renewable energy and the environment. In addition, renewable energy (solar, wind, hydro) falls under the purview of the Ministry of Energy and Hydraulics while biomass from farming and cattle breeding are the responsibility of the Ministry of Agriculture and the Ministry of Livestock and Animal Production.
  The various governmental entities act in a dispersed and uncoordinated manner; the Ministry of Energy and Hydraulics, for example, has been "toying" with donor-funded biogas digesters for over a quarter of a century without having been able to capitalise on its vast experience to transition biogas to a business model based on private sector funding (individual households are also considered as the "private sector") that would ensure sustainability and replication of a biogas programme. In fact, it became apparent during the implementation of the PPG that its mind-set to rely wholly on donor-funded activities on biogas has not changed; hence, it whole-heartedly supported the business approach to biogas initiative with MEWF being the driving force behind it. The Ministry of Agriculture and the Ministry of Livestock and Animal Production have worked independently of each other and have had no involvement with biogas, although the activities they supervise include the production of the feedstock required in biogas digesters. Hence, the institutional barriers that the project will specifically address relate to (i) supporting the inter-sectoral work among government departments, including the development of a coordinated inter-sectoral database for biogas resource potential and options for biogas and

slurry utilisation (ii) supporting the capacities of the decision-makers and local agents of the participating Ministries working on transversal issues at the central and provincial levels.

- Regulatory: Even though the need for "private sector involvement in the production of decentralized and off-grid energy" was articulated in the 2007 National Energy Policy which was updated in 2012 to incorporate elements of the "Sustainable Energy for All" initiative, an appropriate legal and regulatory framework on the use of biomass resources in an integrated manner, especially with regard to bio-digesters and biogas is lacking. These relate to, for example, any licensing that may be required before a household biogas digester can be built, any Environmental Impact Assessment that will be required before an industrial/commercial is given a license to build a digester, regulations governing the generation of electricity from biogas by large promoters either for their own use or for export to the existing grid or mini-grid, requirement for electricity utilities to purchase all electricity generated from biogas, etc.

- Financial: Discussions held during implementation of the PPG indicated that individual households and other private sector promoters consider the availability of credit as a major bottleneck to venturing into business opportunities in biogas development. Very few of them can afford an all-cash transaction. On the other hand, MFIs lack information about biogas technology, the transaction costs and contract enforcement issues involved, resulting in their inability to develop a retail product to service the biogas sub-sector. Hence, this presents the project with a great opportunity to support both the MFIs and the private sector to enter into a win-win situation by having a mechanism that would minimise the lending risks on the part of MFIs and provide confidence to promoters through sharing a small portion of their initial investment costs, thus assisting in reducing the deforestation rate in the country. In this connection, the project will establish a Financial Support Mechanism that will consist of $ 1.2 million ($ 1.0 million from GEF and $ 0.2 million from UNDP) that will be available as an upfront investment grant or as co-financing to undertake a feasibility study and prepare a business plan in order to jumpstart the market for biogas. These funds will be "hosted" at ANAMIF and will be managed by it.

  In addition, in order to facilitate the uptake of biogas technology, a set of financial incentives to biogas promoters in terms of reduction/elimination of import duties/taxes on equipment, income tax holiday for a specific duration, simplification of foreign exchange regulations, etc. will be developed during project implementation.

- Technical: Although some 90 biogas digesters were built during the 1980s and 1990s, except for a few officers and the Ministry of Energy and Hydraulics and CERESCOR, there is no "institutional memory" that a biogas programme was ever implemented in the country. In fact, most of the country's population has never heard of any biogas digester and the benefit it can provide for cooking, lighting and as a source of organic fertiliser. Hence, there is almost a total absence of technical experience with digester design, construction and operation, lack of any local manufacturing capacity, non-availability of tested digester models appropriate for the Guinean context, etc.
  The project will remove these technical barriers through capacity development at all levels from design to construction to operation and maintenance, etc. This will include training provided to masons to build quality digesters, artisans to construct gas stoves and lamps and users to properly oprearate and maintain their digesters.

- Economical: Poverty, tradition and lack of alternatives drive communities and individuals to continue to carry out unsustainable practices of resource exploitation both legal and illegal (e.g. wood cutting and charcoal production from protected forest areas). The lack of jobs and alternative options for income generation drive the rural exodus. During village interviews at the PPG stage, all communities expressed the need for social and economical benefits in their villages (health and income-generating activities) as well as improved natural resource management.
  The project will address this issue through training of biogas digester builders in the rural areas, promotion of biogas for better quality of life related to the provision of a modernised fuel for cooking and lighting in replacement of traditional fuels that need to be purchased, and improved farming practices/increased agricultural outputs through the availability of a fertiliser-rich bio-slurry.

- Promotion/Outreach: In the absence of any experience with private sector-implemented biogas plants, there is evidently a lack of knowledge among a wide range of stakeholders on the benefits that biogas technology can provide and a negative perception (lack of or limited social and cultural acceptance) on the use of a modernised

fuel (biogas) for cooking. In addition, there is a total lack of information on in-country best practices and lessons learned. Once implementation has started, this situation will be remedied through the compilation and publication of project experience and best practices in electronic form.

