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Report No: 101650-KE

CARBON FINANCE ASSESSMENT MEMORANDUM

ON A

PROPOSED TRANSFER OF CERTIFIED EMISSION REDUCTIONS TO THE
CARBON FUND OF THE
CARBON INITIATIVE FOR DEVELOPMENT (CI-DEV)

FROM THE

PROMOTING BIOGAS AS SUSTAINABLE CLEAN COOKING FUEL FOR RURAL

HOUSEHOLDS IN KENYA PROJECT (P153493)

BY

SIMGAS IP BV

January 11, 2016

CURRENCY EQUIVALENTS

Exchange Rate Effective January 6, 2016

Currency Unit = Kenya Shilling
KS 102.25 = US$ 1
US$ 0.01 = KS 1

FISCAL YEAR

July 1 – June 30

ABBREVIATIONS AND ACRONYMS

ABPP	Africa Biogas Partnership Programme
BCE	Biogas Construction Enterprise
BP	Bank Policy
CADF	Carbon Asset Development Fund
CDM	Clean Development Mechanism
CER	Certified Emission Reduction
CFAM	Carbon Finance Assessment Memorandum
CF	Carbon Finance
CFO	Carbon Finance Operation
C/ME	Coordinating/Managing Entity
CO_2	Carbon Dioxide
Ci-DEV	Carbon Initiative for Development
CPA	CDM Programme Activity
CPA-DD	CDM Programme Activity Design Document
DNA	Designated National Authority
DOE	Designated Operational Entity
EIA	Environmental Impact Assessment
ESMF	Environmental and Social Management Framework
ESMP	Environmental and Social Management Plan
ER	Emission Reduction
ERPA	Emission Reduction Purchase Agreement
GNI	Gross National Income
GHG	Greenhouse Gas
INT	Integrity Vice Presidency (of the World Bank)
KBS	Kenya Bureau of Standards
KCIC	Kenya Climate Investment Center
KENDBIP	Kenyan Domestic Biogas Programme
kWh	Kilowatt Hour
LOA	Letter of Approval
m^2	Square Meter
m^3	Cubic Meter
M&E	Monitoring and Evaluation
MFI	Micro Finance Institution
MIC	Medium Income Country
MTP	Medium Term Plan
NEMA	National Environment Management Authority
OP	Operational Policy
POA	Programme of Activities
POA-DD	Programme of Activities Design Document
PID	Project Information Document
PIN	Project Idea Note
SACCO	Savings and Credit Cooperative Organization
SNV	Netherlands Development Organization
SORT	Systematic Operations Risk Ratings
tCO_2e	Tons of Carbon Dioxide Equivalent
TOR	Terms of Reference
TTL	Task Team Leader
UNFCCC	United Nations Framework Convention on Climate Change
WB	World Bank

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PROMOTING BIOGAS AS SUSTAINABLE CLEAN COOKING FUEL FOR RURAL HOUSEHOLDS IN KENYA PROJECT (P153493)

TABLE OF CONTENTS

LIST OF TABLES AND FIGURES

.....

PROMOTING BIOGAS AS SUSTAINABLE CLEAN COOKING FUEL FOR RURAL HOUSEHOLDS IN KENYA (P153493)

CARBON FINANCE ASSESSMENT MEMORANDUM

DATA SHEET

GENDR

Date: January 6 , 2016	Team Leader: Edward Felix Dwumfour; Juha Seppala (co-TTL)
Country Director: Diarietou Gaye	Sectors: Environment
Snr Director: Paula Caballero	Themes: Climate Change
Project ID: P153493	
Financing Instrument: Carbon Finance	Environmental screening category: B (Partial Assessment)

Project Financing Data

[ ] Loan [ ] Credit [ ] Grant [ ] Guarantee [X] Other: Carbon Finance

For Loans/Credits/Others: N/A

Total Project Cost : [Withheld due to World bank Access to Information policy on third party confidential information.]

Total Bank financing. N/A

Financing Plan (US$m)

Source	Local	Foreign	Total
IBRD/IDA			0.00
Government			0.00
Beneficiaries			0.00
Carbon Fund			[Withheld]
Total			[Withheld]

Host Country: Kenya
Responsible Agency: SimGas IP BV

Project implementation period: 10 years
Expected effectiveness date: January 29, 2016
Expected closing date: June 30, 2025

Does the project depart from the CAS/CPF in content or other significant respects? [ ]Yes [X] No

Does the project require any exceptions from Bank policies?	No
Have these been approved by Bank management?	N/A
Is approval for any policy exception sought from the Board?	N/A

Does the project include any critical risks rated "substantial" or "high"?	[ ]Yes [X] No
Does the project meet the Regional criteria for readiness for implementation?	[X]Yes [ ] No

Program development objective

Reduction of GHG emissions from improved access to biogas energy as a clean cooking fuel in livestock-owning rural households in Kenya

Project description

The project is a Private Sector-Led project by SimGas BV which has developed a new and innovative technology of producing small-scale biogas systems made of recycled plastic which enables mass production, easy installation and large scale implementation offering high quality and long lasting biogas systems with competitive price to end-users. By partnering with Silafrica Tanzania Ltd., a local plastic processing company of Sumaria Group, SimGas BV sells and installs biogas systems in East African countries, starting in Kenya and Tanzania, then expanding to Uganda, Rwanda and Ethiopia.

The project's objective would be to promote the use of biogas as clean cooking fuel in livestock-owning rural households in selected parts of Kenya through carbon finance. Carbon finance payments for anticipated delivery of Certified Emission Reductions (CERs) ("carbon credits") would allow SimGas to sell biodigesters to households at a discount and offer an extended 5 year warranty. The Bank project will be limited to purchasing CERs generated by SimGas' Kenya operations only. With carbon finance, the project proposes to reach out to about 11,000 households (HH) every year[1] between 2015 and 2024. According to reports by SNV experts (2007) and ETC (2007), the potential serviceable available market size in Kenya is estimated to be 1.2 million, of which the technical potential is 172,312 units. SimGas aims to obtain a market for 75,000 units by year 2025.

The project would have multiple development benefits resulting from substitution of firewood for cooking by clean biogas. These benefits would include reduced forest degradation and desertification, improved indoor air quality (from reduced indoor smoke exposure), improved health and reduced hardship for women and children who are primarily engaged in the collection of firewood in rural areas, increased income and social welfare improvement for rural HHs, creation of small scale business enterprises, along with contribution to climate change mitigation.

Through a carbon finance transaction, the World Bank as Trustee of the Carbon Initiative for Development (Ci-Dev) intends to purchase CERs from SimGas which are generated by individual households' biogas units under the CDM program of activities (PoA). The technology used in the biodigesters is a proprietary design developed and manufactured by SimGas.

Biogas systems convert manure and/or organic household waste into methane gas. This gas can

[1] Projected biodigester sales would start from 900 annually, rising over time to 11,000 per year in Kenya.

be directly used for cooking. The technology is well-known in Sub-Saharan Africa and Asia, but traditional brick-laid designs are challenging for large scale implementation. Initially, two types of biogas systems—the floating-drum type and the fixed dome type have been promoted. Although these systems have been successful elsewhere, adoption in Kenya has been minimal because of expensive installation costs and limitations as to the size of the systems (with $16m^3$ being the standard size). Unlike traditional biogas systems targeting households, the SimGas system is an innovative design, quick and easy to install and can be mass produced to meet the consumer demand quickly. Also, the system is made of recycled injection-moulded plastic that makes it affordable to users which should also allow for a longer or comparable operating life to traditional brick laid designs. SimGas has developed two proprietary designs of biogas systems: GesiShamba and GesiSafi. Of these, GesiShamba is for rural households and GesiSafi for urban users. The rural GesiShamba system is modular and scalable in $1m^3$ segments from the minimum size of $2m^3$ even after installation, should the need or opportunity to produce more biogas arise in a household. The proposed project would target the GesiShamba model.

