SFG1441

Promoting Biogas as Sustainable Clean Cooking Fuel for Rural Households in Kenya Project

Environmental and Social Management Framework (ESMF)/ Environmental and Social Management Plan (ESMP)

Prepared by SimGas IP BV

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ABBREVIATIONS AND ACRONYMS

CDM	Clean Development Mechanism
CER	Certified Emission Reduction
Ci-Dev	Climate Initiative for Development
CPA	CDM Programme of Activities
ERPA	Emission Reduction Purchase Agreement
ESMF	Environmental and Social Management Framework
ESMP	Environmental and Social Management Plan
GoK	Government of Kenya
MoENR	Ministry of Environment and natural Resources of Kenya
NEMA	National Environmental Management Authority of Kenya
SACCO	Interest Groups or Associations

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PART I: Activity Description

1. Introduction

In many developing countries the dependency on firewood and charcoal as a source of energy is very high[1], with around 3 billion people combusting solid fuels on open fires to meet their cooking and heating needs[2]. As a result, indoor air pollution is one of the ten major threats to health globally, causing almost 2 million deaths annually due to solid fuel use[3]. The burning of firewood and the production of charcoal also contributes to the emission of greenhouse gases and deforestation and forest degradation.

Biogas digesters allow for the production of sustainable fuel from organic waste through anaerobic digestion. The biogas can be used as a clean source of cooking fuel while the slurry from the digester is a very good fertilizer (Figure 1).

Despite recent increases in the production and supply of energy in Kenya, 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 (*see Annex 1 for history and policy reforms in the country*).

2. Project Objective

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

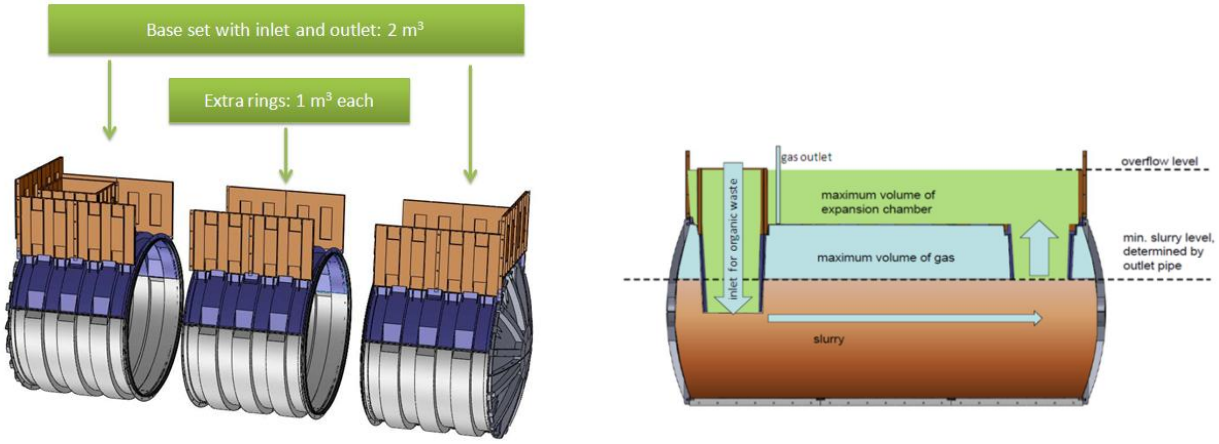
3. Project Description

The project is being developed as a joint venture between Silafrica Ltd., based in Tanzania, and SimGas BV, based in the Netherlands. It aims to install biogas systems with stoves in households, small and medium enterprises (SMEs) and communities that are currently using non-renewable biomass and fossil fuels as their main source of cooking fuel. The biogas systems will be fed with a combination 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 carbon dioxide (CO_2) emissions. The biogas systems that use manure as a feedstock can also reduce methane (CH_4) emissions by diverting manure that would otherwise decompose in open pits, emitting methane.

[1] Food and Agriculture Organization: Forests and Energy, Rome: FAO. (2008)
[2] World Health Organization: Indoor air pollution and health, Fact sheet No. 292: WHO (2011)
[3] World Health Organization: Indoor air pollution and health, Fact sheet No. 292: WHO (2011)

The World Bank, as Trustee of the Carbon Initiative for Development (Ci-Dev) plans to enter into an Emission Reductions Purchase Agreement (ERPA) with SimGas for the procurement of Certified Emission Reductions (CERs) generated by the underlying CDM Programme of Activities[4] sub-project(s)[5] in Kenya as a results-based financing arrangement.

Figure 1: Schematic layout of a rural biogas digester: transportable, scalable and easy to install.



4. Environmental and Social Footprint

The project is associated with a wide range of sustainable development benefits, each of which is outlined briefly below.

1. *Positive Environmental and Health Impacts*

The project will reduce deforestation and forest degradation in areas where non-renewable biomass is used as a source of fuel. The use of biogas as a cooking fuel will reduce demand for firewood and charcoal. This will contribute to the overall stability of forest ecosystems, which support biodiversity and watersheds.

An important by-product from biogas digesters is the bio-slurry that is produced via anaerobic digestion. In fact they reduce waste production by converting manure and organic kitchen wastes –produced by the household in a baseline case without a biodigester-- into useful biogas and bio-slurry which is an excellent form of fertilizer. Soil condition will also be improved where digester slurry is applied to agricultural land[6'7]. This will lead to increased crop yields and reduce costs to farmers where (synthetic) fertilizers were originally purchased. The use of fertilizer also increases soil stability and improves soil quality.

Since biogas is a clean fuel, indoor air quality will be improved as biogas cook stoves do not produce soot or the particulate matter typically associated with the combustion of firewood and charcoal.

2. Negative Environmental and Health Impacts

While biogas digesters do not lead to an increase in waste production, anaerobic digestion process does not wholly inactivate all forms of pathogens such as bacteria, viruses, fungi and other parasites found in the feedstock[8]. Bio−slurry does in many cases still contain a considerable amount of pathogens, although often in smaller quantities than in undigested manure. If not treated appropriately, applying bio-slurry could result in the risk of

[4] UNFCCC reference PoA 7734 : SimGas Biogas Programme of Activities
[5] Also known as a CDM Programme Activity (CPA)
[6] Intelligent Energy Europe: The Future of Biogas in Europe III, University of Southern Denmark (2007)
[7] Lukehurst, C.T.; Frost, P.; Al Seadi, T.: Utilisation of digestate from biogas plants as biofertiliser, IEA Bioenergy. (2010)
[8] Bioslurry =Brown Gold? A review of scientific literature on the co-product of biogas production. Lennart de Groot and Anne Bogdanski, FAO (2013)

contaminating crops with harmful pathogens, directly transmitting pathogens to vegetables, animals and/or agricultural workers, and contaminating groundwater or surface water deriving from field runoff. It should be noted that the sanitation of the end bio-slurry would depend on the quality of the substrates fed into the digester, and on the digester performance, such as previous pasteurization, digestion temperature, slurry retention time, pH and ammonium concentration, among others. The scientific literature shows that both temperature and retention time are crucial parameters to determine whether the resulting effluent can be used without causing health risks. This has been shown for the bacteria Clostridium perfringens, Listeria monocytogenes, Salmonella spp. The same applies for the effectiveness of anaerobic digestion on nematodes and viruses.