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

Table 5: Summary of barriers and mitigation strategies

Barrier	Present Situation	Strategy for addressing barrier
Institutional	Insufficient human resource capacity to perform effectively. Absence of cooperation for inter-sectoral work among various Government departments.	Outcome 1: Formulate and implement a capacity development programme to strengthen institutions and address specific barriers. Outcome 1: Support to coordinate Government departments for an inter-sectoral approach to a biogas programme.
Regulatory	Absence of consolidated set of regulations governing the integrated use of biomass resources for biogas production at the household and industrial/commercial levels.	Outcome 1: Develop a set of regulations governing household and industrial/commercial biogas installations.
Financial	Absence of a Financial Support Mechanism (FSM) to jumpstart projects. Absence of financial incentives to facilitate the uptake of biogas technology.	Outcome 2: Establish FSM within ANAMIF. Outcome 2: Introduction of financial incentives to project promoters.
Technical	Lack of skills to design, build, operate and maintain biogas digesters.	Outcome 3: Capacity development of stakeholders.
Economical	Absence of options for alternative income-generating activities in the communities.	Outcome 3: Implement alternative income generating activities through biogas production and utilisation.
Capacity Development, Promotion and Outreach	Absence of capacity of MFIs to provide loans for biogas plants. Lack of promotional/outreach activities and absence of project experience/best practices.	Outcome 3: Capacity development of MFIs. Outcome 3: Implement outreach/promotional activities and document project experience.

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

Table 6: Risks, Rating and Impact/Mitigation Approach

Risks	**Rating (Probability of Occurrence)**	**Impact/Mitigation Approach**

Health Risk due to Ebola.	High	Guinea is one of the countries in West Africa affected by the Ebola virus outbreak. The outbreak appears to be presently under control with fewer new cases being reported every week. Start of project activities may get delayed until the health situation comes back to normal. UNDP will exercise close monitoring of the situation in the country to decide when the project will become operational.
Institutional and Regulatory: Reluctance in some quarters of the Government to introduce the necessary supporting policies and regulations.	Low	If this risk were to materialise, it would seriously affect project implementation. However, this is very unlikely, as the Government is strongly motivated to provide access to modernised energy services to the large rural and peri-urban population that utilises fuel wood/charcoal for cooking and is driven by its plans to reduce the massive deforestation that accompanies the use of forestry resources. Hence, it will ensure that all its associated Ministries/Departments/Directorates get on board to put in place a conducive policy and an enabling regulatory framework for biogas promotion and development.
Economic/Financial: Non-availability of credit to promoters of biogas.	Low	If this were to happen, there will be no lending for biogas. However, the likelihood of this happening is low, as MFIs already make loans to small farmers/businesses and for opportunities to develop new retail products. Since, they have no experience in lending for biogas, the project will work with them to develop this new retail product targeting lending for biogas development. In addition, the will provide an investment credit to households, thus reducing the loan amount to be provided by MFIs. Finally, it will promote a partnership between borrower and lender that will allow the use of heads of cattle/sheep in a basket of assets required as loan guarantees.
Poor investment climate.	High	The fact that Guinea ranks in 175th place as "Ease of doing Business", as per the WB/IFC "Doing Business 2014" publication, speaks for itself. With this in mind, the project will put in place a Financial Support Mechanism that will be directed at minimising the financial risks that both consumers and lenders may face in doing business targeting biogas digesters.
Technology: Biogas digesters/stoves of inappropriate design and/or of poor quality introduced in the country.	Low	Biogas technology based on private ownership in several other developing countries has developed over the last 20+ years. Still, in order to avoid anything going wrong in Guinea, the project will establish network arrangements with other African countries that have several years of experience with biogas (Benin, Burkina Faso, Senegal, etc.) under programmes implemented by SNV and other partners. This will ensure that only successful models of digesters will be introduced and mistakes made elsewhere are not repeated. In addition, the project will bring in trainers from these countries to train Guinean builders in high quality digester construction.
Safety precautions may be neglected, leading to toxic substance leakages such as methane	Low	During installation and following completion of a digester construction, consumers will be trained in the safe utilisation of biogas. During project implementation, a thorough monitoring of methane leaks will be undertaken, and if any leakage happens, an assessment will be conducted for both health hazards and associated GHG impact attributable to the methane. Methodologies such as the CDM meth (AMSIIIH/manure treatment), assuming a leakage of 10% of the maximum methane producing potential from production, collection and transportation to a flaring system (IPCCC default value) can be applied. The methane content in biogas can give rise to fires if the gas leaks and in the presence of a flame or spark. However, the hydrogen sulphide (H2S), which is itself very toxic, in the gas can quickly alert people of a leak, given its "rotten egg" smell and this prevents accidents from happening. At large-size installations, monitoring of gas leaks will be undertaken with the assistance of gas sensors. And, as a precaution, users will be trained not to enter any closed area where gas may be present without the appropriate personal protective equipment, which may include a self-contained breathing apparatus (SCBA). For household digesters,

		gas leakage monitoring will involve informing consumers to detect foul smell and to refrain from using the gas when this occurs. In this case, they should call a qualified technician, to be trained under the project, to check and rectify the problem. Finally, the risk of gas leakage will be minimised through quality installation by qualified technicians and training of users on safety measures to be observed when utilising biogas.
Environmental/ Climate Change.	Low	There are multiple environmental risks (e.g. decrease in the availability of feedstock/biomass due to land degradation, reduced rainfall/water flows, drying up of watershed areas due to a change in climatic conditions) that can negatively affect biogas development through reduced availability of feedstock for the digesters. These will be mitigated by exploring a combination of cattle waste with other types of feedstock like agricultural biomass and kitchen waste to serve as digester feedstock.