According to studies, most households who have two or more heads of cattle under zero grazing, or four or more heads under semi-zero grazing are technically eligible to benefit from biogas technology[2]. There is technical potential for domestic biogas in at least 35 districts in Kenya, the highest potential areas being Nyanza, Western and Central provinces and more limited potential in Rift Valley and Eastern Provinces. SimGas has set up hub offices (warehouses) Eldoret and Karatina and shortly Nakuru -- to be possibly followed by Central, North and South Rift areas.

The GesiShamba biodigester is marketed through referrals (customer-to-customer), and direct sales are made through SimGas and BCEs (Biogas Construction Enterprises), cooperatives and SACCOs (Savings and Credit Cooperative Organizations). SimGas has a rural customer base, and has adopted a decentralized marketing approach. SimGas is investing in a local hub-office approach to be close to its customers and interested clients. Every main hub can service up to three sub-hubs. Responsibilities of all hubs (sub and main hubs alike) include sales, stock, service, and installation, but main hubs employ a hub manager, have a small office (sub-hubs only have a small shop and storage) and house the vehicles needed by all four hubs. These hubs are situated where there is a high demand for biogas (e.g. dairy farmers who zero-graze their cattle). Each hub has two Sales Representatives who can build relationships with local branches of micro-finance institutions (MFIs), SACCOs, churches, farmer groups and government extension officers. Local warehouses will stock parts, provide quicker installations grouped around the hub rather than further afield, optimizing operational efficiency and customer service. SimGas currently has a head-office and four main hubs with altogether 31 staff in Kenya. Sales representatives service an area of 10 km in radius, which is equal to an area of 300km2. In Kenya, the concentration of dairy cattle farmers is in the North Rift, South Rift and Central Provinces, and therefore SimGas in January 2014 setup main hub offices in Nakuru, Eldoret and Karatina. Nairobi is the central head-office, with key Management staff operating from there. If market demand allows, SimGas aims to open more hubs across Kenya to better serve where clusters of beneficiaries are located.

Another SimGas group entity (SimGas IP BV) is the Coordinating/Managing Entity (C/ME) for CDM purposes, and has developed the Clean Development Mechanism (CDM) Program of

[2] ETC Group and Shell Foundation - Kenya Biogas Feasibility Study (2007)

Activities (PoA) “SimGas Biogas Programme of Activities”, registered under the UNFCCC with reference PoA 7734. The first CDM Project Activity (CPA) covering 4,000 rural digesters and 6,000 urban digesters is already being implemented. Additional CPAs would be included in the PoA once all digesters under the first CPA have been installed. The project is already generating emission reductions from the biodigesters installed after the registration of the PoA. Each CPA would include around 10,000 biodigesters, and SimGas IP BV will include more CPAs into the PoA from time to time. It is expected, that 10 CPAs would be sufficient to include all the biodigesters targeted by the project in Kenya.

Which safeguard policies are triggered, if any?

This Project was designated EA Category B and triggers OP 4.01 - Environmental Assessment.

Covenants applicable to project implementation:

1. Annual certification of ERs,
2. Preparation of Environmental Management Framework and Environmental Management Plan.

A. STRATEGIC CONTEXT AND RATIONALE

1. COUNTRY AND SECTOR CONTEXT

1. Kenya, a lower middle income country (MIC) with per capita Gross National Income (GNI) of US$ 1,160 in 2013, has a population of nearly 40 million people dispersed across 47 counties with significant regional disparities in economic growth and poverty reduction which pose significant development challenges. Kenya holds great potential from this growing and youthful population; its dynamic private sector; a platform for change laid down by the new Constitution; and its pivotal role within East Africa and beyond. From 2006 to 2013, annual growth rates averaged 5.0 percent. Kenya's high unemployment, poverty and inequality rates have dampened its new status as a MIC even though the data are outdated and precise levels are unknown. The rate of poverty reduction has not kept pace with economic growth. Poverty rate is estimated to have reduced to 38 percent in 2012 from 46 percent in 2005/6. Inactivity rates among the youth stand at 9.6 percent compared to national average of 8.5 percent. Inequality stands at 47.7 percent. Infrequently collected and disseminated statistics are not conducive to inform and shape economic policy. Governance concerns persist; and growth has been constrained by low investment and low firm-level productivity and has yet to take off at the rapid, sustained rates needed to transform the lives of ordinary citizens. There are significant differences in opportunities and outcomes between women and men and for those living in the remote and most underdeveloped regions.

2. "Vision 2030", a national long-term development strategy, aims to create a globally competitive and prosperous nation with a high quality of life by 2030 that aims to transform Kenya into a newly industrializing, middle-income country providing a high quality of life to all its citizens by 2030 in a clean and secure environment. Vision 2030 calls for the rehabilitation and upgrading of the road network, upgrading the railways, improving urban public transport and expanding access to electricity and clean and safe water. The Government is currently implementing the first phase of the plan, covering the period 2013-2017 through its Medium Term Plan (MTP).

3. More than 75% of the Kenyan population live in the rural areas, with agriculture as their main occupation. The main farming systems feature cash crops, food crops, fruits and vegetables, forages, livestock, and tree growing. Energy plays a significant role in the lives of the smallholder farmers. They need energy for cooking, lighting, warming and drying (KARI, 2003). Fuel wood is the principal farm-based source of energy but is often in short supply. Biomass accounts for 68% of the total energy consumption (90% of the rural population is dependent on firewood), followed by petroleum with 22%, electricity 9% and others with 1%. In rural areas, reliance on biomass for energy is over 80 percent.

4. Kenya's electricity access is currently at 15% and the government plans to increase connectivity to at least 65% by the year 2022. It is estimated that more than half of the electricity supply is produced by hydroelectric dams, with the rest coming from fossil fuel thermal power plants and geothermal utilities. Some installed small-scale

renewable utilities also contribute to the grid. There is still further potential for a higher contribution or improvement of renewable energy in Kenya with respect to energy efficiency, sustainable exploitation, impacts on the environment and people's health. Among these renewable energy sources is biogas which is mainly used at the domestic level where over 4,500 domestic size units have been installed over the past two years, averaging from 3-15 m^3. Overall, there are several thousand biodigesters installed in Kenya, but, most of them operate below capacity or are currently in disuse due to management, technical, socio-cultural or economic problems.

5. The proposed project is part of the National Biogas Promotion Program KENDBIP (Kenyan Domestic Biogas Programme), which in turn is part of the larger Africa Biogas Partnership Programme (ABPP). ABPP has a target of 100,000 systems installed in Ethiopia, Kenya, Tanzania, Uganda, and Burkina Faso and providing half a million people access to a sustainable source of energy by the year 2017. The KENDBIP program, which is supported by SNV --the Netherlands Development Organization, an NGO--, was initiated in Kenya in 2009 with an overall goal of developing a commercially viable biogas sector in Kenya. Since from 2009 the program has managed to install over 14,000 biogas plants of the traditional brick-laid design in Kenya. The second phase of the program runs from 2014 to 2017 with a target of installing 27,500 digesters of both traditional and advanced innovative designs, such as the one promoted by this proposed program. The proposed project would work in collaboration with ABPP and KENDBIP as well as with the National Environment Management Authority (NEMA) of Kenya, which is the Designated National Authority in Kenya for CDM. The program will also look forward to establishing a close working relationship with the Kenya Climate Investment Centre (KCIC) which is funding biogas development through its ongoing incubator financing as part of InfoDEV's Climate Technology Program. Links to the Lake Victoria Environment Management Program will also be established for mutual learning.

6. The project would target a number of development challenges, including providing access to clean, renewable off-grid energy; combating deforestation and providing climate change mitigation benefits; improving livelihoods; empowerment of women and children and improved health from reduced indoor smoke exposure. These are all supporting the World Bank Group's twin goals of eradicating extreme poverty and boosting shared prosperity.

