



# PROJECT IDENTIFICATION FORM (PIF)

PROJECT TYPE: FSP

TYPE OF TRUST FUND: GEF TF

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## PART I: PROJECT INFORMATION

Project Title:	Promoting organic waste-to-energy and other low-carbon technologies in small and medium and micro-scale enterprises (SMMEs): Accelerating biogas market development.		
Country(ies):	South Africa	GEF Project ID:	5704
GEF Agency(ies):	UNIDO (select) (select)	GEF Agency Project ID:	130313
Other Executing Partner(s):	Ministry of Water and Environmental Affairs (DEA), Ministry of Energy- SANEDI, Ministry of Trade and Industry (DTI), Ministry of Agriculture, Forestry and Fisheries (DAFF), Council of Scientific and Industrial Research (CSIR) and National Cleaner Production Center (NCPC)	Submission Date: Resubmission Date:	02/12/2014 03/21/2014
GEF Focal Area (s):	Climate Change	Project Duration (Months)	48
Name of parent program:		Project Agency Fee (\$):	401,100

## A. INDICATIVE FOCAL AREA STRATEGY FRAMEWORK.

Focal Area Objectives	Trust Fund	Indicative Grant Amount (\$)	Indicative Co-financing (\$)
CCM-1 Promote the demonstration, deployment and transfer of innovative low-carbon technologies	GEFTF	1,820,000	8,300,000
CCM-3 Promote Investment in Renewable Energy Technologies	GEFTF	2,402,110	17,150,000
Total Project Cost		4,222,110	25,450,000

## B. INDICATIVE PROJECT DESCRIPTION SUMMARY.

Project Component	Grant Type	Expected Outcomes	Expected Outputs	Trust Fund	Indicative Grant Amount (\$)	Indicative Cofinancing (\$)
1. Capacity building and technology support system	TA	Capacity of market players and enablers strengthened and technology support systems established	<ul style="list-style-type: none"> <li>- Detailed assessment and characterization of waste streams from agro-processing SMMEs conducted.</li> <li>- South African Waste Information System supported in capturing and reporting data on organic waste collection.</li> <li>- Targeted training workshops (10) for market players like project developers, enterprise executives, farmers and operators, current users of waste, etc on integrated biogas systems conducted.</li> <li>- Biogas and low-carbon technologies support center created.</li> <li>- Tool kits, decision support tools, operation and manuals for integrated biogas systems in agro-processing SMMEs are developed and disseminated.</li> </ul>	GEF TF	678,000	800,000

			<ul style="list-style-type: none"> <li>- 2 regional training workshops conducted to train experts, from SADC countries on biogas technologies in SMMEs.</li> <li>- Web-based knowledge management platform to exchange knowhow, expertise and experiences established and operated.</li> </ul>			
2. Biogas market development and regulatory framework	TA	Market environment for biogas strengthened and regulatory framework for grid-connected small to medium scale waste-to-energy projects developed	<ul style="list-style-type: none"> <li>- Quality standards for integrated biogas plants in SMMEs developed, adopted and widely disseminated.</li> <li>- Guidelines and regulations (environmental, technical and legal) on the valorization of digestate and effluent developed and adopted.</li> <li>- An inter-disciplinary committee reviews current regulations related to environment, energy, industry, financing aspects of biogas technologies.</li> <li>- Regulatory framework on access to the grid by small to medium scale biogas projects developed and presented to local authorities.</li> </ul>	GEF TF	405,000	650,000
3. Technology demonstration	INV	Technical feasibility and commercial viability of waste-to-energy and other low-carbon technologies demonstrated	<ul style="list-style-type: none"> <li>- Detailed feasibility studies of selected demonstration projects are conducted.</li> <li>- 4 integrated biogas demonstration projects implemented to achieve at least 3MW installed capacity.</li> <li>- Demonstration projects monitored, evaluated and showcased.</li> <li>- Best practice manual developed and widely disseminated.</li> </ul>	GEF TF	1,067,004	6,980,000
4. Scaling up	INV	Investment in waste-to-energy and other low-carbon technologies promoted	<ul style="list-style-type: none"> <li>- Investment strategy for integrated biogas and low-carbon technologies developed and disseminated.</li> <li>- Technical assistance provided to realize at least 4 more investment projects (at least 6 MW).</li> <li>- Portfolio of at least 25 investment projects in integrated biogas systems are compiled and disseminated.</li> <li>- Technical support provided in designing a financial</li> </ul>	GEF TF	1,801,053	16,220,000