A.7 COORDINATION WITH OTHER RELEVANT GEF-FINANCED INITIATIVES

- Ecosystem-Based Adaptation targeting vulnerable communities of the Upper Guinea Region: This $ 8 million, seven-year project was approved in May 2013 and is implemented by the Ministry of Environment, Water and Forests. Its objective is to reduce the vulnerability of local communities in the Upper Niger River Basin to the additional risks posed by climate change and build their general resilience through an ecosystem-based approach that focuses on watersheds, land-use practices and adaptive capacity.

- As indicated above, Guinea already participates in the regional GEF-funded PROGEDE project on biodiversity that is implemented by UNDP (implementing period: 2008 – 2016); the other countries covered are The Gambia, Senegal and Mali. PROGEDE aims at developing and implementing models for community based conservation and management of critical habitats for specific endemic ruminant livestock species (cow, sheep and goat) and to demonstrate strategies for preserving the unique genetic trait/habitat complexes that are of global importance.

- Increased Resilience and Adaptation to Adverse Impacts of Climate Change in Guinea's Vulnerable Coastal Zones: This $ 4,355,000 project is jointly funded by GEF, UNDP and the Government of Guinea. Implementation commenced in 2009 and is scheduled to complete this year. Its objective is to strengthen protection of vulnerable groups/communities living along the coastal region from the negative effects of climate change. Activities are focused on those zones that are of special importance for agricultural production (mainly rice farming) and, consequently, dealing with food security.

- Strengthening farmers' communities' livelihoods resilience against climate changes in the Guinean Prefectures of Gaoual, Koundara and Mali: The objective of this project, which is still under formulation, is to strengthen capacities of communities living in northern Guinea to integrate climate change into their policies, investment plans, sectoral budgets and strategies for development. It will also introduce piloting measures to improve resilience of the means of subsistence means in the face of climate change. This project, with a budget of $4,016,364 will be funded by GEF UNDP and the Government of Guinea over the period 2014 – 2018.

- "Project Gestion Intégrée des Ecosystèmes" (PGIE) and "Projet de Gestion Intégrée des Ressources Naturelles du littoral et de la biodiversité" (PGIRN): Both these projects are financed by GEF to the tune of $ 4.5 million and $ 7 million, respectively and are fully integrated into the "Programme d'Appui aux Communautés Villageoises" (PACV - see below). Funding from these 2 projects will be utilised to implement activities related to sustainable management of natural resources, utilising a spatial approach, either micro or watershed, to which will be linked interaction between human activities and productivity of natural resources.

- "Projet de gestion intégrée des ressources naturelles du Massif du Fouta Djallon", financed by the African Union, GEF, FAO and UNEP ($ 5 millions) is a regional project that covers Gambia, Guinea, Guinea-Bissau, Mali, Mauritania, Niger, Senegal and Sierra Leone. The objectives of the project are (i) to institute sustainable management of natural resources over the medium and long terms to contribute to better conditions of life to the population directly or indirectly dependent on the Highland of Fouta Djallon, aka the Water Tower of West Africa and (ii) to mitigate the cause and incidence of soil degradation on the structural and functional integrity of the

Highland. The four-year first phase commenced in July 2009 and has been extended to December 2014. A six-year second phase is presently in its planning stages.

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

- "Programme d'Appui aux Communautés Villageoises" (PACV): Within the framework of the fight against poverty, mainly in the rural areas, and with the support of several development partners (World Bank, IFAD, AFD, etc.), this $ 39.7 million programme is putting in place a strategy for decentralized and participative development. The main objective is to strengthen decision-making at the local level through the country's 303 Rural Development Communities. Activities under this programme commenced in 2000 with the Initiation Phase and proceeded to the Expansion Phase in 2012 and which will be followed by a Consolidation Phase.

- "Programme National d'Appui Aux Acteurs des Filières Agricoles» (PNAAFA): PNAAFA commenced activities in May 2011 and targets support to agricultural activities in Guinée Forestière and Moyenne Guinée with the support of $ 22 million from IFAD, of which a loan of $ 13.3 million, with the remaining $ 8.7 million constituting a grant. An additional grant of $ 9.1 million was secured from IFAD in 2012 to extend activities to Haute Guinée.

  The OPEC Fund for International Development will contribute an additional $ 10 million to implement studies and develop rural infrastructure. This funding will also enable expansion of PNAAFA to Basse-Guinée commencing this year.

- Projet STEWARD : This forestry conservation and sustainable subsistence activity, jointly funded by USAID and the United States Forest Service, has as strategic objective the implementation of a coherent regional programme encompassing transborder concerns related to bio-diversity. It will draw upon lessons learned from the regional perspective and disseminate best practices and harmonise policies, bearing in mind the negative effects of climate change at the level of priority areas of the Haute Guinée ecosystem. This $ 18-million programme, which commenced activities in October 2007 is presently in its implementation phase and is scheduled for completion in 2015.

B. ADDITIONAL INFORMATION NOT ADDRESSED AT PIF STAGE:

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

The project will be implemented through the NEX execution modality by the Ministry of Environment, Water and Forests (MEWF). The Ministry will appoint a National Project Director who will assume overall responsibility for project implementation, ensure the delivery of project outputs and the judicious use of project resources. The National Project Director will be assisted by a Project Management Unit headed by a Project Manager (PM) to be recruited through a competitive process. 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. An international part-time Chief Technical Adviser (18 weeks/year) will be recruited to support the PM on technical issues, while a full-time Project Assistant (PA) will support him/her on administrative and financial matters.