3. *Social Benefits*

The respiratory health of biogas digester users will be improved through the reduced combustion of fire wood, charcoal and fossil fuels in households/SMEs/communities. This is of particular significance to women and children who spend a large portion of their time near the domestic hearth[9, 10].

The time spent on collecting firewood, typically a woman's task, will also be reduced; thereby freeing up time for other income-generating activities and improving the safety of women and children in areas where collecting firewood requires journeying to remote areas alone.

5. Policy, Legal and Administrative Framework

National Environmental and Social Management Requirements

A few of the national environmental and social management requirements of Kenya that may be applicable to the SimGas biogas digester project are listed below (*see table summary in Annex 3*):

1. The Constitution of Kenya 2010
2. The Environment Management and Co-ordination Act, 1999
3. Environmental Impact Assessment and Audit Regulations 2003
4. The Water Act, 2002
5. The Wastewater Regulations, 2006
6. The Occupational Health and Safety Act, 2007
7. Water Quality Regulations (2006)
8. EMCA (Wetlands, riverbanks, lakeshores and Sea shore management) regulations, 2009
9. EMCA (Waste Management) Regulation, 2006
10. EMCA (Noise and Excessive Vibration Pollution Control) Regulations, 2009
11. Environmental Management and Coordination Act (Air Quality) Regulations, 2008
12. Electric Power Act, 2006
13. The Factories Other Places of Work Act (Cap 514)
14. Electricity Regulatory Commission (Energy Policy of 2004, Energy Act of 2006 & various Regulations)
15. Pest Control Products Act CAP 346

Relevant World Bank Policies

The proposed project has triggered World Bank Operational Policy 4.01 on Environmental Assessment and it is therefore assigned the Environmental Category B (Partial Assessment). Thus, the proposed project would screen early for potential negative impacts and select appropriate instruments to assess, minimize and mitigate potentially adverse impacts. Affected groups and NGOs should be consulted early on in the process.

According to the screening process conducted by the environmental specialist in the task team, the project will have small scale, site specific environmental and social impacts related to safety of the biodigester operation and

[9] World Health Organization, Indoor Air Pollution: National burden of Disease Estimates., Geneva: WHO (2007)

[10] B4BL, Biogas for Better Life - Business Plan: 2006-2020. (2007), available at: https://www.biogasafrica.org/Documents/Biogas-for-Better-Life-Business-Plan-2006-2020.pdf: Biogas for Better Life.

sludge management. SimGas has screened the project according to Kenyan environmental regulations and produced an ESMF/ESMP checklist (see: Part II) in-line with World Bank policies and procedures to ensure that appropriate mitigation measures are incorporated into the training materials to be used at the household level. SimGas also has internal procedures/protocols for the handing over of the biogas systems to customers and for safe installation. Furthermore, customers are given a pamphlet (Annex 1) highlighting safe use of the biogas system.

Box 1: Safeguard policies triggered.

OP 4.01 Environmental Assessment	The objective of this policy is to ensure that Bank - financed projects are environmentally sound and sustainable, and that decision - making is improved through appropriate analysis of actions and of their likely environmental impacts. This policy is triggered if a project is likely to have potential (adverse) environmental risks and impacts on its area of influence. OP 4.01 covers impacts on the natural environment (air, water and land); human health and safety; physical cultural resources; and trans - boundary and global environment concerns.

Besides OP 4.01 Environmental Assessment, other World Bank safeguard policies include OP 4.04 Natural Habitats; OP 4.36 Forests; OP 4.09 Pest Management; OP 4.11 Physical Cultural Resources; OP 4.10 Indigenous Peoples; OP 4.12 Involuntary Resettlement; OP 4.37 Safety of Dams; OP 7.50 Projects in International Waters and OP 7.60 Projects in Disputed Areas. Only OP 4.01 was triggered and applies to this project.

6. Stakeholder consultations

The project organized a stakeholder consultation meeting on November 29, 2011 at the Methodist Guest House and Conference Center in Nairobi, Kenya. The meeting provided an opportunity for stakeholders to provide comments and inputs to the project. Invitations for the meeting were extended through personal email invitations and a public notice published in the Daily Nation newspaper on 22 November 2011 (*Annex 2 list some of the questions raised by participants*). Comments from stakeholders unable to attend the meeting were also invited by email and telephone as per a newspaper announcement.

A total of 35 people participated in the stakeholder consultation meeting. Participants included NGOs, community-based organizations, private sector representatives, SACCOs, academia and members of the general public. During the meeting, the project proponent presented some background on SimGas biogas project as a social enterprise and an overview of SimGas biogas project operations and distribution channels in Kenya. The carbon consultant also made a presentation on the background and fundamentals of the Clean Development Mechanism and how the SimGas biogas project is expected to generate carbon credits. After each presentation, stakeholders were provided with an opportunity to ask questions and provide comments and inputs.

ESMF/ESMP Disclosure

The ESMF/ESMP and its executive summary respectively will be disclosed in-country and internationally e.g., SimGas and NEMA websites and at the World Bank's InfoShop. In Kenya the document will be made available at the following locations for public access:

(i) Cabinet Secretary office in the Ministry of Environment & Natural Resources (MoENR) in Nairobi;
(ii) NEMA office; and
(iii) The Kenya National Library Services in Upper Hill, Nairobi.

The ESMF/ESMP is available to any interested individual or organization

7. Technical Assistance, Capacity Building & Training

SimGas will establish a functional system of environmental and social management, including hiring a social and environmental officer to screen and track social and environmental impacts of the project. Screening for social and environmental impacts should be mandatory. SimGas staff associated with this project and all other biogas organizations such as local cooperatives, SACCOs, village leaders, extension officers and teachers who have expressed interest to collaborate with SimGas in implementing this project will have to be trained in the fundamentals and principles of environmental sustainability, including safeguard compliance matters especially on how to apply the ESMF/ESMP (including the screening process) during the construction, operation and decommissioning phases of the biodigesters.

Technical assistance, capacity building and training will be tailor-made and will include the following areas:

- Environmental and social impact screening process using ESMF checklist and application of the ESMP
    - Screening process
    - Identification of environmental and social impacts (positive and negative)
    - Rationale for using Environmental and Social Checklists
    - The importance of public consultations and participation of households in the screening and planning process
    - How to monitor ESMF/ESMP implementation
- Safeguard policies, procedures and sectorial guidelines
    - Review and discussion of GoK environmental policies, procedures, and legislation
    - Review and discussion of the World Bank ’s safeguard policies
- Selected topics on environmental protection and social safeguards
    - Air-CO2 mitigation
    - Soil and water contamination
    - Health and Safety
    - Waste management and disposal

8. Implementation Budget for ESMF/ESMP

SimGas will provide a budget for technical assistance, training and the actual implementation of the ESMF/ESMP.

Annex 1: History and Policy Context of Biogas in Kenya

History

Despite recent increases in the production and supply of energy in Kenya, 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.

Domestic and institutional biogas digesters are not new to Kenya. Mr. Tim Hutchinson built the first biogas digester in Kenya in 1957. This provided all of the gas and fertilizer that his coffee farm needed. He found the effluent (or "sludge") an excellent fertilizer and that its application to his coffee trees greatly improved productivity. In 1958, he started constructing biogas digesters commercially, marketing the effluent as the main product with biogas as a useful by-product.

Between 1960 and 1986, Hutchinson's company (called Tunnel Engineering Ltd.) sold more than 130 small biogas units and 30 larger units all over the country. Hutchinson biogas digesters (some still working after fifty years) can be found in various parts of Kenya, although mainly in the so-called high productive areas (Central and Western Kenya). Mr. Hutchinson is retired, though still manufactures solar water heaters, and a limited number of biogas units.