			mechanism that will support investments in waste-to-energy and other low-carbon technologies in industry. - National biogas investment forum organized regularly.			
5. Monitoring and Evaluation	TA	Project's progress towards objectives continuously monitored and evaluated	- Mid-term and final evaluation carried out; project's progress monitored, documented and recommended actions formulated.	GEF TF	70,000	150,000
		Subtotal			4,021,057	24,800,000
		Project Management Cost (PMC)		GEF	201,053	650,000
		Total Project Cost			4,222,110	25,450,000

#### C. INDICATIVE CO-FINANCING FOR THE PROJECT BY SOURCE AND BY NAME IF AVAILABLE, (\$)

Sources of Co-financing	Name of Cofinancier	Type of Cofinancing	Amount (\$)
National Government	Government Department – Green Fund	Grant	6,500,000
National Government	Government Departments	In kind	500,000
Private Sector	Under consultation	Equity/Loan	9,500,000
Banks and other financiers	Under Consultation	Soft and Hard Loans	8,665,000
GEF Agency	UNIDO	Grant	60,000
GEF Agency	UNIDO	In-kind	225,000
<b>Total Cofinancing</b>			<b>25,450,000</b>

#### D. INDICATIVE TRUST FUND RESOURCES (\$) REQUESTED BY AGENCY, FOCAL AREA AND COUNTRY<sup>1</sup>

GEF Agency	Type of Trust Fund	Focal Area	Country Name/Global	Grant Amount (\$)(a)	Agency Fee (\$)(b) <sup>2</sup>	Total (\$) c=a+b
(select)	(select)	(select)				0
(select)	(select)	(select)				0
(select)	(select)	(select)				0
<b>Total Grant Resources</b>				0	0	0

#### E. PROJECT PREPARATION GRANT (PPG)

Please check on the appropriate box for PPG as needed for the project according to the GEF Project Grant:

	Amount Requested (\$)	Agency Fee for PPG (\$)
• (upto)\$150k for projects up to & including \$6 million	90,000	8,550

## **PART II: PROJECT JUSTIFICATION**

### **A. PROJECT OVERVIEW**

#### **A.1 Project Description**

##### **1) The global environmental problems, root causes and barriers that need to be addressed.**

South Africa's most recent National Waste Baseline estimates that the country generated approximately 108 million tons of waste in 2011 of which 59 million tons is classified as "General waste" while 49 million tons is characterized as "Unclassified and Hazardous Waste". Of the 59 million tons "General Waste" produced in 2011, about 36 million tons is mainly biomass waste from industry, while further 3 million tons of organic waste was generated. Only about 35% of the organic waste is recycled while none of the 36 million tons of biomass waste from industry is recycled. Figure 1 below shows the breakdown of the general waste category and the amounts recycled.

General Waste	Generated	Recycled	Landfilled	Recycled
	Tonnes			%
Non-recyclable municipal waste	8,062,934	-	8,062,934	0
Organic waste	3,023,600	1,058,260	1,965,340	35
Construction & demolition waste	4,725,542	756,087	3,969,455	16
Paper	1,734,411	988,614	745,797	57
Plastic	1,308,637	235,555	1,073,082	18
Glass	959,816	307,141	652,675	32
Metals	3,121,203	2,496,962	624,241	80
Tyres	246,631	9,865	236,766	4
Other (mostly biomass waste from industry)	36,171,127	-	36,171,127	0
Total general waste	59,353,901	5,852,484	53,501,417	10