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

A Project Board, chaired by the Ministry of Environment, Water and Forests (MEWF) will be established to provide strategic directions and management guidance to project implementation. It will consist of representatives of the relevant ministries and Government Departments/Directorates (Ministry of Energy and Hydraulics, Ministry of

Agriculture, Ministry of Livestock and Animal Production, Ministry of Technical Education, Professional Training, Employment and Labour, National Agency for Microfinance) participating in the project, Association of MFIs, CERESCOR, the UNDP Country Office, the National Project Director as well as representatives of the NGO community and women's groups (e.g. Association for the Promotion of Renewable Energy, National Organisation for Professional Training, National Confederation of Farmer Organisations, etc.). Representatives of the private sector may be invited to participate as observers.

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

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

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

- A substantial reduction in deforestation as a result of utilising biogas for cooking in lieu of wood fuel. Biogas will also eleiminate the time households, especailly women and girls, spend daily on wood collection.
- Provision of a clean and smokeless fuel for cooking, thus eliminating respiratory and eye problems associated with exposure to smoke.
- A rural development dynamism through support to farmers will be encouraged at the local level through additionnal income-generating activities such as fruit and vegetable gardening through the use of slurry emanating from the digester and/or reduction of expenses for chemical fertilisers. This is expected to generate 3,000 jobs in farming during the project period.
- Opportunities for the private sector in job creation for digester construction, manufacture of gas stoves/lamps and maintenenance. If required , the project will support local training institutions (e.g. Centre de formation professionelle and Centre de formation polytechnique) to develop technical capacity required by project developers – a total of 500 jobs expected to be generated in this sector.
- The project will seek to achieve gender equality through the empowerment of women to fully participate in all project activities and specifically those related to capacity development under the various project components.
- Paricipation of civil society, through the involvement of NGOs, including women NGOs already mentioned above**,** and stakeholder consultations, in the decision-making process related to biogas development, and for information and awareness raising activities.

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

The project is expected to be approved in time to commence activities in mid-2015. Under this scenario, it is assumed that 400 household digesters (6 m^3) will be installed during Year 1, 700 during Year 2 and 900 during Year 3 (Table 4). Year 4, the final year of the project, will be devoted to expanding the gains and momentum generated during the prior years to expand the household digester programme. With regard to the pilot 10 large (20 m^3 or larger) digesters (Table 5), it is assumed that 5 of them will be installed during Year 2 of the project and the remaining 5 installed during Year 3. Hence, by the start of Year 4 of the project, it is expected that all 2,000 household and 10 large pilot digesters would be operational.

As per the above scenario, it is estimated that 1,200 m^3 of biogas/day would have been generated only by the household digesters by the end of Year 1, 4,580 m^3 of biogas/day by both household and large size digesters by the end of Year 2, 9,545 m^3 of biogas/day, again, by both household and large size digesters by the end of Year 3 and,

finally, 12,230 m^3 of biogas/day by both household and large size digesters during Year 4 of the project. Thus, by project completion, some 10,051,575 m^3 of biogas would have been generated and an annual biogas generation of 4,463,950 m^3 would be sustained over an expected 20-year projected life of the digesters installed under the project and not allocating for additional digesters that could be installed utilising the momentum generated by the project. All the energy obtained from this biogas generation, if not implemented, would have otherwise been obtained through burning of fuelwood. Through the use of biogas, not only deforestation will be reduced, but also the forests will be saved to continue serving as "carbon sinks".

The calorific value of biogas is variable (depending on methane content) at 20-26 MJ/m^3 (Source: Agri-Food and Biosciences Institute, UK, August 2010) and, for calculation purposes under the present project, the median value of 23 MJ/m^3 is used. In addition, as per IPCC guidelines, the global warming mitigation potential of biogas is 81.5 g/MJ or equivalent to 1.87 kg/m^3. Consequently, during the 4-year project period, almost 19,000 tons of CO_2 (10,051,575 m^3 x 1.87 kg/m^3) would have been avoided, equivalent to $ 139 of GEF funds per tCO_2. However, these biogas digesters will continue avoiding 8,350 tCO_2 (4,463,950 m^3 x 1.87 kg/m^3) annually during their remaining 16 – 18 years of useful life. When one looks at the 20-year lifetime of the biogas digesters earmarked for installation during the project period, they would have avoided 179,000 tCO_2, equivalent to $ 14.79 of GEF funds per tCO_2. Moreover, GEF funding should be viewed as creating the conditions to jumpstart the biogas market in the country that would help to galvanise both the government and the private sector. This implies that there would be significant potential in further "indirect" GHG reduction once the market has reached cruising speed.

Finally, under the assumption of the great interest generated in biogas during project implementation and given the conducive environment for investment in biogas that the project would have created, it is highly likely that many more new digesters will be built over a post-project period of 10 years, exceeding by several times the number installed during the 4-year project implementation period. Thus, the indirect post-project emission reduction estimates related to only the additional biogas digesters over their 20-year lifetime – on the basis of a conservative policy scenario and a GEF causality factor of 80% (top-down approach) -- can be estimated at 961,000 tons of CO_2 avoided, which translates into an abatement cost of $ 2.76 of GEF funds per tCO_2 reduced. In the case of the bottom-up approach, with a replication factor of 3, the indirect post-project emission avoided would be 501,000 tons of CO_2. Table 7 below summarises the direct and indirect total CO_2 emissions reduction during implementation of the project and beyond.