2. RATIONALE FOR WORLD BANK INVOLVEMENT

7. According to the latest CPS for Kenya (FY 2014-2018), the WBG will ramp up its already considerable support to public-private partnerships, especially in the energy, water, and transport sectors. Another high priority is to target support for the poor including focus on agriculture -- a direct link with helping families in rural areas. The poor must also be protected from the impact of disasters and climate-related changes to their environments, as climate variability and hydro-climatic shocks (droughts and floods) impact disproportionately on the poor. The proposed project, by providing cooking energy from manure, would enhance energy security at household level, while

slurry from the biodigesters can enhance agricultural productivity. The monetary savings from free biogas can buffer against food price shocks.

8. The World Bank has been the Trustee of over 15 carbon funds since 2000. The Bank launched the Carbon Initiative for Development (Ci-Dev) in 2013 to promote energy access in IDA countries in Africa and Least Developed Countries in Asia using carbon finance as a catalyst for projects to meet their individual financing gaps and reach financial closure. The current low prices for CERs are not conducive for most project developers to consider CDM. Ci-Dev's unique pricing approach is not reliant on the prevailing market price for carbon credits, but focuses on the overall level of carbon finance needed for an individual project to become implemented. In addition, a proposal for the development of a real-time biogas monitoring system is seeking separate Ci-Dev grant funds, which would allow for remote-monitoring of installed biodigesters to ensure they remain in full working order after installation.

B. CARBON FINANCE OPERATION

1. PROGRAM DEVELOPMENT OBJECTIVE

Reduction of GHG emissions from improved access to biogas energy as a clean cooking fuel in livestock-owning rural households in Kenya.

9. In many developing countries the dependency on fire wood and charcoal as a source of energy is very high, with around 3 billion people combusting solid fuels on open fires to meet their cooking and heating needs. Indoor air pollution is one of the ten major threats to health globally, causing almost 2 million deaths annually due to solid fuel use. The unsustainable burning of fire wood also contributes to the emission of greenhouse gases and deforestation.

10. This program aims to install biogas systems in households using non-renewable biomass and fossil fuels as their main source of cooking fuel. The biogas systems will be fed with a feedstock of manure and/or organic waste, which will be anaerobically digested to produce biogas. The biogas produced will be used to replace the combustion of non-renewable biomass and fossil fuels, thereby reducing CO_2 emissions. The biogas systems that use manure as a feedstock can also reduce CH_4 emissions by diverting manure that would otherwise decompose without the capture and use of the methane.

11. The proposed carbon finance (CF) operation is built on a pre-existing Clean Development Mechanism (CDM) Program of Activities (PoA) in Kenya that has already been registered at the UNFCCC since December 21, 2012[3]. The CDM project is currently undergoing monitoring for generation of carbon credits (CERs) and first issuance is expected after conclusion of the first monitoring period and subsequent verification by a third party verifier in early CY2016. Though this particular project provides a new innovative take to biodigester technology, similar CDM projects based on biodigesters

[3] PoA 7734 : SimGas Biogas Programme of Activities

have successfully been implemented by the Bank, including in Nepal with successful issuance of CERs. Payment for CERs from the Carbon Initiative for Development (Ci-Dev) Trust Fund will be made upon issuance and delivery of CERs to a special holding account, minimizing the fiduciary risks to the Bank as Trustee. As a carbon finance operation, Bank policies on financial management and procurement do not apply. All other Bank policies and procedures apply.

2. PoA Outcomes

12. The key performance indicators of the program are (a) Cumulative GHG reductions achieved; (b) number of households benefiting from access to biogas energy for cooking; (c) direct project beneficiaries, out of which XX% women; and (d) improvement of indoor air quality in participating households (as measured by proxy indicators e.g. reduction in smoke-induced illnesses such as eye irritation, chest disorders, etc.).

13. The program will contribute to sustainable development environmentally, socially and economically.

14. The overall program will aim to ultimately reduce GHG emissions up to 3 million tons of carbon dioxide equivalent by year 2025 in Kenya. By promoting the use of biogas technology, the program will reduce deforestation and forest degradation in areas where non-renewable biomass is used as a source of fuel. Rural households in Kenya consume on average 11.77 kg wood per day or 4.3 t per year. Urban households predominantly cook on charcoal and use 742 kg of it per year. Reduction of the use of non-renewable biomass will contribute to the overall stability of forest ecosystems, which support biodiversity and watersheds. Finally, soil conditions will be improved where digester slurry is applied to agricultural land.

15. Reduced combustion of firewood and fossil fuels in households/SMEs/communities will reduce indoor air pollution, thereby improving the respiratory health of users, particularly women and children who spend a large portion of their time indoors.

16. According to calculations by SimGas, a family that operates a 6-8 m3 biogas system can save about US$ 75-90 on fire wood, about US$ 90-100 on kerosene and US$ 25-30 on health expenses every year. The value of the nutrients in the slurry (produced by the biogas system) is estimated at between US$ 125 and US$ 250 annually. The use of digestate (or slurry) as an organic fertilizer on agricultural soils can significantly improve soil quality and offset costs that would otherwise be incurred in the purchase of chemical fertilizers. The nutrient value of the slurry produced has also been shown to be higher than raw manure.

3. POA DESCRIPTION

17. The carbon finance operation includes the small-scale CDM Program of Activities (PoA) and a yet-to-be determined number of CDM Project Activities (CPAs), including the first registered CPA 01. For this proposed project, the World Bank supported carbon finance operation will only consider CPAs in Kenya. A typical CPA will cover the installation and operation of biodigesters fed on manure or organic waste in rural households. Where Type I methodologies apply (AMS-I.I; AMS-I.E), the aggregate capacity of the CPA will not exceed 15MWth, whilst the thermal capacity of each individual digester will not exceed 150 kWth. Where a Type III methodology applies (AMS-III.R) the aggregate emissions reductions as a result of avoided methane emissions achieved in the SSC-CPA will not exceed 20 kt CO2e per year, while the emission reduction per installation will not exceed 5 tCO2e. It is expected that in the carbon finance operation in Kenya the focus will mainly be on methodology AMS-I.E. Each installed biodigester will have a unique serial number and CDM program logo physically attached to it. The serial number will be recorded along with the GPS location of the installation. Upon installation, users will sign a sales contract confirming that they transfer the rights to the CERs to SimGas IP BV which will sell the CERs onwards to Ci-Dev.

4. MONITORING AND VERIFICATION

18. The UNFCCC accredited Designated Operational Entity (DOE) will independently verify emissions reductions achieved within each CPA. Use of the programme database will allow unambiguous identification of the emissions reductions achieved in each CPA as all records will be kept with a clear division between CPAs.

19. The DOE may use the programme's electronic database to perform checks such as ensuring there are:

– No double serial number entries;

– No installation dates falling outside the CPA start date in which the biodigester is included;

– No incomplete data for each installation;

– A complete set of supporting documents for each database entry (annual monitoring reports, sales contract, Baseline survey, Monitoring Survey, Manure Management survey, commissioning protocol).

20. Verification shall be carried out following the sampling guidelines as per the methodology applied. The DOE may also perform spot-checks of the installations to ensure that the data recorded in the database is accurate. The CME is responsible for annual monitoring of CPAs. Results of the monitored parameters will be compiled in a monitoring report for each monitoring period, which will be made available to the DOE. Monitoring will be carried out through a combination of direct measurements of installed system's operating performance, as well as through monitoring surveys, using statistically sound sampling methods in line with a 90/10 confidence, as outlined in the *Standard for Sampling and Surveys for CDM Project Activities and Programme of Activities*.

5. TECHNICAL ASPECTS

21. The CPA covers biogas systems of two types: manure-fed systems (rural model) and organic waste-fed (urban) systems. Other types of biogas digester may be included in future CPAs, as long as they are in line with the methodologies and micro-scale additionality guidelines.