**Figure 1: Breakdown of the general waste category and rates of recycling.**

These figures are based on data that the South African Waste Information Center (SAWIC) gathers from provinces and private landfills. It should be noted that gaps exist in this data sets as some of the waste from various sectors is dumped in unmanaged and uncategorized areas. Over the years, volumes of waste that is formally recorded has continued to increase rapidly leading to shortages of land for landfills and most landfills filling up faster than initially projected. As the South African economy continues to grow, average GDP growth rate estimated at over 3%, coupled to increased affluence in previously segregated sections of the population, overall consumption will inevitably increase, so will the generation of waste. In fact, the country has recently experienced a rapid increase in intensive animal production and agriculture practices that generate huge volumes of waste. As an indicator, South Africa's average daily municipal solid waste generated per-capita is above 2kg, which is only comparable to developed countries. Various industrial processes generate organic waste to levels that cause various environmental challenges that include water, soil, and air contamination. Of particular concern is the organic waste generated by industry and other sources in large volumes that ends up being dumped in landfills or illegally dumped. On average, SMMEs contribute to 50% of South Africa's GDP, implying that they have a proportionately huge contribution to waste generated from industry estimated to be at least 18 million tons. The actual figure would be much higher due to the fact that a significant portion of SMMEs in remote areas like food processors and farms do not necessarily dump their waste in recognized landfill and hence their waste is not captured in the SAWIC. This is particularly true for agro-processing based SMEs like piggeries, poultry farms and processors, stock farms and processors, fruit farms and processors, vegetable farms and processors, wineries etc as they are typically involved in the primary processing of agro-produce that generates huge volumes of waste. The National Waste Baseline report estimates that approximately 9 million tonnes of food waste was generated in 2011, with 26% lost at agriculture production, 26% lost at post harvesting and handling, 27% lost at processing and packaging, 17% lost at distribution, and a further 4 % lost at household levels. Most of this waste finds its way to landfills where it decomposes producing methane and leachate that contaminates ground water. On average, the 9 million tons of food waste would be able to generate about 600million m<sup>3</sup> of methane gas which could generate about 2,4 TWh.

The waste-to-energy (WTE) industry in South Africa is currently focused on large-scale WTE projects and technologies. The market for small to medium-scale WTE technologies is limited as the demand had been suppressed. The deployment of WTE like biogas in SMMEs faces a number of barriers. To begin with, most SMEs have traditionally not focused on energy generation as the utility has, until recently supplied them with cheap and reliable coal-based power. Against this background, most SMMEs would not invest in WTE projects whose technical feasibility and commercial viability they do not fully appreciate. In addition, most SMEs are not able to invest in new WTE projects due to their balance sheets. The situation is further compounded by the fact that resource use efficiency is normally not perceived as a priority in most SMMEs as they are more focused on the survival of their businesses. Furthermore, given the limited volumes of waste produced by individual SMMEs, the potential for WTE technologies in this sector is conventionally viewed as non-existent. Therefore, under a business as usual scenario, the uptake of WTE like biogas and other low-carbon technologies will only marginally grow.

South Africa has been experiencing power shortages since 2008 due to rapidly increasing power demand across the whole country while power generation capacity has, over the years, not proportionally increased. In parallel, the power tariffs have been gradually increasing as part of efforts to charge full cost-recovery tariffs in line with trends in the Southern Africa Power Pool. Accordingly, besides the power shortages, industries are being forced to deal with the increasing cost of power. In fact, over the last 5 years, NERSA has approved ESKOM's proposals to increase tariffs steadily. Over this period the year-on-year percentage change in tariffs have been estimated at 12.3% with new tariffs reaching 9.10 US\$ cent/kWh or 6.96 € cent/kWh in 2013. Accordingly, tariffs have more than doubled over this period and are projected to triple by year 2018. Therefore, industries are increasingly eager to reduce their production costs by efficient use of energy and increasing the use of renewable energy resources. The use of organic waste to produce biogas and other products will usher multiple benefits and opportunities to agro-processing SMEs that include: a) widening of revenue streams for SMEs by the generation of heat and power at the local level; b) increased productivity through technology and skills upgrading that would be associated with adoption of new technologies; c) reduction of environmental challenges associated with dumping organic waste in landfills or in natural water bodies; d) reduction of costs associated with transporting organic waste to landfill and the landfill fees; e) creation of local jobs through waste sorting/collection schemes as well as fertilizer distribution. In addition, the digestate and the effluent could be used as fertilizer and for irrigation respectively thereby creating new business lines that would enhance the viability of biogas system. This project is going to focus on promoting the conversion of organic waste from industries to energy and other by-products through mainly anaerobic digestion. The project will adopt an integrated approach to waste treatment where other technologies that convert the waste from the biogas system into other by-products will be promoted. In particular, the project will also actively promote technologies that convert the residuals to other by-products like fertilizer, soil conditioner, inputs for the chemical industry etc. Through this integrated approach, the project will ensure that in the end, very minimal residuals are actually produced so as to minimize or eliminate the burden for the environment but also create opportunities for enterprises.