However, due to potential methane leakage, (2006 IPCC Guidelines for National Greenhouse Gas Inventories Volume 4 Chapter 10 guidelines specify a default value of 10% of the maximum methane producing potential for the physical leakages from anaerobic digesters - IPCCC default value). To be conservative, CO2 emission reductions have been reduced by 10%, to take into account any potential methane leakage.

Table 7: Project GHG emission reduction impacts

Time-frame	Direct project without replication (20-year digester projected life).	Indirect post-project (top-down) with replication (based on 8,000 household and 1,000 large digesters over next 10 years of project influence).
Total CO_2 emissions reduced (tons)	161,100	864,900
Unit abatement cost of GEF funds	$16.4	$3.0

C. DESCRIBE THE BUDGETED M & E PLAN:

A Project Board, as indicated above, will provide overall guidance to project execution. Private sector investors interested in developing business opportunities in biogas development and other interested parties will be invited to participate in the meetings of the Project Board, as observers, when required.

UNDP will monitor and report on progress in project implementation in accordance with the UNDP Programme Manual and GEF Monitoring and Evaluation (M&E) guidelines. In undertaking this, it will be supported by a National Project Director, to be designated by MEWF, a Project Management Unit (PMU) that will be supported by an international part-time Chief Technical Adviser and the UNDP-GEF Regional Service Centre in Addis Ababa. The PMU will report on relevant progress to the National Project Director and UNDP on a quarterly basis. Regular monitoring of the project will take place through this reporting mechanism as well as through site visits, as required.

Progress will be measured against targets set out in the Work Plan and indicators defined in the Project Logical Framework. For each of the project components, a detailed monitoring plan will be prepared during project inception. In this connection, a Project Inception workshop will be organized at the start of project activities to review the Logical Framework; specifically detailed means of verification, assumptions, etc. will be revisited and adapted (adaptive project management) as necessary, including measures to track any major project risks and taking into consideration the situation prevailing in the country. These indicators will draw upon all sources of information, including those of other donors active in the communal services field in the country. Appropriate and specific performance benchmarks will be established prior to project implementation to effectively monitor project progress and to make crucial management decisions.

Annual Tripartite Review meetings (TPRs), with the participation of the project team and stakeholders, will be held to review progress, identify problems, and agree on solutions to maintain timely provision of inputs/achievement of results. The Project Board will review annual work plans as well as provide strategic advice on the most effective ways and means of implementation. Reporting to GEF will be accomplished through Annual Project Reviews (APRs) and Project Implementation Reviews (PIRs).

Additionally, the project will be the subject of an independent mid-term review midway through project implementation and a terminal evaluation at project completion. The independent evaluations will review the relevance, timeliness and impact of project inputs and discuss lessons learned for use in improving the quality of future development interventions with similar activities that could be undertaken in collaboration with other development partners to the project. The results of the terminal evaluation, incorporating the lessons learned, will be disseminated both within and outside the region. All reports will be posted on the project website.

The costs for Monitoring and Evaluation are estimated at $ 102,000 (Table 10 below). This budget allocation includes activities related to preparing quarterly progress reports, undertaking Project Implementation Reviews, Annual Project Reviews, an independent mid-term review, an independent terminal evaluation and organizing/participating in Project Board Meetings, as required.

Table 10: Monitoring and Evaluation (M&E) Work Plan and Estimated Associated 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: 12,000	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.	Annually prior to ARR/PIR and to the definition of annual work plans

Type of M&E activity	Responsible Parties	Budget US$ *Excluding project team staff time*	Time frame
ARR/PIR	▪ Project manager and team ▪ UNDP CO ▪ UNDP RTA ▪ UNDP EEG	None	Annually
Periodic status/ progress reports.	▪ Project manager and team	None	Quarterly
Mid-term Review	▪ Project manager and team ▪ UNDP CO ▪ UNDP RCU ▪ External Consultants (i.e. evaluation team)	Indicative cost: 35,000	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 : 40,000	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: 3,000 (Total: 15,000)	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$ 102,000	

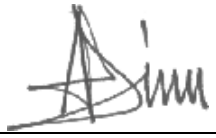
PART III: APPROVAL/ENDORSEMENT BY GEF OPERATIONAL FOCAL POINT AND GEF AGENCY

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

NAME	POSITION	MINISTRY	DATE (mm/dd/yyyy)
Mr. Amadou Sébory Touré	Director FSE (Guinea Environment Protection Funds) / GEF OFP	Ministry of Energy & Environment	AUG 29, 2012

B. GEF AGENCY (IES) CERTIFICATION

This request has been prepared in accordance with GEF policies and procedures and meets the GEF criteria for CEO Endorsement.