22. The Bank supported carbon finance operation will support **Manure-fed biogas systems** ("Rural systems") which enable users to use the manure of their livestock to generate energy and organic fertiliser. A pit latrine can also be connected to the biogas system. A manure-fed biogas system is an anaerobic digestion system designed for households/SMEs/communities in the (sub-) tropics. Anaerobic digestion is the biological conversion of complex organic material to methane, under anaerobic conditions. The biological conversion is performed by bacteria that are already present in the manure. The whole process takes place in a single gas-tight volume: the digester. For the users the operation of the system is very simple:

- Collect manure, urine and water. Add biodegradable kitchen waste in small pieces.
- Mix the manure and organic wastes 1:1 with the liquids and feed it into the digester.
- Gas production will start immediately and pressure will build up in the digester.
- Gas can be used throughout the day by a biogas cooker.

23. The build-up of gas will push out slurry from the other end of the biogas system. This bioslurry is an excellent fertiliser and can either be applied directly to crops or composted with other organic material. Maintenance needs are limited since the biogas systems have no moving parts. Over the years, some indigestible material will build up in the digester, limiting the reactor volume. This issue can be simply solved by scooping the indigestible material out and re-filling the biogas system with manure.

24. The SimGas rural GesiShamba system is modular and scalable in $1m^3$ segments from the minimum size of $2m^3$ even after installation up to $16m^3$. Other sizes could be offered in future, as long as they are in line with the methodologies and micro-scale additionality guidelines.

25. At the factory in Dar Es Salaam, Tanzania, testing equipment is being employed to the product to simulate exposure to the elements and to speed up the wear and tear experienced by the biodigesters. SimGas also has testing grounds in Arusha, Tanzania, where the design is being improved by way of testing with different compositions of the material. SimGas is setting up regional hubs with a 10 km radius to the biodigesters installed to allow for ease of maintenance. Training customers in the use of the biodigester is carried out during installation and periodic calls/visits by SimGas staff.

26. SimGas has prepared a simple user manual to provide guidance to users of the system. After the SimGas technician has completed the installation, the customer will need to wait for up to 2 weeks for the bacteria to start working and producing gas. When the slurry starts running from the outlet, the customer will call SimGas and a technician will arrive with the stove and connect it and provide user training. Compared to the prevailing practice of cooking indoors with an open flame on the floor, the SimGas solution with a counter-top stove is a big improvement safety-wise.

6. FINANCIAL ANALYSIS [REDACTED DUE TO AI POLICY EXEPTION ON THIRD PARTY CONFIDENTIAL INFORMATION]

27. [Redacted.]

28. [Redacted.]

29. Overall, the revised base-case business plan is assessed to be reasonable for a small and fast growing venture company. While the revised base-case led to a decrease in total sales in order to be more conservative, the rate of sales remains still steep but is assessed to be appropriate for an early-stage growth company. [Redacted]

C. IMPLEMENTATION ARRANGEMENTS

1. INSTITUTIONAL ARRANGEMENTS

30. **SimGas IP** BV is the Coordinating/Managing Entity and is responsible for overall CDM PoA execution and management, raising awareness, technological promotion, quality control, extension services, general monitoring and reporting. SimGas IP BV will also be responsible for CER commercialization and carbon finance utilization. It will fulfil the following tasks:

- General management of the Program, including its carbon asset management and coordination of the contributions of all entities involved.
- Initiate and supervise monitoring
- Draft monitoring reports for all CPAs in accordance with the latest version of AMS-I.E, AMS-I.I and AMS-III.R methodologies
- Coordinate and communicate with the validator/verifier and the CDM Executive Board;
- Maintain a system for management and record keeping for each CPA under the PoA.
- Request the UNFCCC to issue CERs into a registry account.
- Coordinate the contributions of all entities involved

31. Users (households) in areas with SimGas sales representatives or associates offering the biodigester make the purchase decision based on their financial position, interest and a feasibility assessment by SimGas and operate the biodigester with either

predominantly animal manure or organic kitchen wastes, depending on the type purchased. Tasks allocated:

- If manure-fed biogas digester is purchased, users are responsible for recording the quantity of manure fed into the digester, and for ensuring that slurry is applied to agricultural land aerobically (following the training provided);
- Maintain the operation of the biogas systems;
- Correctly and accurately complete/provide information for completion of the Sales Contract and Commissioning Protocol.

32. Households will benefit from a discount offered by SimGas and the extended warranty in exchange for the carbon finance. Benefit-sharing to households would thus not materialize in carbon revenue per se, but would be built-in to the warranty provided. The households have an incentive to keep the systems in operation due to displacement of wood fuel and/or cooking gas and associated savings.

33. Suppliers will be contractually bound by the CME to provide the following services within the program:

- Supply and install biogas systems at users
- Inoculating biogas digesters at installation
- Instruct users on how to use and maintain the biogas digester installed
- Correctly and accurately prepare Sales Contracts and Commissioning Protocols
- Arrange after-sales service for users
- Provide training on the proper application of slurry to agricultural land and how to record the quantity of manure fed into the biodigester.
- Moving biogas digesters, if needed
- Assist in monitoring on request of the CME SimGas IP BV

CPA implementing entity

34. The CPA implementing entity (CPA IE) is the party that is in charge for running a particular CPA. The role of the CPA IE will be SimGas Kenya, a company fully under SimGas East Africa, but other parties can join the program and set up new CPAs either in Kenya or in other countries where the PoA operates. Where this is the case, the CPA will be contractually bound to the SimGas IP BV as the CME to meet the requirements of the CDM, as detailed in the PoA-DD. The CPA IE will be responsible for draft monitoring reports for their respective CPAs in accordance with the latest version of AMS-I.E, AMS-I.I and AMS-III.R methodologies and to coordinate the contributions of all entities involved in the CPA.

Field measurement personnel

35. Field measurement personnel operate under the direction of the CPA implementing entity and the CME. They are responsible for assisting in conducting monitoring within the respective CPA at the request of the CME, e.g. recording monitored data in the CME database and providing input for the writing of monitoring reports.

36. All field measurement personnel will have undergone training to ensure they have the capacity to accurately measure the monitored parameters. On completion of training, staff will receive a letter confirming their attendance, which will also be recorded electronically by the CME. This will be used to confirm that staff are qualified to carry out data collection as required under the PoA.

2. IMPLEMENTATION PLAN

37. SimGas plans to manufacture the biodigesters in Dar Es Salaam, Tanzania, at their joint venture production facility and import the digesters to Kenya by road. In Kenya, Nairobi is the central head-office, with key Management staff operating from there. Biodigester parts will be distributed to warehouses (currently in Karatina, Eldoret and Nakuru). SimGas sales representatives stationed within 10 km radius from warehouses will promote biodigesters to households owning a minimum of 2-3 heads of cattle. Simgas installation teams will install the biodigesters and provide training in their use to customers. SimGas plans to open hub offices by renting warehouse & office space in 9 high-potential areas in North-rift and Central in Kenya, namely Nairobi, Nyeri-Karatina, Kiambu, Eldoret, Meru, Kisii, Nyandarua, Kericho, and Nakuru in 2015 and 2016. If the market demand allows, SimGas aims to open more hubs across Kenya to better serve where clusters of beneficiaries are located.

38. [Redacted.]

TABLE 2: PLANNED SALES AND ER GENERATION [REDACTED]

39. Achieving these delivery numbers will rely on the success of the salesforce on one hand, but also the quality of biodigesters and the satisfaction of customers. Thus far, a large share of sales have been made based on recommendation of satisfied customers. Going forward, customer-to-customer marketing will continue to be an important aspects of the implementation plan, but so will the importance of the salesforce grow when expanding to new geographical locations. Another marketing avenue will be the use of dairy cooperatives to reach out to their respective members. Growth to more underprivileged areas of the country will require more readily available credit. Currently SimGas offers a limited option for payments in installments, but this form of financing is planned to be rolled out in a larger scale as a pay-as-you-go scheme starting in December 2015 in Kenya. This type of scheme has recently been launched in Tanzania [Redacted].