The German development organization GTZ started promoting biogas in the middle to late 1980s in Kenya, in collaboration with the Ministry of Energy under the Special Energy Programme. In Kenya, the Special Energy Programme opted for the floating drum type, possibly because there was local steel manufacturing capacity. Approximately 400 biogas units were built under the Special Energy Programme directly, though it is likely that the training and promotional activity spurred entrepreneur masons to build on an individual basis.

Over the last fifty years, biogas technology has been promoted by national and international organizations (both Government and NGO) and they, together with trained Kenyan technicians have built hundreds of biogas digesters in the country.

More recently, the Kenya National Domestic Biogas Programme (KENDBIP) was launched as a component of the Africa Biogas Partnership Programme, (ABPP), supported by the Directorate General for International Cooperation (DGIS) under the Netherlands Ministry of Foreign Affairs. The support is channeled through two Dutch international development organizations; Humanist Institute for Cooperation with Developing Countries, (HIVOS) as the fund manager and a Netherlands Development Organization (SNV), as the technical advisor. The national stakeholder-appointed implementing agency is the Kenya National Federation of Agricultural Producers (KENFAP). KENDBIP is the operational framework for ABPP in Kenya and seeks to meet a broad DGIS goal; provision of sustainable energy to a target population in the Global South by 2015. KENDBIP has an ultimate goal to contribute to the achievement of Millennium Development Goals (MDGs) by disseminating biogas as a safe, locally available and sustainable source of energy. The programme aims to use a Public Private Partnership Model, promote, incentivize and implement the installation of 8,000 domestic biogas plants in Kenya between July 2009 and December 2013. It is expected that the programme will generate employment opportunities, reduce the incidence of deforestation and other hazardous environmental practices and trigger complimentary business opportunities. These will all contribute to improved livelihoods and incomes and better living standards for target populations. The proposed SimGas project is being implementation in close consultation with KENDBIP and areas of collaboration have been identified.

Policy context

The implementation of domestic biogas programmes is very much in line with Kenya's national policies which seek to increase access to energy and promote the use of renewable energy technologies.

The first attempt to prepare a policy paper on energy was made in 1987, to, among other things, mitigate the adverse effects of oil importation on the domestic economy and balance of payments and the need to have a consistent policy on energy to ensure security of supply, efficient but affordable pricing and accelerated development of indigenous resources including the search for domestic fossil fuels.

New challenges associated with liberalization of the economy in the 1990s, including deteriorating balance of payments, economic stagnation, rising population, rising poverty, electricity rationing and outages, dwindling official development assistance, deforestation and the recently observed phenomenon of climate change called for a new energy sector development strategy based on prudent integrated policies consistent with broader government policies on socio-economic development.

In keeping with the Government's Economic Recovery Strategy for Employment and Wealth Creation, the Session Paper No. 4 of 2004 on Energy was developed spelling out the Government's aspirations towards provision of quality, adequate, sustainable, cost-effective and affordable energy services for socio-economic growth, including the use of biogas. The use of biogas as a renewable source for energy was also included in the Energy Act 2006. Paragraph 103(1) states "The Minister shall promote the development and use of renewable energy technologies, including but not limited to biomass, biodiesel, bioethanol, charcoal, fuelwood, solar, wind, tidal waves, hydropower, biogas and municipal waste. In this context, SimGas has also informed the Ministry of Energy about the proposed biogas programme.

Annex 2: Report on how due Account was taken of any Comments received during Stakeholder Consultations

Stakeholders were given an opportunity to give comments at the meeting. A small number of inputs were also received via email and phone. Comments received by stakeholders are summarized below. The overview also explains how the project proponent are taking due account of the comments received.

1. Stakeholders raised questions on the safety of the SimGas biogas systems, in particular the possibility of gas leakage and explosions.

The possibility of a gas explosion is very low. The SimGas systems are designed to avoid gas leakage. If there are leaks end users will be able to smell these and notify SimGas who will have the problem fixed. Technicians will be properly trained to deal with such situations. Other issues such as the entry of unwanted objects into the biogas systems will be addressed through user education and the placement of a grate over the inlet valve.

2. Questions were raised on how the project will use the revenue from the carbon credits and how the revenue will be shared with stakeholders.

The current plan is to use carbon credit revenue to discount the price of the biogas systems to end-users. The carbon revenue will further assist SimGas to invest in product development, conduct trainings for contractors and end users and offer after sale services and replacements for the systems. In this way, end-users are expected to benefit and indirectly share in the revenues from the carbon credits.

3. Even though the price of the SimGas biogas systems is competitive with that of similar systems, stakeholders still noted the overall cost of the biogas systems and the ability of households to afford them. They proposed that SimGas should look into ways that will make the biogas systems more affordable to the targeted consumers.

In addition to using the carbon revenue to help reduce the end-user price, SimGas will partner with local micro-finance institutions to provide loans or lease construction to its customers. Together this will keep the upfront payment required to a minimum. Also, SimGas will negotiate a bulk contract with financial institutions on behalf of end users of the systems. This will lower the threshold for households to apply since a bank will have less due diligence requirements and hence lower transaction costs. Risks for non-payment will also be kept at a minimum because the biogas system can also function as collateral in combination with the livestock. Repayment of the loans in small installments will better meet the cash flow situation of rural households.

4. Stakeholders suggested that trainings should be done during installation of the systems to enable end-users to effectively utilize the SimGas biogas systems.

SimGas will implement user education by making considerable investments to train contractors in the installation of the biogas systems and end-users on their operation.

5. Stakeholders proposed that SimGas should involve the local community and regional industries in the development, manufacture and production of the systems.

SimGas is a joint venture with a regional East African plastic company. The plastic industry already has an established distribution chain and manufacturing sites for plastic containers. The regional industry will be responsible for mass producing the biogas systems and setting up distribution channels locally owing to its extensive experience in regional manufacture, production and distribution. With regards to product development, SimGas is currently testing its systems with selected end users in Kenya, the results of which will be considered in future design modifications. However, when it comes to some of the system tests the required facilities do not exist in Kenya.

6. Stakeholders suggested that SimGas should partner with local organization and companies dealing with biogas in the implementation of the project.

Annex 3. National Environmental and Social Requirements

The Constitution of Kenya 2010	• Article 40(3) states: *"The State shall not deprive a person of property of any description, or of any interest in, or right over, property of any description, unless the deprivation results from an acquisition of land or an interest in land or a conversion of an interest in land, or title to land, in accordance with Chapter Five; or is for a public purpose or in the public interest and is carried out in accordance with this Constitution and any Act of Parliament that –* o *Requires prompt payment in full, of just compensation to the person; and* o *Allows any person who has an interest in or right over, that property a right of access to a court of law"* • Article 42 states that every person has a right to a clean and healthy environment, which includes the to; (a) to have the environment protected for the benefit of present and future generations through legislative and other measures, particularly those contemplated in Article 69; and Article 70. • Article 69 (1) (f) says that the state shall establish systems of environmental impact assessment, environmental audit and monitoring of the environment and • Article 69 (1) (g) demands that the state eliminate processes and activities that are likely to endanger the environment. • Article 69 (2) states; every person has a duty to cooperate with state organs and other persons to protect and conserve the environment and ensure ecologically sustainable development and use of natural resources. • Article 70 relates enforcement of environmental rights in case of violation, infringement and threats to right to a clean and healthy environment as protected under article 42.
The Environment Management and Co-ordination Act, 1999	Part VII section 58 directs that any proponent of any projects listed under schedule II should carry out an environmental impact assessment and prepare an appropriate assessment report for submission to NEMA, who in turn may issue a license as appropriate. Schedule II lists sites involving agriculture (large scale, pesticides, fertilizers, introduction of new crops and animals, use of fertilizers and irrigation); electricity generation and drilling for the purpose of utilizing ground water resources; among the projects that must undergo environmental impact assessment prior to their operation. CIC clients fall in these broad categories (agribusiness, renewable energy and water).