Agency Coordinator, Agency name	Signature	Date *(Month, day, year)*	Project Contact Person	Telephone	Email Address
Adriana Dinu UNDP/GEF Executive Coordinator		May 15, 2015	**Saliou Touré** Regional Technical Advisor, EITT	+251 912 503 320	saliou.toure@undp.org

ANNEX A: PROJECT RESULTS FRAMEWORK

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

Objective/ Outcome	Indicator	End of Project Targets	Sources of information
Objective - To assist the Government in addressing the barriers to significantly increase the utilisation of biogas resources to meet the energy needs of the country.	Emission reductions (in tCO2 over 20 yr timeline) Number of installed digesters (household and large scale) Energy produced by capacity installed during the project in MWhTh Number of jobs generated	1,026,000 tCO_2 (direct and indirect) reduced over 20-year lifetime of digesters installed. 2,000 household and 10 large digesters installed. 64,270 MWh_{TH} generated by project end and 28,542 MWh_{TH}/year sustained over 20-year projected digester life. 3,000 jobs in farming sector and 500 jobs in digester construction created.	Project's annual reports, GHG monitoring and verification reports. Project terminal evaluation report.
Outcome 1 – Streamlined and comprehensive energy policy and legal/regulatory framework for the use of biogas as a sustainable source of renewable energy.	Existence of adequate policy and regulatory framework	To be completed within 6 months of project initiation and approved by Government by the end of year 1.	Published documents. Government decrees/laws.
Outcome 2 – Promotion of investment in biogas technology through appropriate catalytic financial incentives for project developers.	Installed capacity of biogas digesters (in number of units and total MW capacity)	2,000 household and 10 large digesters constructed by project end. 64,270 MWh_{TH} generated by project end and 28,542 MWh_{TH}/year sustained over 20-year projected digester life.	Project documentation.
Outcome 3 - Programme to sustain a growing market of suppliers and users of biogas and its effluents, leading to overall improved livelihoods.	Awareness about biogas and its possibilities Existing capacity for installation and maintenance services	Increased awareness and capacities among stakeholders in place to promote, develop market for and utilisation of biogas.	Project documentation.

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

RESPONSES TO COUNCIL RECOMMENDATIONS

Comment	Response	Reference
Frances's Comments • The project aims to establish a functioning and effective market for the widespread use and commercialization of biogas technologies in Guinea. • The barriers to be addressed are well analysed and the components to be put in place well described. • The project should rely on local and international NGOs who have experience in biogas. We suggest to set up competitive process with call for proposals to select projects for the realization of the pilot units and select the best organizations able to implement these units in the Guinean context. *Opinion: Favourable*	The project will establish partnerships with organisations that have extensive experience with biogas in developing countries (e.g. SNV) and build on the experience of countries in Africa (e.g. Benin, Burkina Faso, Ethiopia, Mali, Niger, Rwanda, etc.) that have on-going experience with biogas. Criteria were developed for the selection of the selection of the regions/locations of the digesters. During the implementation stage, the project will adopt a competitive process to select the actual locations of the digesters and the organisations best suited to deliver successful results.	
Germany's Comments *Germany approves the following PIF in the work program but asks that the following comments are taken into account:* Germany requests that the following requirements are taken into account during the design of the final project proposal: The proposal remains somewhat unclear about the collaboration and complementarity to existing biogas activities in Guinea. • Page 5 says that the baseline for component 3 is the PRONIASE program. It is not clear why the baseline is not represented by the existing EU programme (National program for domestic biogas in Guinea). This is crucial in terms of defining the incremental investments. The incremental nature of the GEF funding is also unclear with view to component 1 on the creation of an enabling policy. • Component 2.2 is about developing an operational micro-finance mechanism. However, the proposal does not describe whether finance represents the largest and singular barrier. If finance is not the major barrier a shift towards training and construction training could be worthwhile. It is unclear whether manufacturers of biogas installations or buyers/operators shall be the beneficiaries. • In terms of component 3.2 the use of biogas instead of traditional fuels shall be promoted.	Some 80+ community biogas digesters were installed in Guinea during 1977 – 2001 under technical assistance programmes. However, once these programmes ended, the digesters started being neglected for lack of funding and the result is that at the present time there is not a single biogas digester operating in the country. The PRONIASE programme which was scheduled for implementation between 2013 and 2016 has, unfortunately, not started yet, for lack of resources. It is now highly unlikely that it will ever get implemented in Guinea. Hence, the 2,000 household digesters that were to constitute the baseline project will now get implemented under the present project. Finance does constitute one of the barriers to implementing the biogas programme and the project will work with micro-finance institutions to address this. In addition, training will be provided in digester construction, stove and lights manufacture and maintenance/repairs. The beneficiaries will be the households owning individual digesters, the communities/enterprises owning large-size digesters, builders of digesters and manufacturers of stoves, lights, etc. The digester size will be designed for it to be fed daily and the gas produced to be also used on a daily basis.	