3. BANK SUPERVISION

40. As for carbon finance projects in which underlying investments are not directly financed by the World Bank or IFC, Bank supervision of procurement, financial management and disbursement aspects is not required. However, the Bank will need to

supervise safeguards compliance and carry out regular supervision of the PoA to monitor achievement of its objectives.

D. SAFEGUARDS

41. This Program was assigned a Category B as it is likely to have minimal or no adverse environmental impacts, based on the nature of planned interventions. The project triggers OP 4.01 -Environment Assessment – to guide safe handling and appropriate timing of application of the bioslurry onto fields with sufficient period of delay between land spreading organic amendments and crop harvesting. When utilizing the biogas, careful attention should be paid to the safe usage of the biogas and regular checks made on the digesters and piping for cracks to avoid leakage of biogas into ambient air. SimGas has internal protocols for safe installation and for providing its customers with environmental health and safety information together with other technical documentation (which will serve as an ESMF/ESMP for the project). The environmental provisions of the technical documentation have been made publicly available in Kenya and have been disclosed in the Bank InfoShop. SimGas has an established information sharing / grievance redress system for customers and project affected people with a telephone number for their central office in Nairobi, which will be utilized for this project.

TABLE 2: SAFEGUARD POLICIES

Safeguard Policies Triggered by the Project	Yes	No
Environmental Assessment (OP/BP 4.01)	[X]	[ ]
Natural Habitats (OP/BP 4.04)	[ ]	[X]
Pest Management (OP 4.09)	[ ]	[X]
Physical Cultural Resources (OP/BP 4.11)	[ ]	[X]
Involuntary Resettlement (OP/BP 4.12)	[ ]	[X]
Indigenous Peoples (OP/BP 4.10)	[ ]	[X]
Forests (OP/BP 4.36)	[ ]	[X]
Safety of Dams (OP/BP 4.37)	[ ]	[X]
Projects in Disputed Areas (OP/BP 7.60)*	[ ]	[X]
Projects on International Waterways (OP/BP 7.50)	[ ]	[X]
Piloting the Use of Borrower Systems to Address Environmental and Social Issues in Bank-Supported Projects (OP/BP 4.00)	[ ]	[X]

World Bank Grievance Redress

42. Communities and individuals who believe that they are adversely affected by a World Bank (WB) supported project may submit complaints to existing project-level grievance redress mechanisms or the WB's Grievance Redress Service (GRS). The GRS ensures that complaints received are promptly reviewed in order to address project-related concerns. Project affected communities and individuals may also submit their

* *By supporting the proposed project, the Bank does not intend to prejudice the final determination of the parties' claims on the disputed areas*

complaint to the WB's independent Inspection Panel which determines whether harm occurred, or could occur, as a result of WB noncompliance with its policies and procedures. Complaints may be submitted at any time after concerns have been brought directly to the World Bank's attention, and World Bank Management has been given an opportunity to respond. Information on how to submit complaints to the World Bank's corporate Grievance Redress Service (GRS), is available at http://www.worldbank.org/GRS. For information on how to submit complaints to the World Bank Inspection Panel, visit www.inspectionpanel.org.

E. CARBON FINANCE ASPECTS

1. MAIN ERPA TERMS AND CONDITIONS

43. The World Bank's CER purchase from the PoA will be in its capacity as Trustee of the Carbon Fund of Ci-Dev. The estimated amount of CERs that will be purchased will be negotiated between the SimGas IP BV and the World Bank as Trustee and recorded in the Emission Reductions Purchase Agreement (ERPA), based on due diligence by the Ci-Dev team and calculations in the Project Design Documents. Due to the commercial nature of the ERPA, the CER volume to be transacted cannot be publicly disclosed. The exact number of CERs transacted will be subject to periodic verification by an independent accredited DOE, and the PoA outcome will be the annual amount of delivered CERs, which have been certified and issued by the CDM Executive Board.

44. As designed, each CPA will have a 7 year crediting period renewable twice up to a total of 21 years. The overall potential for the program is to generate a total of 3,257, 212 tCO_2e of CERs over 10 years. However, the actual amount of CERs will depend on the actual installation as well as implementation of monitoring program to determine the total amount of CERs generated.

2. NEGOTIATIONS AND ERPA SIGNING

45. The ERPA was signed on January 29, 2016.

3. ADDITIONALITY

46. The concept of additionality means that CDM projects have to realize actual, measurable and long-term benefits in deferring or halting climate change. The amount of emission reduction has to be additional to any that would have occurred without the project's implementation.

47. The PoA is a voluntary coordinated action by SimGas IP BV who coordinates and implements any policy/measure that leads to anthropogenic GHG emission reductions or net anthropogenic greenhouse gas removals by sinks that are additional to any that would occur in the absence of the PoA, via an unlimited number of CDM programme activities

(CPAs). The demonstration of additionality of the PoA as a whole has been assessed in the PoA-DD as per the following checklist:

(i) The proposed PoA is a voluntary coordinated action;

The proposed PoA is a voluntary initiative of the proposed CME, SimGas IP BV, a limited liability company registered in the Netherlands and specifically set up to disseminate and scale up the use of biodigesters. It does not have any legal or other obligations to further spread the use of biodigesters. Therefore all its activities are undertaken purely voluntarily.

(ii) If the PoA is implementing a voluntary coordinated action, it would not be implemented in the absence of the PoA;

In the absence of the PoA the consumption of non-renewable biomass would remain or increase. As the PoA covers a large area with regional/national differences the additionality is established at CPA-level.

(iii) If the PoA is implementing a mandatory policy/regulation, this would/is not enforced;

The PoA is not implementing a mandatory policy/regulation.

(iv) If a mandatory policy/regulation is enforced, the PoA will lead to a greater level of enforcement of the existing mandatory policy/regulation.

Not applicable

The information presented here above constitutes the demonstration of additionality of the PoA as a whole.

F. RISKS

48. The proposed projects overall risk rating is Moderate.

49. The operating environment of the project is unlikely to be influenced by the overall political and governance situation of the country as contacts with these institutions are minimum. The project has been issued a Letter of Approval by the Kenyan Designated National Authority (DNA) for CDM. The project will be implemented at the local level such that macroeconomic effect risk is low. Payments for CERs will be based on performance, thus fiduciary risk is low.

50. The project will be distributing a novel design of biodigester for which long-term durability is yet uncertain. Testing equipment is being employed to the product to simulate exposure to the elements and to speed up the wear and tear experienced by the biodigesters. SimGas has testing grounds in Arusha, Tanzania, where the design is being

improved by way of testing with different compositions of the material. After installation, SimGas will periodically call up owners of biodigesters to make sure that the systems are functioning properly. Training on the use of the biodigester is given during installation.

51. The target for rolling out the new design of biodigesters into a new market and then scaling up rapidly is ambitious. However, early results from neighbouring Tanzania are encouraging and affordability of the digester to households is improved by the rebate offered based on carbon credits and also the 6 month payment period provided by SimGas for the remainder of the 40% of the investment cost (household makes a 60% initial payment). Moreover, a new pay-as-you-go scheme will be introduced in Kenya in December, which should make the biodigester even more affordable to households. SimGas uses three sales channels: (i) own salesforce; (ii) Biogas Construction Enterprises (BCEs) and (iii) Cooperatives. Key element is a customer-to-customer marketing approach with local demonstrations. Feasibility studies (e.g. by SNV) for the biogas sector in Kenya have been used by the project developer to determine that sufficient critical mass exists for biodigesters in Kenya. All assumptions on roll-out are being made only with the rural model to be conservative. Further, annual installation of only 5,000 biodigesters are being considered in feasibility calculations by the task team.

52. SimGas is a company formed in 2009 and is in the process of scaling up its operations and expanding to new countries in East Africa putting strain on production capacity and hiring and training of staff. A Nairobi-based TTL will monitor implementation progress and will maintain contact with the CPA implementing entity. Regarding the risk associated with the Bank engaging with a private sector entity, an Integrity Due Diligence process had been conducted by INT on the client company SimGas BV and associated companies (SilAfrica, Sumaria Group) with no flags raised.