Environmental Impact Assessment and Audit Regulations 2003	Article 4. (1) Environmental Impact Assessment and Audit Regulations 2003 stipulate that No proponent shall implement a project; (a) likely to have a negative environmental impact; or (b) for which an environmental impact assessment is required under EMCA Act or these Regulations; unless an environmental impact assessment has been concluded and approved in accordance with these Regulations.
The Water Act, 2002	Part II, section 18, sub-section 3 allows the Water Resources Management Authority (WRMA) to demand from any person or institution, specified information, documents, samples or materials on water resources. Under these rules, specific records may require to be kept by a facility operator and the information thereof furnished to WRMA. Section 73 of the Act allows a person with license (licensee) to supply water to make regulations for purposes of protecting against degradation of water sources. Section 75 and sub-section 1 allows the licensee to construct and maintain drains, sewers and other works for intercepting, treating or disposing of any foul water arising or upon land for preventing pollution of water sources within his/her jurisdiction.
The Wastewater Regulations, 2006	These regulations state that; No person shall Abstract ground water or carry out any activity near any lakes, rivers, streams, springs and wells that are likely to have any adverse impact on the quality or quantity of the water without an EIA license issued.
The Occupational Health and Safety Act, 2007	The Act applies to All Workplaces where any person is at work, whether temporarily or permanently. The purpose of this Act is to: Secure the safety, health and welfare of persons at work; and Protect persons other than persons work against risks to safety and health arising out of, or in connection with, the activities of persons at work.
Water Quality Regulations (2006)	The Water Quality Regulations (2006) are contained in the Kenya Gazette Supplement No. 68, Legal Notice No. 120. Water Quality Regulations apply to water used for domestic, industrial, agricultural, and recreational purposes; water used for fisheries and wildlife purposes, and water used for any other purposes. Different standards apply to different modes of usage. These regulations provide for the protection of lakes, rivers, streams, springs, wells and other water sources. Part II Sections 4-5 as well as Part V Section 24. Part II Section IV states, “Every person shall refrain from any act which directly or indirectly causes, or may cause immediate or subsequent water pollution”. Part IV Section 24 states that “No person shall discharge or apply any poison, toxic, noxious or obstructing matter, radioactive wastes, or other pollutants or permit any person to dump any such matter into water meant for fisheries, wildlife, recreational purposes or any other uses”.

EMCA (Wetlands, riverbanks, lakeshores and Sea shore management) regulations, 2009	*Relevant General Principles* *5*(1) the following principles shall be observed in the management of all wetlands in Kenya; (b) Environmental impact assessment and environmental audits as required under the Act shall be mandatory for all activities likely to have an adverse impact on the wetland; (f) The polluter-pays principle. (g) The pre-cautionary principle.
EMCA (Waste Management) Regulation, 2006	The Waste Management Regulations (2006) are contained in the Kenya Gazette No. 69, Legal Notice No. 121. The Waste Management Regulations are meant to streamline the handling, transportation and disposal of various types of waste. The aim of the Waste Management Regulations is to protect human health and the environment. The regulations place emphasis on waste minimization, cleaner production and segregation of waste at source. The regulation requires licensing of transporters of wastes and operators of disposal site (sections 7 and 10 respectively). Of immediate relevance to proposed development for the purposes of this project report is Part II Sections 4(1-2), 5 and 6. • Section 4 (1) states that "No person shall dispose of any waste on a public highway, street, road, recreational area or any other public place except in a designated waste receptacle". • Section 4(2) and 6 explain that the waste generator must collect, segregate (hazardous waste from non-hazardous) and dispose waste in such a facility that shall be provided by the relevant local authority. • Section 5 provides method of cleaner production (so as to minimise waste generation), which includes the improvement of production processes through conserving raw materials and energy. Section 12 provides that every licensed owner or operator shall carry out an annual environmental audit pursuant to the provision of the act • In section 14 (1) every trade or industrial undertaking is obliged to install anti- pollution equipment for the treatment of waste emanating from such trade or industrial undertaking.

EMCA (Noise and Excessive Vibration Pollution Control) Regulations, 2009	These Regulations determine that no person or activity shall make or cause to be made any loud, unreasonable, unnecessary or unusual noise that annoys, disturbs, injures or endangers the comfort, repose, health or safety of others and the environment. In determining whether noise is loud, unreasonable, unnecessary or unusual, the following factors may be considered: • Time of the day; • Proximity to residential area; • Whether the noise is recurrent, intermittent or constant; • The level and intensity of the noise; • Whether the noise has been enhanced in level or range by any type of electronic or mechanical means; and, • Whether the noise is subject to be controlled without unreasonable effort or expense to the person making the noise. These regulations also relate noise to its vibration effects and seek to ensure controlling the level of noise causes no harmful vibrations. Part II Section 4 state that: except as otherwise provided in these Regulations, no person shall; • Make or cause to be made excessive vibrations annoys, disturbs, injures or endangers the comfort, response, health or safety of others and the environment; or • Cause to be made excessive vibrations which exceed 0.5 centimetres per second beyond any source property boundary or 30 metres from any moving source. Part III Section 2 (1) states that any person wishing to a) operate or repair any machinery, motor vehicle, construction equipment, pump, fun, air conditioning apparatus or similar mechanical device; or b) engage in any commercial or industrial activity, which is likely to emit noise or excessive vibrations shall carry out the activity or activities within the relevant levels provided in the First Schedule to these Regulations. Any person who contravenes this Regulation commits an offence. Section 13 (1) states that except for the purposes in sub-Regulation (2) hereunder, no person shall operate construction equipment (including but not limited to any pile driver, steam shovel, pneumatic hammer, derrick or steam or electric hoist) or perform any outside construction or repair work so as to emit noise in excess of the permissible levels as set out in the Second Schedule to these Regulations. These purposes include emergencies, those of domestic nature and/or public utility construction.