Thereby it should be taken into account that biogas accrues on a permanent basis while consumption is temporary. Further, it should be taken into account that manure might not be available throughout the entire year (e.g. summer when livestock is kept extensively). • The benefit of component 3.6 ("completed value chain for biogas use") needs further explanation especially for the small-scale biogas applications. In general further clarification on the benefit of promoting the use of biogas and the technology to promote its use is sought. • The need for the modification or development of adequate policies on biogas use is not clear. • The assumed lifetime of 20-years is very long and aspiration of such high quality technology might not be appropriate. In this context exchange with SNV biogas programme should be sought (e.g. SNV supported Vietnamese household-level biogas construction and servicing programmes).	In additions, digesters will be installed only at sites where the feedstock and water will be available throughout the year. Household biogas digesters (6 m3 capacity) can meet the needs of rural families for cooking and lighting while the slurry from the digester provides an excellent source of organic (bio) fertiliser for use in growing vegetable or farming. Biogas eliminates the use of fuelwood/charcoal for cooking, thus contributing to reducing deforestation. The digesters themselves will be the fixed-dome type made of bricks and the gas produced will be utilised in gas stoves and lamps. The project will establish a partnership with SNV which is implementing its Africa Biogas Partnership Programme in Burkina Faso, Ethiopia, Kenya, Senegal, Tanzania and Uganda. It is also heavily involved in biogas development in several countries in Asia and Latin America. Its website (http://africabiogas.org) indicate that "In Africa and Asia, the fixed dome (the type to be developed in Guinea) plants are the most popular due to their relatively low cost of construction, long life – about 20 years, …". In addition, the World Bank Carbon Finance Unit (https://wbcarbonfinance.org) indicates that "The estimated useful life of a biogas plant is 20 years …". Finally, SNV started its biogas programme In Nepal in the 1980s and over 150,000 digesters have been installed, with the vast majority of them operating over 20 years The methane produced in the biogas digesters is not allowed to escape; instead, it is burned for cooking/lighting in lieu of fuelwood/charcoal. The forests that are saved through utilising biogas represent an additional potential for absorbing GHG emissions.	
• The GHG mitigation potential as mentioned under component 1 for the 10 large-scale biogas plants (around 56,000 tCO2e/year) seems overestimated especially in view of typically high project emissions of biogas plants. • The necessity to support large-scale biogas installations should be reassessed both in terms of incremental cost reasoning and in complementarity to existing activities.	In many developing (and developed) countries, large-scale biogas plants have been successfully used to convert farm waste, for example, into biogas for producing heat and or electricity for self-use or exporting to the grid, thus providing savings from the use of fossil fuels while generating additional income. In the case of Guinea, as explained in the document, it will take several years in biogas technology development before this level of utilisation is achieved.	

USA's Comments • The United States believes this project is promising given that there are already biogas initiatives underway in the country.	Although a community biogas programme was implemented in the country from 1977 to 2001, this programme relied solely on donor assistance. Once, the programme ended, the digesters were not properly maintained for lack of clearly spelled-out ownership and started falling into disuse. This has resulted in not a single digester operating in the country at the present time.	
• The proposal does not clearly explain who would own, operate, and maintain the 2,000 digesters – whether the electricity and heat produced will be used by families or sold to commercial enterprises. We recommend a more comprehensive explanation of the ownership and management plans for this project.	The 2,000 digesters (6 m^3 capacity) will be owned by the individual homeowners and the gas produced will be used for cooking and lighting in gas lamps. Each household will be responsible for operating/managing her/his own digester. With regard to institutional (large-size) digesters, they will be managed by the institutions that own them. In both cases (household and large size), training will be provided to the owners/operators and trained technicians will be available in the villages to troubleshoot whenever necessary.	

RESPONSES TO STAP RECOMMENDATIONS

Comment	Response	Reference
1. The biogas potential in Guinea seems promising with some initiatives already under way as identified in this well-constructed proposal. The project is well warranted. It looks at developing a market for medium to large-scale digesters.		
2. It includes constructing and installing 2000 small family-sized units yet there is also a UNDP PRONIASE project underway on this topic as described. It states this sub-program "will be subsumed as baseline to this GEF funded project". If so why is this included at section 2.6 under project Component 2? On page 7 it states under Component 2 that "while the baseline focuses on small scale bio-digesters with 6m3 average capacity, GEF funds will be used for large scale bio-digesters with 20 m3 capacity." It would be sensible if this project related only to medium to large scale digesters and not to include domestic scale digesters which tend to confuse the proposal. So the amount of funding allocated for these 2000 domestic scale digesters on page 2 should be removed.	The partnerships on which the PRONIASE Programme was counting upon did not materialise, with the result that no resources have been mobilised yet. In addition, with only 2.5 years remaining, it is difficult to envision as to when the Programme will mobilise sufficient resources for it to start. Therefore, with a programme that has not yet started, completion of the installation of the 2,000 household digesters that would have constituted the baseline for the UNDP-GEF project remains very uncertain, as of now. Hence, the 2,000 household digesters have been included under this project.	
3. Local manufacture of the large biogas plants will need to use overseas experience as	The digesters will be manufactured locally using bricks, cement and sand. Storage and piping for the gas to be	