The deployment of biogas technologies in SMMEs, and subsequently in rural and urban areas, faces a number of interlinked market challenges that this project will address. To begin with, there is limited information (quantities, qualities, locations) on organic waste streams from different sectors, especially agro-processing SMMEs in South Africa. While the South African Waste Information System (SAWIS) was established to help inventory all waste generated in the country, reporting remains largely voluntary and SAWIS relies on information gathered by provincial authorities. In particular, with some of the landfills being privately operated, there are bound to be under-reporting the waste especially in competing industries or industries that are required to process such waste but are currently not doing so. In addition, the technical feasibility and economic viability of biogas technologies in SMMEs is not well appreciated. This is particularly true as SMMEs have, over the years, relied on cheap and reliable power supply from the grid. Accordingly, demonstrating the utility of these technologies in SMEs is a crucial part of any effort to promote the adoption of these technologies and their eventual scaling up. The project will build on the existing focus in industry on adopting new and better technologies and improving productivity as part of overall efforts to access international markets. In addition, there is an equal lack of appreciation of technologies that valorize residuals

into useful by-products like organic fertilizer from biogas digestate and the use of the effluent for irrigation. Therefore, it will be critical that the integrated approach, where all the by-products of the biogas systems will be valorized, i.e. the gas, the digestate and the effluent is demonstrated. Institutions like CSIR and other universities are engaged in research and development of WTE technologies, including biogas. The project will build on their capacities to establish a technology support centre that will then provide normative support and training to industry and service providers. The successful introduction of any new technology requires that both market players and enablers have requisite capacity to support the technologies and the investments. So far, market enablers need their capacities to support and sustain the scaling up of integrated biogas in SMMEs strengthened. On the other hand, market players like developers, technology suppliers, and financiers like banks need to strengthen their skills in dealing with the business of biogas projects as well as the associated technologies to treat the residuals. To date, this integrated approach has only been used in very few cases. If this integrated approach to waste treatment is to become mainstream, there is need to systematically address these and other interlinked barriers.

## **2) The baseline scenario and any associated baseline projects**

At business as usual scenario, increasing volumes of organic waste from industries in South Africa will continue to be dumped in landfills, natural water bodies and other non-regulated places. With increased waste generation due to increasing economic growth and affluence, it is projected that agro-processing SMMEs will increase in number and importance to the economy and so will organic waste generated. Efforts to promote waste minimization in industry are yielding results but will not eliminate waste generation. Whereas large industries will have the wherewithal to convert their organic waste to energy and other by-products, such technologies will not be readily accessible to SMMEs. In addition, small-to-medium scale industries will have limited information and technology support mechanisms to adopt integrated biogas systems on a large scale. Furthermore, while funding opportunities for renewable energy projects like the Green Fund etc will be in place, only a few integrated biogas projects will access funding from these windows. Consequently, opportunities for reducing GHGs emission by avoiding the generation of methane on one side and by making use of electricity and heat from organic waste compared to the primarily electricity generated from coal on the national grid will only be realized in very few small-to-medium scale industries. In addition, the residuals will not be converted to other valuable by-products, thereby replacing conventional products that would have high energy content. Without the integrated approach as offered by this project, only very few small-to-medium scale enterprises will use waste as a resource. Accordingly, the issue of waste management will continue to be viewed as a regulatory barrier rather than an opportunity to increase productivity on the part of industries. So far, efforts to promote sustainable production and consumption have marginally focused on waste as a resource. Therefore, this project will provide a unique opportunity for SMMEs to convert a by-product into a resource on a wide and accelerated scale.