Environmental Management and Coordination Act (Air Quality) Regulations, 2008	The objective of these Regulations is to provide for prevention, control and abatement of air pollution to ensure clean and healthy ambient air. The general prohibitions state that no person shall cause the emission of air pollutants listed under First Schedule (Priority air pollutants) to exceed the ambient air quality levels as required stipulated under the provisions of the Seventh Schedule (Emission limits for controlled and non-controlled facilities) and Second Schedule (Ambient air quality tolerance limits).
Electric Power Act, 2006	Section 121 (1) c of the Electric Power Act, 1997 empowers the Electricity Regulatory Commission (ERC) to "formulate, enforce and review environmental, health, safety and quality standards for the energy sector, in coordination with other statutory authorities"; ERC is therefore the Lead Agency in respect of the electric power sub-sector, while section 9 (3) of the Act requires ERC to take into account the need to protect the environment, conserve natural resources, and protect the health and safety of service users and the public at large, among other things; when evaluating applications for licenses. The Act also empowers the board to ensure the licensees provide information to the public on the environmental performance and sources of their electric power.
Ministry of Energy & Petroleum (Energy Policy of 2004, Energy Act of 2006 & Regulations).	• Energy (Energy Management) Regulations-entrepreneurs should carry out energy audits of their facilities periodically and implement recommendations. • Energy (Solar PV) Regulations-Solar PV dealers have specified certification & training to practice. • Energy (Solar Water Heating) Regulations-industries utilizing more than 100 liters of hot water are required to heat a given portion using solar water heating. • Draft Appliances Energy Performance Regulations stipulate that energy performances of particular appliances must be displayed in a specified label and must meet specified Minimum Energy Performance Standards (MEPS) to be allowed in the Kenyan Market. • Energy (Improved Biomass Cookstoves) Regulations-A person manufacturing, importing, distributing, or installing Improved Biomass Cookstoves shall be required to obtain the necessary License from ERC.

The Factories Other Places of Work Act (Cap 514)	Section 13 states that every factory shall be kept in a clean state and free from effluvia arising from any drain, sanitary convenience or nuisance including accommodation of dirt and refuse. Section 17 of the same Act requires that where any process is carried out which renders the floor liable to be wet to such an extent that the wet is capable of being removed by drainage, effective means shall be provided and maintained for safe draining off the wet. Section 51 requires suitable means of removing dust or fumes from work places. Section 53 of this Act requires that workers employed in a process involving exposure to wet or to any injurious or offensive substances, suitable protective clothing and appliances (gloves, footwear, goggles, and head coverage) shall be provided. Section 4 of Kenya subsidiary legislation of 2004, Legal Notice No. 31 of Kenya Gazette Supplement No.25 of 24th May, 2004 of the Factories Act Cap 514, requires that, all factories or other workplace owners to establish a safety and health committee, which shall consist of safety representatives from the management and the workers. The number of the committee members will range from 3 to 7 depending on the size (number) of employees. The Act also requires the management to appoint a competent person who is a member of the management staff to be responsible for safety, health, and welfare in the factory or workplace. Section 13 goes ahead to state that a health and safety audit of the workplace be carried out in every twelve months by a registered health and safety adviser. If the owner(s) or management contravenes any of the rules, he/she shall be guilty of an offence. Under environment health and safety performance in the electric power sub-sector, the electricity generating stations are regarded as factories. The Factories Act has provisions dealing with the safety and health of persons working in factory premises, which description encompasses electricity-generating plants. The provisions of the Factories and Other Places of Work Act (Cap 514) and the attendant subsidiary legislations are enforced by the Department of Occupational Health and Safety of the Ministry of Labour. The Electricity Regulatory Commission will therefore liaise with the Department of Occupational Health and Safety to ensure that the safety and health of persons working in utilities in the electric power sub-sector are safeguarded at all times.

Pest Control Products Act CAP 346	This is an Act of Parliament to regulate the importation, exportation, manufacture, distribution and use of products used for the control of pests and of the organic function of plants and animals and for connected purposes Article 3 on the Control of manufacture etc., of pest control products demands; (1) No person shall manufacture, package, store, display, distribute, use or advertise any pest control product except in accordance with conditions prescribed by regulations made under this Act. (2) No person shall package, label or advertise any pest control product in a manner that is false, misleading or deceptive or is likely to create an erroneous impression regarding its character, value, quality, composition, merit or safety. Definition; "A **pest control product** is a product, device, organism, substance, or thing that is manufactured, represented, sold, or used as a means for directly or indirectly controlling, preventing, destroying, attracting, or repelling any pest...." Pest Control Products Board (PCPB) is empowered to suspend or revoke a certificate of registration if: • It realized later that the content of the application was false, • New information indicates that the product is unsafe, • The premises in which the product is manufactured, formulated or stored are unsuitable for the purpose.

Annex 4: Implementation Arrangements

Background and Legal status of Project Developer and CPA implementers (Private, Government, NGO)	SimGas BV is a private company specializing in biogas technology and was founded in 2009 by Sanne and Mirik Castro In 2011 SimGas established SimGas Tanzania Ltd as a joint venture with Silafrica Tanzania Ltd (part of the Sumaria Group). SimGas Tanzania is in the process to become SimGas East Africa Ltd., of which SimGas Tanzania and SimGas Kenya are subsidiaries, and aims to expand and market SimGas biogas systems all over East Africa.
Roles of the project Developer and sub-project implementers	**SimGas IP BV and SimGas BV - CME** The CME is SimGas IP B.V., a 100% subsidiary of SimGas Holding B.V. SimGas IP BV holds the carbon rights. SimGas BV is the operational company that is developing and managing the PoA. Upon sale of the biogas system, users will sign a sales contract, transferring the rights to the CERs generated to SimGas IP BV. SimGas BV is a private limited company with residence in The Hague, The Netherlands. It was founded in 2009. SimGas BV established a joint venture with Silafrica Tanzania Ltd (part of the Sumaria Group) in 2011: SimGas Tanzania Ltd. SimGas BV has a design team that takes care of the design of the systems, product improvements, the design of additional products (like the remote sensor, stoves and other biogas appliances), and provides support to SimGas Tanzania Ltd. on the production and installation. The business development team is responsible for finance, market research and the management of the carbon programme. **SimGas Tanzania Ltd - Implementer** SimGas Tanzania Ltd. is a 50-50 Joint Venture of SimGas B.V. and Silafrica Tanzania Ltd. (the largest plastics manufacturer in East Africa). SimGas Tanzania Ltd. is responsible for the production, marketing, sales, distribution, servicing and monitoring of the biogas systems under the PoA. SimGas Tanzania Ltd. is also

	responsible for quality control. The management of the production facilities is sourced from experienced personnel within the Silafrica plastics group.
Other Partners involved (technology provider, main financier, carbon aggregator, carbon consulting, implementation partners, etc.)	**SimGas** SimGas is involved in the full project and product cycle, from design and production to distribution and service. The distribution and installation of the systems is done by SimGas Tanzania Ltd. or under SimGas Tanzania Ltd.'s supervision, to guarantee high quality and sufficient service (including user-training). SimGas has a number of private investors, and is financed through different grants from the European Union and different European governments. When scaling-up to new countries or regions, new partners will be sought for partnerships on production and distribution. SimGas Tanzania Ltd. is a Joint Venture of SimGas BV and Silafrica Tanzania Ltd., and is established in 2009. The shares are equally divided between the partners. The Board of Directors of the JV has four seats with equal voting rights, two seats each for either JV partner. The JV is responsible for the production, marketing, sales, distribution and service of the biogas systems in East Africa. The management of the production facilities is sourced from experienced personnel within the Silafrica plastics group. **Silafrica Tanzania Ltd.** Silafrica Tanzania Ltd. is part of the Sumaria Group, which is one of the leading private corporations in East and Central Africa. Sumaria Group has extensive experience and a great track record in brand building and successfully marketing innovative technologies to lower income consumers in East Africa. Silafrica possesses all major plastics processing capabilities and is market leader in almost all segments that it operates in. **Kenyan Domestic Biogas Programme (under the African Biogas Partnership Programme)** SimGas cooperates with the main players in the East African biogas sector, i.e. the African Biogas Partnership Programme (ABPP) supported by SNV and Hivos. ABPP and its country programmes in Tanzania and Kenya have tested and approved the SimGas biogas systems, and have included the SimGas systems in the biogas programmes. The letter of inclusion in the Kenyan Domestic Biogas Programme (under ABPP), KENDBIP, is attached. KENDBIP is involved as implementation partner. To rapidly expand, 40 Biogas Construction Enterprises (BCEs) will be converted to SimGas franchises by 2015. These BCEs currently work for KENDBIP and TDBP, the Kenyan and Tanzanian Domestic National Biogas Programs under ABPP; this allows for a more aggressive ramp-up of biogas installations in both countries. For the BCEs it is a win-win situation because they will be able to earn 5-10 times the profit by more installations and use fewer resources. They will also professionalize, working with SimGas to become vibrant local private sector partners. **Climate Focus** SimGas cooperates with Climate Focus for the development of the carbon program. Climate Focus is a highly specialized climate finance and carbon market consultancy supporting clients