mentioned. Biogas is corrosive. What materials will the digesters and balance-of-plant components be used for construction? Will they be designed locally or manufactured under license? This is an option worth considering since there are many manufacturers with experience and long-standing reputations for reliability.	delivered to the point of utilisation will be made of PVC.	
4. The plants will also need good maintenance programs if a long working life is planned. Will the plants be large enough to have a full-time operator because maintenance of steel components due to corrosion is always an issue. This includes pumps, tanks etc. The life of a biogas plant (and hence the overall cost) is determined strongly by the quality of its maintenance programme.	Large-size digesters will have dedicated and trained personnel feeding and maintaining them. For household digesters, the owners will be trained to do that. No steel components will be utilised for either producing or storing the gas. However, maintenance is very important and the project will develop the capacity of technicians to accomplish this.	
5. It is not clear if the electricity/heat produced will be used to satisfy on-site needs of commercial enterprises or if the intention is to sell electricity or heat or both. Legal, regulatory, and institutional frameworks as well as business models will differ in these two cases. The information is requested at the CEO endorsement stage. Can it be assumed that the biogas produced will be direct combusted for heat applications? If not, and it is to be used in gas engines for stationary or vehicle applications, it will first need scrubbing (removal of CO2 and H2S) which is not mentioned. It does state on page 8 that some gas will "displace the use of diesel generators for electricity production". Then scrubbing of the raw gas is essential - but it is not mentioned in the discussion. So is it included in the cost and GHG analyses?	All gas produced will be used for producing heat for cooking or hot water at health centres for maternal and child care and for sanitising medical equipment, and used in gas lamps, except for the slaughterhouse at Mamou and the Professional Training Centre at Dalaba, where small 1 and 2 kVA generators will also produce electricity. In these 2 cases, the gas will be cleaned prior to use.	
6. Component 1 includes producing a resource map of the country's biogas potential with the focus on domestic applications. Producing a resource map is a good idea but, as stated above, it should be targeting larger scale plants. It needs to be a map showing where the biomass feedstock resources are located from which the biogas can be produced. This can then be matched to possible sites of heat demand which should be nearby as transporting either the biomass, or the gas (after compressing in cylinders at an additional cost) are costly options. Also a thorough assessment based on technical, economic, financial and social costs of biogas	Component 1 will include a comprehensive market assessment of the country's biogas resource potential completed and develop options for biogas and slurry utilisation. As indicated in para. 5 above, all gas will be used for producing heat/hot water and in gas lamps except in 2 cases where small electricity generators will be installed. No compression of gas is envisaged under the project; all gas produced will be used on site.	

production from different feedstocks is needed. 7. The risks outlined include micro-finance - which only applies to domestic scale so should this be deleted? 8. A Component 4 relating to monitoring and evaluation is missing. What are the indicators and milestones that will depict whether the project is successful or not? STAP recommends that the project proponents develop specific indicators for monitoring and evaluating project impacts such as volume of fossil fuels replaced by biogas production (also converted into GHG reductions); amount of fossil fuel energy capacity retired from the grid; the amount of avoided GHG emissions with the increasing use of bio-based feedstocks/waste; market development indicators as well as human capacity indicators. 9. It is not clear how specifically the project will ensure that biogas production will reduce "the pressure on the forest resources and unsustainable land use". Obviously biogas used for domestic cooking will displace the demand for fuelwood - but also perhaps for industrial heat and diesel-fuelled electricity? And if so, to what degree?	Micro-finance will constitute a risk for household digesters and will be managed through working with micro-finance institutions, including ANAMIF. Monitoring and evaluation will be undertaken as part of the project implementation process described on page 30 of the RCE (Request for CEO Endorsement). In addition, activities related to M & E have been reinforced by adding an Output under Component 2 where specific indicators will be developed for monitoring and evaluating project impacts on volume of wood fuel/charcoal and diesel fuel displaced by biogas production and consumption, the amount of avoided GHG resulting from the increased use of cow dung, kitchen waste, etc. While there will be no grid-connected electricity generation during the project period, biogas utilisation will substantially replace fuelwood and charcoal for cooking, thus drastically reduce deforestation (hence, increasing the availability of carbon sinks), reduce GHG emissions, prevent soil erosion and improve livelihoods of the population, especially of those 64% living in the rural areas. Market development indicators as wells human capacity indicators in terms of job creation in the biogas sector are provided for in the log frame. Biogas utilisation will substantially reduce the pressure on forestry resources by replacing “forest generated” fuelwood and charcoal for cooking, thus drastically reduce deforestation (hence, increasing the availability of carbon sinks), reduce GHG emissions, prevent soil erosion and improve livelihoods of the population. With the accumulation of experience, it will also, in the long term, become a substitute to diesel for electricity and/or heat generation. Electricity will be generated under the project from a 1 kVA biogas generator at the slaughter house and a 2 kVA biogas generator at the Professional Training Centre. The remaining biogas at these two institutions will be for hot water at the slaughter house and hot water/cooking at the Professional Training Centre. At the Health Centres, PV systems are already installed for medical refrigeration; therefore, at Health Centres, biogas will be utilised for lighting, medical equipment sterilisation and hot water for maternity wards (ref. Table 5, page 25). Thus, substantial experience will be obtained from utilising biogas for heating applications; this will replace diesel fuel. In addition, some experience will be gained with electricity generation from biogas at the 2 above-mentioned institutions and this will prove useful during replication of electricity generation from biogas in the future.	

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

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

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

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

N/A

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

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

Project Preparation Activities	*Implementation Status*	*GEF Amount ($)*				*Co-financing ($)*
		Amount Approved	*Amount Spent to date*	*Amount Committed*	*Uncommitted Amount**	
Collection and analysis of baseline data including comparative review of other countries under similar conditions and circumstances	Completed	24,000	24,000			24,000
Review of experiences in Guinea and other countries of the following: - Application of biogas energy technologies use and productive use for income generation activities; - Large scale versus small scale biogas production - Area/community-based energy needs assessment and planning	Completed	10,000	10,000			10,000
Conduct a Logical Framework Analysis (LFA) to define project goal, objectives, outcomes, outputs and activities, including success indicators as well as delineation of responsibilities and coordination mechanisms	Completed	5,000	5,000			5,000
Stakeholder engagement, capacity needs assessment of key local implementing partners and co-financing	Completed	10,000	10,000			10,000
Detailed design of project implementation plan	Completed	11,000	11,000			11,000
Preparation and finalization of the full-sized Project Document	Completed	0	0			
Total		**60,000**	**60,000**			**60,000**

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