53. Biodigesters convert manure into biogas and bioslurry. Care needs to be employed when spreading the bioslurry to reduce infections from possible pathogens still alive in the bioslurry, though much less than in untreated manure. All households are trained on the effective and safe use of bioslurry by a quality officer or senior technician from SimGas to prevent the spread of diseases. In addition, care should be taken not to introduce dung from cows being treated with antibiotics so as not to interfere with the useful bacteria in the biodigester. The design of the biodigester has been made in such a way that operation is safe. For example, the inlet has been designed in such a way that livestock and small children cannot fall into the digester. In case the family installs a toilet connection to introduce human waste into the biodigester, additional measures will need to be taken to protect the crops against contamination: either only use bioslurry to fertilize (fruit) trees or the bioslurry needs to be composted first kill off the last pathogens.

54. Main stakeholders are the customers who have bought the biodigesters. They will generally have installed the equipment on their own property, which reduces the risk of opposition from those advocating for potentially alternate uses for the land. Customers will need to indicate in pre-sales interview whether she/he owns the land or has the lease title. If multiple families or extended family members control the land, the customer

should indicate proof of evidence that she/he has consulted the other families in the use of the plot for the digester.

55. Regarding social acceptance of biodigesters, Kenya was among the first countries in Africa to adopt biogas technology in the early 1950's and under the umbrella Kenya National Domestic Biogas Programme (KENDBIP) over 14,000 biogas plants have been constructed since 2009. From the consumer perspective, SimGas takes the market risk for generation of carbon credits to finance a price discount offered to customers. Regarding possible "elite capture" of the benefits provided by the proposed project, as the biodigesters require a minimum of 2-3 cows to generate the dung to feed the digester, the technology is not suitable for the poorest households. However, the price discount offered will make the technology more readily accessible to households over a wider array of income levels. Poorer households unable to afford a biodigester can consider a selection of improved and cleaner cook stoves to achieve some of the clean cooking and cost savings benefits associated with the biodigester. SimGas also offers payment schemes that allow for payment in instalments. The Kenyan market offers various designs of biodigesters at various price points, including Floating Plastic Drum designs (Blue flame, PolyBiogas, approx. $930), fixed brick dome (ABPP, approx. $1000) and plastic flexi-bag (e.g. Flexi Biogas, approx. $410). Interested customers are free to select the solution that best fits their needs. The price discount achieved with carbon finance for the SimGas model is justified, as it should offset some of the customer hesitation towards a newer more untested type of design and actually level the playing field for SimGas which is a more recent entrant to the market.

56. Risks associated with importing the biodigester parts to Kenya from Tanzania are (a) hold-ups at the border leading to delays and (b) obtaining the Kenya Bureau of Standards (KBS) approval for the new biodigester standard. SimGas is confident that border crossings can continue with only slights delays on occasion. A visit by the KBS to the production facility in Dar Es Salaam is expected in May 2016, and since SimGas has been involved in the drafting of the proposed new biodigester standard, they anticipate they will be successful in obtaining the certificate without problems. This should not impact SimGas' ability to continue selling the biodigester in the interim.

57. The task team also acknowledges the risks involved in moving ahead with a CDM program that has yet to issue CERs. However, the monitoring requirements in the proposed program are manageable and mainly involve ensuring by means of annual sample surveys that the biodigesters remain operational and that non-renewable biomass continues to be available.

Risk rating summary[4]

Risk Categories	Rating – High (H), Substantial (S), Moderate (M), Low (L)
1. Political and governance	L
2. Macroeconomic	L
3. Sector strategies and policies	L
4. Technical design of project or program	M
5. Institutional capacity for implementation and sustainability	S
6. Fiduciary	L
7. Environment and social	L
8. Stakeholders	L
9. Other	
Overall	**M**

[4] The new risk management approach of the Bank, the Systematic Operations Risk Rating Tool (SORT), is required from 1 October 2014 and optional before that date. The table presented on this page is the SORT template.

ANNEX 1: ELIGIBILITY CRITERIA FOR INCLUSION OF CPA IN POA

The eligibility criteria for including a CPA in the PoA are as follows:

Category	
General	All biogas digesters in each CPA are located within the geographical boundaries of one Host Country**.**
	In addition to the geographical boundaries, the boundaries between CPAs are also defined by a time-induced boundary. This includes that each biogas digester within the CPA is commissioned within the timeframe specified in the CPA-DD. The date of construction of each biogas unit is specified by the date of the Commissioning Protocol
	Each biogas digester in the CPA has a unique serial number and programme logo engraved or permanently attached as a nameplate. The serial numbers are listed in the CPA database. [and] The GPS coordinates of the location of each biogas digester is recorded in the CPA database. [and] The CME has an agreement in place with the owner of each individual biogas digester in the CPA in which the owner of each biogas digester transfers the rights to the emission reductions to the CME
	The start date of the CPA is the date at which the commissioning of the first biogas digester is completed. This is recorded in the Commissioning Protocol, which is archived and the date recorded in the CPA database. The database allows for easy verification that the earliest commissioning date is the start date of the CPA.
	A written confirmation from the CME has been issued for the CPA that no funding from Annex 1 parties has been used for this CPA or that, if used, this did not result in a diversion of official development assistance.
	The proposed small scale CPA of the PoA is not a debundled component of a large scale activity because: Each of the independent subsystems/measures included in the CPA of a PoA is no larger than 1% of the small-scale thresholds defined by the applied

	methodology (not exceeding 450kWth for SSC type I; not exceeding 600tCO2e for SSC type III methodologies).
	The CPA demonstrates additionality as detailed in the *Guidelines for demonstrating additionality of microscale project activities* (EB 68, Annex 26) More details below: The CPA will stay below the scale limits, defined as follows: (a) Where AMS-I.E or AMS-I.I applies, the size of the CPA is less than or equal to 15 $MW_{th;}$ and (b) Where AMS-III.R applies, the size of the CPA is less than or equal to 20 $ktCO_2/yr$. Whichever CPA capacity is reached first will define the limits of the CPA. (b) Where AMS-I.E or AMS-I.I apply, an individual household biogas system in the CPA has a maximum thermal capacity of 4,500 $kW_{th;}$ (c) Where AMS-III.R applies, each of the independent biogas systems in the project activity achieves an estimated annual emissions reduction equal to or less than 600 tCO_2e per year (d) End users of the subsystems or measures are households/communities/SMEs.
Project Activity	The CPA will install biogas digesters of the following types: □ Manure-fed biogas systems, which generate biogas and organic fertiliser, and measure 2 – 16 m_3. Other sizes could be offered in future, as long as they remain below the maximum output capacities in criteria 9 below. □ Organic-waste fed biogas systems, which generate biogas from domestic organic waste, and measure 0.54 – 3.5m_3. Other sizes could be offered in future, as long as they remain below the maximum output capacities in criteria 9 below. □ Other types of biogas digester that are approved by the CME, as long as they are in line with the methodologies and micro-scale additionality guidelines.
Only if AMS-I.E applies:	All biogas digesters in the CPA [will be/are] replacing non-renewable biomass.
Only if AMS-I.E applies	The CPA demonstrates that non-renewable biomass has been used since 31 December 1989, using survey methods or referring to published literature, official reports or statistics.