	around the globe with designing and implementing mitigation policies, programs, and projects, emissions trading and climate change strategies. Climate Focus is independent and a proven international leader in providing strategic unbiased advice of the highest quality to its clients. Climate Focus has provided advisory services in more than 50 countries, including on numerous occasions in Africa, to governments, companies, carbon funds, international organizations and non-profit organizations. The Climate Focus team is comprised of specialists operating in the carbon market since its inception, and experienced in identifying and advancing successful projects. Climate Focus is a pioneer in PoA development. Biogas PoAs are a main focus, with programs realized and implemented in Tanzania, Kenya, Nicaragua, Nepal and Indonesia. Other PoAs have been amongst others developed in India (solar water heaters), Philippines (small hydro) and Chad (solar cookers). Climate Focus has authored a series of much appreciated guidebooks on PoA development and PoA management.
Stakeholder Engagement	Based on the definition of Stakeholders in the CDM[11], the project has identified the following stakeholders: **Customers:** the general public is a stakeholder because they will be the end-users of the SimGas biogas systems and, as such, they will be impacted by the products and services offered by SimGas. **Academia:** universities and research institutions with experience and knowledge in the field of biogas systems and biogas projects are considered stakeholders because of the valuable inputs they can provide in terms of the technical design of the biogas systems as well as the implementation of biogas projects in different cultural and social context. **Government representatives and Designated National Authority:** Government representatives and the Designated National Authority are considered stakeholders because the implementation of the SimGas biogas project is expected to impact on the achievement of a number government policies and sustainable development goals in relation to poverty reduction and energy provision. **NGOs, community representatives, donor and development organizations:** NGOs, community representatives, donors and development organizations are considered a stakeholder because of their potential role in up scaling the distribution of the SimGas biogas systems and in raising awareness about the biogas systems and carbon markets. **Microfinance institutions (MFIs) and Savings and Credit Co-Operatives (SACCOs):** MFIs and SACCOs are considered a stakeholder because of their potential role in providing micro-loans and other types of credit schemes to poor households. **Biogas related companies/organizations:** Other biogas related companies and organizations are considered stakeholders due to their experiences in the biogas field in Kenya, they are able to share their lessons learnt and ways to make improvements to new biogas systems and ventures in the specifically to the Kenyan market. SimGas has in 2014 completed additional stakeholder consultations as part of Gold Standard certification of the CDM programme.

[11] version 06 of the Glossary of CDM Terms (EB 66, Annex 63)

Involvement of local communities in the development, implementation and monitoring of progress of the project/program	SimGas targets individual households and SMEs to guarantee ownership. In doing so, SimGas cooperates closely with local communities for awareness and promotion purposes. Because SimGas is a private company, and depending on sales numbers, it is important to offer a product that is accepted and popular in local communities. Upon entering a new area to make sales, SimGas staff identifies early adopters such as teachers or church elders, who become our first customers in the area and provide a demonstration site for others to see the product. Key decision makers in the local government are invited to participate in the following activations and promotion events done around the initial customers. Local savings and lending institutions (SACCOS) are also invited. The SMEs involved are from the local communities and carry out their work in these areas.

Annex 5: Environmental and Social Screening, Assessment and Management

The project activity involves the introduction of small-scale biogas systems, which will reduce the use of kerosene and non-renewable biomass for cooking purposes. The environmental impacts of the project activity are therefore expected to be largely positive. No negative impacts are expected. The project activity will act in accordance with all relevant laws and regulations and principles of good practice, as outlined below:

The project proponent will ensure that all biogas systems brought into the country for use comply with the relevant Kenyan Standards. According to the Quality Inspection of Imports Order of 1998, all imports to Kenya shall be subjected to quality inspection by the Kenya Bureau of Standards at the port of entry. The imported commodities will be allowed into the country upon issuance of a certificate of release by the Kenya Bureau of Standards.

The project activity will also comply with the 2006 Environmental Management and Co-ordination (Waste Management) Regulations, which govern the general disposal of waste in Kenya. The Rules define a "waste generator" as any person whose activities or activities under his or her direction produces waste. As the use of the biogas systems is an activity that is being carried out under the project proponent's direction, the project proponent is a 'waste generator' for purposes of the Act in case of effluent emissions.

The Rules set out various responsibilities of a waste generator. These include the collection, segregation and disposal of waste in the manner provided for under the Regulations.

In order to comply with the above-mentioned rules, the project activity will ensure:

- The design, operation and maintenance of waste storage facilities will comply with best operation and maintenance practices to minimize venting of methane from waste storage facilities for example through training of biogas system users on the best operation and maintenance practices.
- The design, operation, and maintenance of gas collection facilities will comply with best practices to minimize venting - emissions of biogas from leaks in the gas collection system for example through frequent monitoring to ensure biogas leakage during normal operation conditions is held at near-zero levels and minimization of pipe distances (e.g. locating gas collection facilities as near as possible to energy recovery facilities).

1. Potential Environmental Impacts

Secondly and in line with the draft National Guidelines for Strategic Environment Assessment in Kenya (Draft SEA Guidelines), the project has further screened for any potential impacts that might arise as outlined in section 3.1 of the draft SEA Guidelines. In the second column, if the project is expected to have a negative impact in a given area

this is indicated with a check mark [✓]. If the project is not expected to have a negative impact it is marked with a [x]. The rationale behind the brief assessment is then briefly explained.

ITEM	IMPACT	COMMENTS
1. Is the PPP likely to result in significant environmental effects, with regards to magnitude, duration and spatial extent of effects?	X	The proposed project is not likely to result in significant environmental effects. In fact, as has been highlighted before, the impacts of the programme on the environment are expected to be largely positive through reducing the use of non-renewable biomass and fossil fuels for cooking. The only aspect that warrants some attention from an environmental impact point of view is the use of plastic for the construction of the biogas digesters. In this context, however, it should be noted that the project is using post-consumer plastic for the production of the biogas digesters. The plastic used is similar to the plastic used for water tanks, which has been in use across Kenya for decades. The expected lifetime of the biogas digesters is 20-25 years. After its useful life, the digesters can be recycled.
2. Is the proposed PPP likely to be politically or publicly contentious?	X	The programme involves the distribution of small-scale domestic and institutional biogas digesters at the local level. Therefore, it is very unlikely the programme will be politically or publicly contentious.
3. Are the cumulative nature of the effects (i.e. the additive and synergistic effects) likely to be significant?	X	The programme will not have significant cumulative effects.
4. Are there likely to be trans-boundary effects (i.e. likely to affect other municipalities, counties, regions and countries)?	X	The programme involves the distribution of domestic and institutional biogas digesters at single sites at the local level. Therefore, there will be no transboundary effects.
5. Are there inherent uncertainties and/or important gaps in predicting effects of the PPP?	X	Biogas is a known technology that has been in use in Kenya for decades. Also, the use of plastic water tanks is very common in Kenya. Therefore, it can be concluded that there are no important gaps in predicting the effects of the programme on the environment.
6. Are risks to health, safety and/or the integrity of social or ecological systems considered to be high?	X	The project will have a positive impact on the health of people, both through the reduction of indoor air pollution and through the processing of organic waste that is often disposed of in an unsanitary and unsustainable manner. Also, in terms of the biogas produced in the digesters, there is no explosion hazard as the gas will be contained internally and any gas from leaks will dissipate quickly and can be repaired by the project after-sale service team. Therefore explosion risks are