## **3) The proposed alternative scenario, with a brief description of expected outcomes and components of the project**

This proposed project seeks to promote market-based dissemination of integrated biogas systems in agro-processing SMMEs in South Africa. This will be achieved by a combination of interventions at regulatory level, market development, combined with specific investments as well as building the capacity of market players and enablers. The project activities will bring about a systematic change in perception of the value of organic waste thereby contributing to GHG emissions reductions, creation of green jobs and overall socio-economic development.

**COMPONENT 1: Capacity building and technology support system.** To begin with, the project will support the South African Waste Information Centre so as to operationalize the South African Waste information system by building capacities in provinces and private landfill operators to be able to accurately report and categorize waste. In addition, the project will carry out a detailed inventory of waste streams from industry to establish volumes, characteristics, location of landfills etc. The information and data gathered through these activities will also support the identification of potential sites for WTE projects. The project will build capacities of major stakeholders, especially participating industries, banks/IFIs, technology developers

and current users of waste. The project will develop standardized training programmes on the operation and maintenance of biogas systems and train owners and operators on how to manage their biogas systems. It is envisaged that under component 4, the financing institutions will require that SMEs that are interested to borrow capital to invest in biogas projects will be required to attend the standardized training programme and pass the test. This will ensure that biogas systems will effectively operate and be viable investments. In addition, the project will support the strengthening of technology support center at a selected institution that is already in existence. Such an institution will then be responsible for providing support services to industries. The project will not create any new center but will strengthen the capacities of an already existing institution like NCPC, CSIR or SANEDI that are also participating in other GEF projects, in particular the Clean Tech Project. The selection of the host institution will be done at PPG stage taking into consideration the mandate, capacity and capabilities of the host institution, financial standing etc. To ensure that the host institution will continue to provide the services well beyond the life of this project, the selection will focus on institutions that already have practitioners that provide advisory services to industry and can integrate WTE support services in their business activities. Decision support tools and operation manuals will be developed and disseminated through dedicated web portal. Given the importance of waste treatment in industries across the region, the project will support two regional training workshops for officials, experts and industry representatives from the SADC region. For biogas plants, methane leakage is a significant challenge that should be attended to already in the early phases of conceptual and detailed design, construction and procurement of suppliers of components/facilities, as well as during operation of the plants. The central measure to minimize gas leakage is to ensure proper operation without major fluctuations of production/supply/fuelling of biogas and hence fluctuating gas pressures, regular controls and gas leakages checks. Accordingly, the toolkits, decision support tools and maintenance plan will be developed providing practical guide to how to check for methane leakage, the frequency of check and how to remedy the situation. Accordingly, all pilot project and investment project to be implemented under this project will benefit from the decision support tools and guides. In addition, the project will minimize the distribution of methane but would promote the conversion of the methane into power that will then be transported.