Only if AMS-I.I applies:	Each biogas digester shall have a rated capacity equal to or less than 150 kW_{th}
Only if AMS-III.R applies:	The CPA comprises the recovery and destruction of methane from manure and organic wastes that would be decaying anaerobically in the absence of the project activity.
Only if AMS-III.R applies:	The CPA is limited to biogas digesters installed at individual households or small farms with methane recovery systems that achieve an annual emission reduction of less than or equal to 5 tCO_2 / year per system.
Only if AMS-III.R applies:	The CPA specifies that methane emissions are prevented by changing the management practice of a biogenic waste or raw material in order to achieve the controlled anaerobic digestion equipped with methane recovery and combustion system.
Only if AMS-III.R applies	The CPA uses the methodology AMS-III.R in combination with: − AMS-I.I "Biogas/biomass thermal applications for households/small users" or □ AMS-I.E "Switch from non-renewable biomass for thermal applications by the user"
The CPA uses the methodology AMS-III.R in combination with: − AMS-I.I "Biogas/biomass thermal applications for households/small users" or □ AMS-I.E "Switch from non-renewable biomass for thermal applications by the user"	The CPA satisfies the following conditions: □ The sludge is handled aerobically. In case of soil application of the final sludge the proper conditions and procedures that ensure that there are no methane emissions is ensured; □ Measures are used (e.g. combusted or burnt in a biogas burner for cooking needs) to ensure that all the methane collected by the recovery system is destroyed.
	The target group within the CPA are households, communities and /or SMEs, as recorded in the Sales Contract. All biogas digesters will be directly installed at the user's by qualified personnel. All entities involved in the distribution of biogas digesters will have a contractual agreement with the CME detailing their role in the CPA and the transfer of emissions rights to the CME.
	The sampling method applied in the CPA (e.g. in the monitoring plan) follows the *Standard for Sampling and Surveys for CDM Project Activities and Programme of Activities* (EB 69, Annex 4). A 90% confidence interval and a 10% margin of error

	requirement is achieved for the sampled parameters.
	Where AMS-I.E or AMS-I.I apply: The CPA's power capacity in aggregate remains below 15 MW_{th} throughout the crediting period; Where AMS-III.R applies: The CPA's annual emission reductions in aggregate remains below 20 $ktCO_2e$ per year throughout the crediting period.
Environment and Social Issues	The CPA must have secured all required environmental clearances.
	The CPA must comply with World Bank safeguards. The project safeguard documents (EMP) must be disclosed at locally, nationally and internationally.

ANNEX 2: TECHNICAL PARAMETERS OF BIODIGESTERS

The GesiShamba (English: Farm-Gas) fixed dome biogas system is mass-produced in High Density Polyethylene (HDPE), which reduces material costs, while greatly expediting the transport and installation process. A modular GesiShamba system is installed in just one day. It is available in any size starting at 2 m3, with increments of 1 m3. In this manner, SimGas is able to offer a system that matches the needs of any household. Following initial installation, a system can easily be expanded, or removed and relocated.

FIGURE 1: SCHEMATIC LAY-OUT OF A MANURE-FED BIOGAS SYSTEM

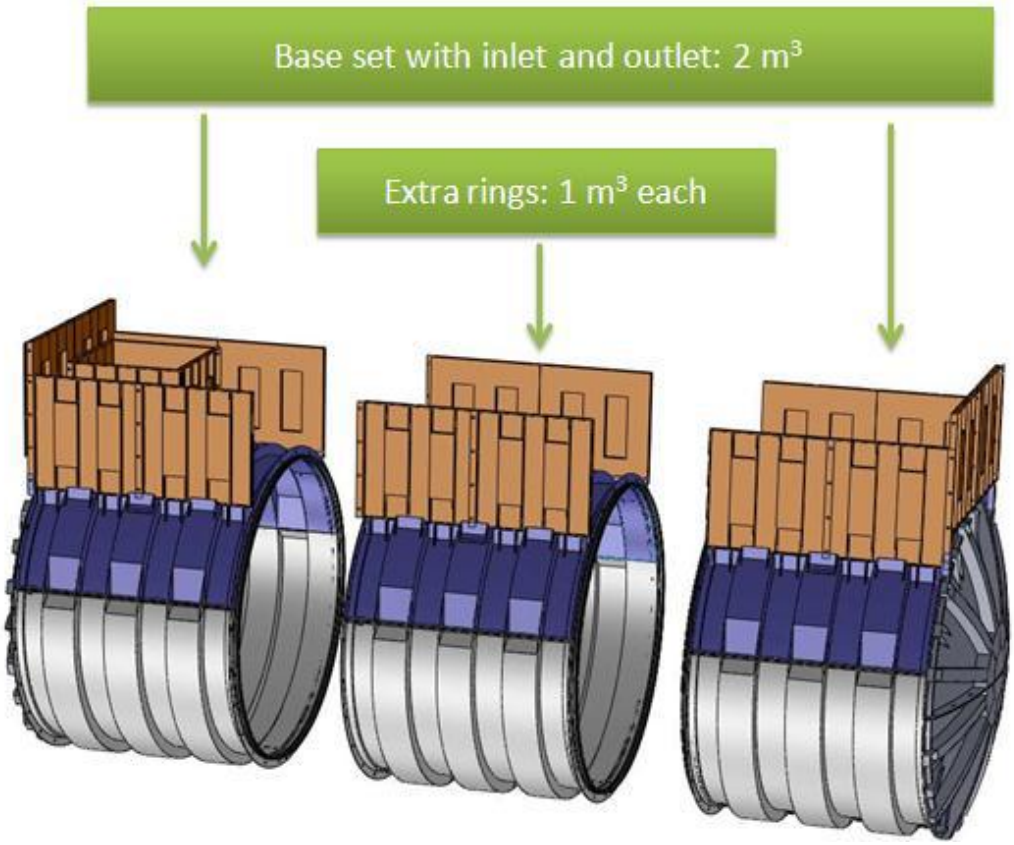
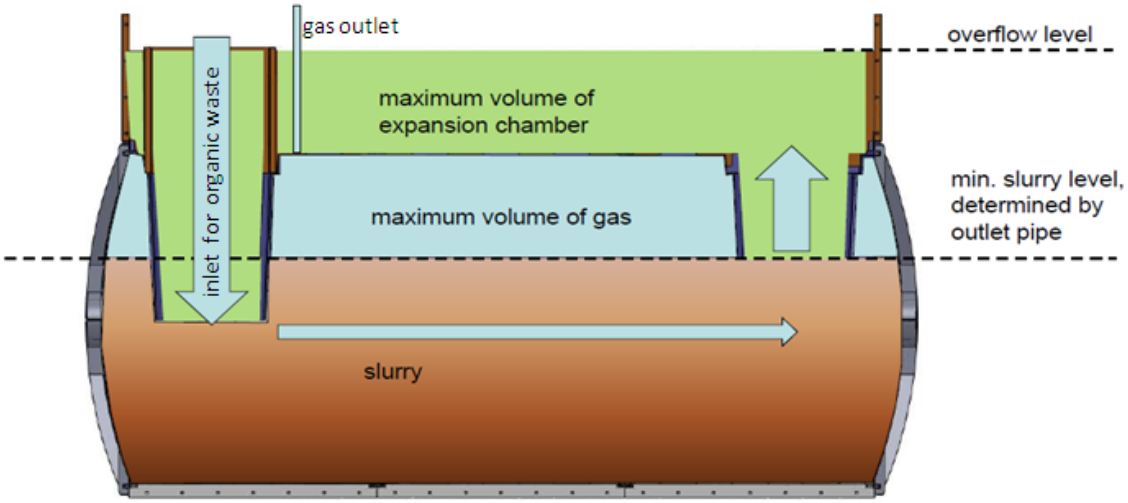


FIGURE 2 – SCHEMATIC LAYOUT OF A SCALABLE ORGANIC-WASTE FED BIODIGESTER SYSTEM, SHOWING HOW ADDITIONAL PLASTIC RINGS CAN BE INCLUDED TO INCREASE THE CAPACITY OF THE BIODIGESTER, AS WELL AS THE BASIC INNER STRUCTURE.