		very low and no occurrence of such has been reported.
7. Are there social and/or ecological systems with low resilience and high vulnerability to disturbance or impact (e.g. poor communities, sensitive ecosystems) within the PPP locality?	X	The biogas digesters will be installed in private homesteads and at small business premises. Therefore, no negative impacts are expected on people and ecosystems, which will on the other hand benefit from the positive impacts of the project.
8. Are the existing levels of environmental quality close to defined limits of acceptable change; i.e. is there a definite risk of these limits of acceptable change being exceeded?	X	As per above, the biogas digesters will have site specific impacts which will be very positive. Therefore there will be no negative impact on systems that are close to defined limits of acceptable change.
9. Is the PPP likely to have a negative impact on: a) Unique, special or highly valued natural or cultural elements (e.g. threatened biodiversity, sacred areas)?	X	The biogas digesters will be installed in private homesteads and at small business premises, areas that are already occupied for daily human use. Therefore, there will be no impact on unique, special or highly valued natural or cultural elements.
b) Recognized local, county, national or international conservation or protection status e.g. nature reserve, heritage sites, Ramsar sites)?	X	The biogas digesters will be installed in private homesteads and at small business premises. Therefore, there will be no impact on recognized local, county, national or international conservation or protection status areas.
10. Is the PPP likely to result in major changes in actions, behaviours or decisions by individuals, businesses, NGOs or government, that could lead to: a) The stimulation of development of infrastructure or other changes in urban or rural land use?	X	The use of biogas digester slurry as natural fertilizer will help to increase agricultural production and reduce chemical fertilizer inputs, which can be considered as a positive development impact. There will be no changes in infrastructure development due to the project.
b) An increase in the transformation and development of natural habitat or areas of nature conservation importance?	X	The implementation of the programme will result in a decrease in the use of non-renewable biomass for cooking. This will positively impact on natural habitat and conservation areas due to a reduction in demand for fuelwood and charcoal. Conversely, there will be no increase in the transformation and development of natural areas.
c) Major changes in the pattern of settlement, land occupation and/or demographics in an area?	X	The programme will have no impact on settlement patterns, land occupation or demographics in the project area.

d) Increased risk of climate change?	X	The programme will reduce greenhouse gas emissions from the use of non-renewable biomass and fossil fuels for cooking and will therefore have a positive contribution towards climate change mitigation.
e) Major changes in the development or use of technology that could have negative implications for health and/or safety?	X	The programme will reduce indoor air pollution, improve organic waste management practices and decrease use of chemical fertilizer which will have only positive health implications and safety implications.
f) The introduction of alien and potentially invasive organisms?	X	The programme does not involve the introduction of invasive species.
g) Changes in society's consumption of energy and in particular fossil fuels, and therefore, in emissions of carbon dioxide and other greenhouse gases?		The programme will reduce the consumption of non-renewable biomass and fossil fuels for cooking and will, therefore, help to support positive changes in society's consumption of energy and reduce greenhouse gas emissions.
h) Changes in the rate of society's consumption of, and/or demand on natural resources, including water?	X	The programme will reduce the use of non-renewable biomass and hence decrease demand on natural resources. The biogas digesters will require modest amounts of water to aid in the digestion of the input material – organic waste and animal manure. However, these inputs have moisture content which will minimize the amount of additional water that will need to be added and biogas digester users will be encouraged to supplement with grey water/cooking water residue rather than with fresh potable water. Biogas slurry water can also be re-injected where another use for the slurry (e.g. as fertilizer) is not available. So any increase in demand for water is expected to be minimal and will be more than offset but the substantial reduction in the unsustainable use of biomass resources (which itself often leads to negative impact on water due to deforestation/degradation of Kenya's water towers).

From the analysis shown above, it is clear that there are negligible environmental or social impacts that may result from the Simgas biogas project.

The use of plastic in the biogas digester manufacture is one area that has been identified where negative impacts should be considered. The biogas systems however, will use post-consumer plastic as the input material to minimize use of virgin plastic during manufacture. Furthermore the biogas digesters, which are expected to last 20-25 years, are fully recyclable and therefore the plastic material can be reprocessed for subsequent life at end of use.

2. Environmental Management Approach

The Kenyan environmental legislation does not require an Environmental Impact Assessment for this type of biogas digester construction activity. The programme is in line with Kenyan policies on environment, sustainable waste management, rural development and reduced dependency on wood and kerosene for energy.

However, SimGas is a triple bottom line company that takes social and environmental impact just as seriously as economic impact.

3. Monitoring and Reporting

SimGas will prepare an annual Monitoring Report on the operation of the CDM PoA as per the requirements of the UNFCCC regulations covering CDM projects. The project will also be subject to Implementation Support from the World Bank task team.

Annex 6. Sample Environmental and Social Screening Form (ESSF)

The Environmental and Social Screening Form (ESSF) has been designed to assist in screening of installation of biodigesters for any potential adverse social & environmental before funding them. The Form is designed to place information in the hands of implementers and reviewers so that impacts and their mitigation measures are determined. The Form contains information that will allow reviewers to determine the characterization of the prevailing local biophysical and social environment with the aim to assess the potential environmental and social negative impacts of the investment. The intention is to include this form in the digital workflow of the sales and installation teams on their mobile sales and installation apps.

1. Name of the customer: ……..
2. Location of the project (GPS): ……
3. Customer mobile number: ……..

Contact details of the person responsible for filling out this ESSF:

1. Name: ……
2. Job title: ……
3. Telephone numbers: ……
4. Signature: ……..

PART A: Brief description of the activity

Please provide information on the area, required land, pit dimensions, slurry use plan, water supply, energy requirements, human resources, etc.).

[Automatically generated work brief]
……
……
……

PART B: Sample environmental and social safeguard screening questions for domestic biogas systems

NO.	Social information	Yes/No	Remarks/Mitigation Measures
1.	Will the installation result in resettlement of individuals or families or require the acquisition of land (public or private, temporarily or permanently) for its development? Note: If the installation would lead to new land acquisition or loss of livelihood and assets the installation should be excluded from financing under this project.		Customer should always 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 that she/he has consulted the other families in the use of the plot for the digester.
2.	Has the possibility of accidents and injuries to workers and owners during construction or operation taken into account?		Installation is a standard procedure, which is safe, however small accidents might happen. A first aid kit is available on site for safety.