**COMPONENT 2: Biogas market development and regulatory framework.** To develop a functional and effective market for biogas technologies in South Africa, it is critical to provide market development and assurance support that will guide the development of the industry. Accordingly, it is important that standards are established and adopted on biogas plants to guide all market players and enablers involved. The project will engage all stakeholders in developing standards for biogas systems and present to authorities for their adoption. An independent standards body will then be tasked with ensuring conformity/compliance with the agreed standards. In addition, the project will develop guidelines and on environmental, technical and legal issues on the valorization of the digestate and the effluent. The development of the standards and guidelines will ensure that financiers will require that projects that would access funding would have to comply with the adopted standard. On the other hand, SMMEs and farmers would require that technology providers and project developers meet the adopted standards and guidelines. South Africa, through various policy and regulatory initiatives, has largely sought to encourage the utilization of waste in general. In fact, the country has put in place various laws, policies and regulations to promote renewable energy that include White Paper and strategy on Renewable Energy (2003), the Integrated Resource Plan etc that all prioritize renewable energy development. Spurred by the power shortages of 2008 and the ever increasing demand, the government put in place renewable energy feed-in-tariffs to encourage renewable energy development in 2009. In 2011, the Renewable Energy Bid (REBID) – Renewable Energy Independent Power Procurement Programme was announced. REBID seeks to encourage IPPs investments in renewable energy systems. A close review of the progress on REBID shows that mainly large-scale IPPs have benefited. In fact, the results of REBID's 3rd Window show that 60MW was allocated to be covered from biogas projects but no project has yet been approved. In addition, most of the projects have been large-scale projects and all projects that generate less than 1MW, cannot access the grid. If waste-to-energy projects in SMMEs are to be encouraged, there is need for such project to access the electricity grid. Accordingly, this project will develop a regulatory framework on access to the electricity grid by biogas projects present it to authorities for approval. The regulatory adoption of the regulatory framework will catalyze the development of many other small to medium scale renewable

energy systems that would be connected to the grid.

**COMPONENT 3: Technology demonstration.** As part of the process of demonstrating the technical feasibility and commercial viability of technologies that convert organic waste-to-energy and other by-products, the project will support the implementation of 2 demonstration projects in the size range of 1-3 MW in selected SME clusters to achieve about 3 MW of installed capacity. The project will focus biogas and other biomass waste utilization systems that operate in combined heat and power (CHP) fashion so as to increase efficiency of the system and increase economic viability of the projects. The utilization of both the digestate and effluent are critical aspects of this project. Accordingly, the demonstration and investments projects will integrate on-site testing facilities of the qualities of the digestate and the fertilizer produced so as to provide adequate information on would-be users of the fertilizer and. The project will focus on agro-processing industries like breweries, poultry, dairy, slaughter houses, cattle farms, wineries etc. The project will be able to support the development of detailed feasibility studies of the 4 demonstration projects and prepare detailed technical specifications of the integrated biogas systems. The detailed feasibility studies will include assessment of technological options for valorizing residuals, the on-site testing facilities etc. The project will initially focus on industrial clusters that generate huge volumes of organic waste so as to achieve the economies of scale and make waste-to-energy projects viable. In addition, the project will also focus on other non-industrial sources of organic waste, as long as the volumes of waste generated would be such that biogas projects would be viable and would have high replication potential. By initially focusing on sectors where significant volumes of waste are generated, the project will ensure that both the electricity (35-45% efficiency) and heat (35-60%) produced from the demonstration projects could be used for productive purposes the biogas systems would achieve high overall efficiency of about 85%. Once the demonstration projects are successful, it is envisaged that developers would have the confidence to invest in even smaller-scale biogas systems in other sectors like rural and urban households, institutions etc. The overall effect of the demonstration projects would be to make small to medium scale biogas technologies available in small and scalable sizes. This will effectively ensure that SMMEs that are not in clusters can then access such technologies in the replication scale-up phase and beyond the life of the project. Depending on the findings of the feasibility study, the project will provide capital grant support (up to 30%) to the 4 demonstration projects. This grant will be targeted, but not limited to, the cost of technology import or manufacture that could have an international cost element. The grant financing will only be disbursed based on performance and results achieved on the ground and actual GHG emission reductions achieved. The owners of the project will be expected to mobilize up to 70% of the actual cost of the investment either from equity or from debt. The Green Fund could also provide part of the investment costs under its high-risk financing window. The owners of the demonstration projects would be required to first undergo the training under component 1 of the project. In addition, financial service providers who would be active in the scaling up phase would be invited to provide debt financing of the demonstration project. The supported demonstration projects will be monitored and their performance will be showcased to various industries as part of the general awareness raising. A best practice manual will be developed and disseminated to build the confidence of those who are interested to invest in similar projects. The project will select most innovative projects that are supported by viable institutions that have a viable business model approach to the valorization of all the byproducts i.e. the biomethane, the digestate and the effluent. The project will pay particular attention to the need of communities who may be currently using the waste for income generation activities at informal levels like the South Africa Waste Pickers Association. These communities will be engaged so that they can be integrated into new activities under this project like the gathering and sorting of waste or the selling of fertilizer. This will ensure that these communities will neither be disfranchised nor displaced due to the activities under this project. Under this component, the project will engage financial institutions who would be early movers in supporting such investments. This will ensure that the financial services sector comes on board and will maintain their interest in the scaling up phase of the project.