Improved fixed dome design

The GesiShamba has been specifically designed to fulfil the needs of smallholders with livestock. On average, these are larger families with a high demand for cooking energy. The larger farms will also be able to benefit from other biogas equipment for lighting, cooling or brooding/incubating purposes. The GesiShamba has innovative features that traditional brick biogas systems do not possess: (1) By placing the expansion chamber on top of the gasholder heat is better preserved and the footprint reduced; (2) the tubular design reduces retention time spread (1 and 2 contribute to a higher gas yield); (3) the inlet and outlet are improved; eliminating the need for pre-mixing of manure with water to a smooth paste, reducing the need for water by at least 80%, and separating the acidification phase, which leads to a higher quality biogas and improved process stability. The GesiShamba is made as an all-eater, which means it can also be used for co-digestion of (nonlignin) biodegradable materials, further improving the gas yield.

Product specifications

Biogas system examples in three different sizes	**3m³**	**6m³**	**12m³**
Required number of cows cross breed, zero grazing	2 - 3 cows	4 - 6 cows	8 - 12 cows
Manure feed in liters per day	50 liter	100 liter	200 liter
Water feed in liters per day	25 liter	50 liter	100 liter
Biogas production in cubic meters	1m³	2m³	4m³
Daily cooking hours using a two-burner stove	1.5 - 2.0 hours	3.0 - 5.0 hours	6.0 - 12.0 hours
Slurry production in liters per day	75 liter	250 liter	300 liter
Product dimensions in meters	3.0x1.2x1.7 m	7.0x1.2x1.7 m	10.5x1.2x1.7 m
Pit dimensions in meters	4.0x2.5x1.0 m	8.0x2.5x1.0 m	11.0x2.5x1.0 m
Product weight in kilograms	93 kg	203 kg	294 kg

SimGas biogas systems come in any size from 2m³ to 25m³ in 1m³ increments. Larger installations are available on request.
Based on an Hydraulic Rentention Time (HRT) of 40 days.

ANNEX 3: MONITORING AND EVALUATION PLAN

The parameters to be monitored within each CPA will depend on the methodologies applied, as outlined below. A weighted-average approach will be applied based on the population sizes of the sampled clusters. As stated in section E.6.2 of the PoA-DD, users with the manure-fed biodigesters (rural model) will apply a combination of AMS-I.E or AMS-I.I and AMS-III.R. Users with the organic waste-fed biodigesters (urban model) will apply either AMS-I.E or AMS-I.I only. This carbon finance operation would not cover urban models.

AMS-I.E (version 4)

This category comprises activities to displace the use of non-renewable biomass by introducing renewable energy technologies. Examples of these technologies include but are not limited to biogas stoves, solar cookers, passive solar homes, renewable energy based drinking water treatment technologies (e.g. sand filters followed by solar water disinfection; water boiling using renewable biomass).

Monitoring requirements:

- Yearly check by sampling (90/10) if the biogas systems are still operating.
- Yearly check through a survey that non-renewable biomass previously used by those that start using a digester, is not now used by other households/SMEs/communities that previously used renewable biomass.
- Confirmation that non-renewable biomass is displaced or substituted at the users included under 1 above.

Where AMS-I.E applies, operational data that installed systems are still in use will be monitored. This data will be collected through a biogas data logger which checks if the gas is flowing in a set time interval, or through a survey to check that the systems are operational, conducted via sampling. Through a Monitoring Survey users will be asked how much biomass is used for cooking after the installation of the biodigesters. Leakage under AMS-I.E is to be calculated in accordance with the guidance provided by AMS-I.E version 4, paragraph 10.a: "*By is multiplied by a net to gross adjustment factor of 0.95 to account for leakages, in which case surveys are not required.*"

AMS-I.I (version 3)

This category comprises activities for generation of renewable thermal energy using renewable biomass or biogas for use in residential, commercial, institutional applications (e.g. for supply to households, small farms or for use in built environment of institutions such as schools). Examples of these technologies that displace or avoid fossil fuel use include but are not limited to biogas cook stoves, biomass briquette cook stoves, small scale baking and drying systems, water heating, or space heating systems.

Monitoring requirements:

- Yearly check by sampling (90/10) if the biogas systems are still operating.

- At least five campaigns26 per biodigester type will be carried out per year to account for the total biogas supplied to the thermal energy equipment (BSk,y)

Where AMS-I.I applies, operational data that installed systems are still in use will be collected. This data will be collected through a biogas data logger which checks if the gas is flowing in a set time interval, or through a survey to check that the systems are operational, conducted via sampling. A measure of the biogas throughput will be quantified through a direct measure from a biogas flow meter, applied in campaigns. At least five campaigns (defined as continuous monitoring over a period of at least one month) will be applied per digester type. As such, at least five installations per digester type will be monitored for a period of one month each on an annual basis.

AMS-III.R (version 2)

This project category comprises recovery and destruction of methane from manure and wastes from agricultural activities that would be decaying anaerobically emitting methane to the atmosphere in the absence of the project activity. Methane emissions are prevented by:

(a) Installing methane recovery and combustion system to an existing source of methane emissions; or

(b) Changing the management practice of a biogenic waste or raw material in order to achieve the controlled anaerobic digestion equipped with methane recovery and combustion system.

Monitoring requirements:

- Estimating the average annual hours of operation of a system using survey methods
- Annual recording of operating systems using survey methods
- Survey methods are used to determine the annual average animal population (NLT), the amount of waste/animal manure generated on the farm and the amount of waste/animal manure fed into the biogas system.
- The proper soil application (not resulting in methane emissions) of the final sludge verified on a sampling basis.
- The baseline manure handling practice at a sample of all biodigester users. These exact data will substitute MCFj and MS%Blj estimated in the respective SCC-CPA-DDs.

Where AMS-III.R applies, operational data that installed systems are still in use will be collected. This data will be collected through a biogas data logger which checks if the gas is flowing in a set time interval, or through a survey to check that the systems are operational, conducted via sampling. Average annual hours of operation will be determined through asking users how many days a year they use the biodigesters, and for how many hours per day, on average, they cook using biogas. Through a Manure Management Survey, part of the Monitoring Survey, the CME will also ask users to estimate their annual average animal population, as well as to estimate the quantity of manure generated on the farm and the quantity fed into the system. Users will also be asked to detail the methods used to apply the final sludge to soil.

Upon sale of the biodigester installations, and associated accessories, the user will sign a Sales Contract, and upon commissioning, a Commissioning Protocol. The sales and commissioning persons shall be responsible for ensuring that all data are complete and accurate within respective documents. Hard copies of both documents will be kept at the office of the CME, and all data entered into a central record keeping database.

The record keeping database will be used to record the results of all monitoring, thereby avoiding double counting, with all data stored to be kept for at least two years after the crediting period or the last issuance of CERs for the project activity. The data will be stored electronically in the database, with original hard copies of all collected monitoring data also kept.

ANNEX 4: PROJECT PREPARATION AND SUPERVISION

Table A7-1: Preparation Schedule

Schedule	Planned	Actual
PIN Approval		06/02/2014
PCN Review		03/23/2015
PID and ISDS to Infoshop		09/08/2015
Begin Preparation		03/25/2015
Updated PID and ISDS to Infoshop	10/16/2015	11/18/2015
Decision Meeting	10/21/2015	10/21/2015
ERPA Signing	01/29/2016	
Planned Effectiveness	01/29/2016	
Planned Closing Date	06/30/2025	

Table A7-2: Bank Staff and Consultants Who Worked on the Project

Name	Title	Unit
Edward Felix Dwumfour	Task Team Leader	GENDR
Juha Seppala	Deal Manager, Co-TTL	GCCCF
Kazuhide Kuroda	Sr. Operations Officer	GENDR
Julius Thaler	Sr. Counsel	LEGEN
Svetlana Khvostova	Environmental Specialist	GENDR
Kiyoshi Okumura	Investment Officer	GCCCF
Kirtan Sahoo	Sr. Carbon Finance Specialist	GCCCF
Nuyi Tao	Sr. Carbon Finance Specialist	GCCCF
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Sergi Cuadrat	Biogas consultant (STC)	GCCCF
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