			The design is 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.
3.	Can the installation and operation of the digester generate solid and/or liquid wastes (including human excreta/sewage)?		All households are trained on the effective and safe use of digestate (effluent slurry) to prevent the spread of diseases and generate extra crop growth.
4.	Can the installation result in emissions dust or gaseous fumes?		Safe use instructions are provided to the household by the quality officer or senior technician.
5.	Will the installation and operation be at risk of contamination and pollution hazards (water and soils) as a result of production of bio-slurry?		The installation of a digester reduces contamination of water and soils. In case the family installs a toilet connection, we have additional measures to protect the crops against contamination: Either only used on (fruit) trees or the effluent needs to be composted first to remove the last pathogens.
6.	Is there any concern about human-related diseases related to the activities?		The anaerobic process reduces the pathogenic load. However, when a toilet is connected additional measures are taken (see above).
7.	Can the installation and operation result in the introduction of pathogens?		The anaerobic process reduces the pathogenic load. However, when a toilet is connected additional measures are taken (see above).

N/B:

1. *For all issues indicated by “Yes”, the applicant is expected to explain how he/she intends to mitigate them. If it is not possible, the installation will not be financed.

CERTIFICATION

We certify that we have thoroughly examined all the potential adverse effects of this installation. To the best of our knowledge, the installation plan as described in the sales order and associatedinstallation brief, if any, will be adequate to avoid or minimize all adverse environmental and social impacts.

SimGas (Environmental Health & Safety) Officer (digital signature):

……

Date: ……

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Desk Appraisal by SimGas for decision on new hub site:

During the planning stage for a new hub, the sales manager, or someone falling under the accountability of the sales manager will research possible adverse effects of installations within 10 km of the sales hub.

A field appraisal may be required if there are indications that:

- Within the area there are conflicts about land acquisition and/or community displacement
- Digester installations may affect a protected area or a critical natural habitat
- May encroach onto an important natural habitat, or have an impact on ecologically sensitive ecosystems (e.g. rivers, streams, wetlands)

The following questions will be investigated within a 10 km radius:

NO.	Social information	Yes/No	Remarks/Mitigation Measures
1.	Will the installation reduce other people's access to their economic resources, like land, pasture, water, public services or other resources that they depend on?		Make a mitigation plan with sales and installation teams to avoid land-conflicts.
2.	Will the installation require excavation near any historical, archaeological or cultural heritage site?		If there are any historical, archaeological or cultural heritage site within 10 km radius of the hub (that we have information of), these areas will be excluded from installation. Unless we agree with the local government that installations are aimed to protect such sites (waste treatment to reduce environmental pressure of livestock rearing).

The following issues need to be clarified within 10 km of the (sub)hub site:

……
……
……

A Field Appraisal report will be completed and added to the subproject file.

Name of desk appraisal officer (digital signature):

Signature:……

Date: ……

Annex 7:

SAFETY OPERATION RECOMMENDATIONS

I. Biosafety:

1. **Livestock health control.** No animal manure and slurries should be supplied from any livestock with health problems.
2. **Feedstock control**. Biomass types with high risk of pathogen contamination must be excluded from AD.

II. Manure gas hazards:

1. Manure gases are readily and rapidly generated by the microorganisms found in raw manure. Covered manure storage and collection pits, covered lagoons, upright storage tanks and tanker spreaders are examples of places where manure gases can accumulate to deadly levels. Safe practices and safety training are vital for all who work with manure handling systems. Protect yourself and others from injury or death by learning about the dangers of manure gas.
2. A confined-space hazard that often claims multiple lives before anyone realizes there is a danger is manure gas. Manure pits can be oxygen deficient, toxic and explosive. Manure gases are most dangerous when they accumulate in confined spaces. Enter biogas pit only with (1) with available ventilation and (2) stand-by person for emergency rescue.
3. There are four gases in manure pits that are of primary concern:
    a. **Hydrogen Sulfide** is a highly toxic gas that is heavier than air. It can cause dizziness, unconsciousness and death. At low concentrations it may smell like rotten eggs, but at higher concentrations it deadens the sense of smell so that no odor can be detected.
    b. **Carbon Dioxide** is an odorless, tasteless gas that is heavier than air. It displaces the oxygen supply in the bloodstream, which can cause unconsciousness and death.
    c. **Ammonia** is a gas that is lighter than air. It has a pungent smell and can irritate the eyes and respiratory tract. Ammonia also displaces oxygen in the bloodstream.
    d. **Methane** is also a gas that is lighter than air. The primary hazard of methane gas is that it can create an explosive atmosphere. This gas also displaces oxygen. This is dangerous because it reduces the likelihood of a leak in the storage container or gas line being detected quickly and because methane at high concentrations causes asphyxiation.

III. Safety should be the primary concern in operation of an anaerobic digester.

1. Biogas storage containers should be durable and resistant to corrosion.
2. If methane gas is released uncontrolled, methane and air can form an explosive mixture that can spontaneously combust at high temperatures.
3. Flames, such as matches, lighters, and cigarettes should not be lighted in the same room as the gas storage container.
4. Biogas should be stored away from the biogas stove in order to minimize the explosion hazard.

IV. Stormwater management:

- Ensure that a suitable stormwater management system is designed which will ensure that dirty and clean stormwater is kept separate. The stormwater management system should ensure that all dirty stormwater is directed back to the digesters.
- The waste storage areas and the manure drying areas must be designed with a stormwater system which will utilise bunds for the separation of the clean and dirty stormwater.

V. Fire hazards:

- Fire breaks will be in place around the construction site and will be maintained for the life of the operation. No open fires will be permitted on site.
- No waste will be allowed to be burned on site.
- Induction sessions for operators will include fire prevention/ safety precautions, actions and contacts in the event of a fire.

VI. Equipment Repairs / Managing accidental spills

- All equipment will be kept in good working condition and all leaks repaired immediately.

- Defective electrical equipment or electrical lines; defective lightning protection, defective electrical installations should be attended to immediately, turn off electricity, to ask advice from an electrician.
- All maintenance work will be done over a drip tray to catch all spills and leaks.
- Treat the spill in situ using bioremediation measures; or Use a commercially available hydrocarbon spill kit to absorb the spilt.

Annex 8: SimGas GesiShamba User Guide

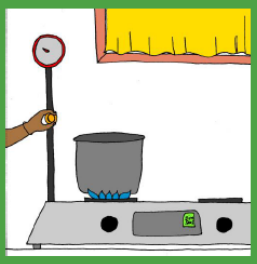
4

Adding water

After the manure is added pour in an equal amount of water into the inlet barrel. Mix it a little together and then open the stopper and the slurry with enter the digester. If there is a blockage add some more water to flush through.

5

Cooking



You will be able to cook with your GesiShamba every day. You will know how much gas is in your digester by looking at the pressure meter. 8Kpa is full, so if you want to cook a big meal wait till it gets there.

Adjust the orange valve so that the flame is smaller than the base of the pan.

To cook rice or foods for long time turn the stove knob to the bottom for minimal flame which will last long time.

6

Using bioslurry

Every day or two the biodigester will produce bioslurry. This should run out of the digester into a small storage pit and from there into a shamba. If there is no nearby shamba the bioslurry can be taken by bucket.

The bioslurry can be dried and used as mulch or dug into the soil next to the roots of plants. Green vegetables, cow fodder and bananas all like fresh bioslurry applied regularly.

sim gas
Our Power

GesiShamba user guide

Caution! Biodigestion works best in the hot season. During the rains the bacteria slow down and produce gas slowly. Make sure that the inlet barrel is covered so that no cold rain water can enter the digester and expect the process to be a temporarily slower.