#### **COMPONENT 4: Scaling up.**

As part of the support towards scaling up, the project will develop a national investment strategy for integrated biogas projects in SMMEs and other sectors in South Africa and disseminate widely. The project is going to provide technical assistance to would-be investors in activities such as project identification and development and until financial closure. The actual investments into these selected projects will come from existing financing sources such as special funds and commercial banks. At the PPG phase, the project will approach banks and other sources of financing such as the Green Fund, Industrial Development Corporation, Development Bank of Southern Africa to discuss financing requirements for biogas projects in SMMEs. The project will work with would-be investors that would be prepared to provide some equity to their projects. It is envisaged that during the life of this project, further 6 MW will be installed with more capacity to be realized beyond the life of this project. To sustain interest in these technologies beyond the life of this project, a portfolio of at least 25 viable investment projects on technologies that convert organic waste to energy and other by products will be developed. These projects will be selected taking into consideration the need to distribute projects in all provinces of South Africa and the replication potential of each project. Based on the review of the 4 demonstration projects, the project will work with providers of financial services to set up financing schemes with terms and conditions that would support the scaling up of integrated biogas investment projects in SMMEs in South Africa. To leverage existing financing mechanisms, the project will establish partnerships between the Green Fund ([www.sagreenfund.org.za](http://www.sagreenfund.org.za)) and commercial financial services providers where the Green Fund would support the preparation of projects and, on a case-by-case basis, provide a performance linked subsidy to the projects, so that commercial financial service providers will invest in the biogas projects. In addition, the Green fund will also provide grants for the project development phase of the potential biogas projects and then provide matching equity or loans so that commercial financial service providers would then provide part debt finance. As the Green Fund operates in funding cycles, the design of the partnership between the Green Fund and the commercial banks would be such that the subsidy from the Green Fund would gradually decrease while commercial financing would take over the financing of integrated biogas projects. In the later cycles of the Green Fund, it is envisaged that the fund will then focus on supporting biogas projects in other sectors like households and play a catalytic role in the replication and scaling up of the integrated biogas systems in other sectors. By providing this catalytic and enabling financial support, the project will encourage address the gaps in the financing of biogas projects that exist in the country.

#### **4) Incremental/additional cost reasoning and expected contributions from the baseline the GEFTF, LDCF/SCCF and co-financing**

GEF financing will be used for incremental costs for this project by supporting catalytic activities under the four components and project management. In particular, GEF financing will support the developing and adoption of quality standards for biogas systems and guidelines for the valorisation of waste. In addition the project will develop a regulatory framework for accessing the grid by biogas projects in SMEs under component 3. With regards to technology demonstration, GEF support will be dedicated to the design of integrated biogas systems demonstration projects as well their evaluation and showcasing. It is envisaged that the beneficiaries will co-finance up to 70% of the investments. The co-financing could come from private equity, debt or other funding sources to include the Green Fund. In addition, GEF financing will be used in creating an inventory of available waste streams from industries and their characterisation as part of the process of supporting decision making in waste-to-energy projects as a whole. This will be done as part of the support to South Africa Information System. The information will also be useful in other components such as capacity building. In terms of capacity building, GEF resources will be used to bring best practises and international expertise to capacity development efforts. Accordingly, the project will work with already existing institutions to develop targeted capacity building activities to which GEF will bring experiences from cases from other region. With regards to scaling up, GEF resources will be used to develop a national investment strategy for biogas projects from in SMMEs. GEF support will also be used to catalyse investments by providing technical assistance to first mover investors on waste-to-energy projects. In addition, GEF support will be used to set up and bridging supportive financing schemes for biogas and waste-to-energy projects. In summary, GEF support will focus on incremental costs of addressing barriers to the adoption of integrated biogas project in an integrated and systematic manner. It is envisaged that the support from GEF will catalyse a broad and accelerate shift towards waste-to-energy technologies based projects and hence contribute to reduction of GHG

emissions at the global level but also simultaneously result in increase productivity in SMMEs, job creation at the local level and contribute to low-carbon economic growth in South Africa.

**5) Global environmental benefits** will derive from the displacement of fossil fuels by the use of renewable energy systems for productive uses and the avoided generation of methane. It is estimated that over 9MW of biogas capacity will be installed in both demonstration projects and the scaling up component, with potentially more than 100MW to be achieved from the investments projects whose feasibility studies would have been supported by this project. Focusing just on the electrical power generated from these projects and based on the 2011 Eskom report, the grid carbon intensity in the country is 0.99 kg per kWh, and assuming 70% capacity factor, the project will realize 666,644 tCO<sub>2</sub> per year and 9,999,660 tCO<sub>2</sub> over the life time of the projects. Since the project will promote the adoption of CHP systems, its means that process heat will also be locally used from the power generation process thereby increasing the efficiency of the biogas plants from about 35-45% to about 90%. This effectively doubles the GHG emissions reductions of the project. By just adopting CHP systems the project will result in 1,809,462t CO<sub>2</sub> per year translating to about 4% of the national GHG emissions. More GHG emission reductions will be realized in terms on the avoided methane generation from landfills and the elimination of the transportation of the waste to landfills. It should be noted that methane has a global warming potential 23,5 times than that of CO<sub>2</sub>, so the total GHG emission reductions will increased several fold. Additional GHG emission reduction will be achieved from the production replacement of energy intensive products like the use of digestate to replace chemical fertilizer. Furthermore, more installed capacity will be realized in the scale up phase where financial service providers will now increasingly finance biogas projects resulting in more GHG emission reductions. In addition, the transformational change that the project will achieve will result in more emissions reduction from the use of integrated biogas system in other sectors. It is envisaged that the wide scale use of biogas in agro-processing SMMEs will in the end be replicated to other sectors such as municipal waste and the potential for using biogas in transportation systems. This is particularly likely as some of the municipalities are already encouraging the sorting of municipal waste at household levels thereby generating huge volumes of organic waste and are also keen to shift towards low carbon transportation systems. Detailed calculation to determine the full extent of the global environmental benefits of the project will be carried out at the PPG phase, in particular, the avoided methane generation, the heat that will be generated and replication potential of the project.

## **6) Innovativeness, sustainability and potential for scaling up**

The project's innovation derives from the adoption of a business model approach to the integrated use of industrial organic waste as a resource. The private sector, in their attempts to address existing energy challenges, will play an instrumental role in driving and sustaining innovation in waste-to-energy technologies like biogas and technologies that valorise residuals. By focusing the interventions under this project on the needs of agro processing SMMEs, there is no doubt that once industry is fully convinced of the double dividend of using waste in terms of economic and environmental benefits, the dissemination of these technologies will be market driven. Under this project, all products of the biogas systems will have their commercial value determined and included in the economic analysis of the projects. This means that besides focusing on just the use of biogas to produce heat and power, the project will also focus on the use of the digestate and effluent as fertilizer or inputs into other economic activities like aquaculture etc. Given the approach in this project, agro-processing industries will become partners in South Africa's waste management efforts thereby enormously increasing the chances of success with minimal enforcement. The project approach is premised on mobilising economic interest by stakeholders who will sustain the interventions of the project beyond the life of the project. By developing standards for biogas systems, the project will ensure that all market players and enablers have a common reference point on biogas technologies. Through building capacity of market players and enablers through an already existing institution, the project ensures that the capacity will be available to support more biogas and other WTE projects beyond the life of this project. Therefore, the entire project design is geared towards sustaining interest in investing in integrated biogas technologies based projects in the long-term. In terms of replication, the project has high replication potential as it targets a sector of the South African economy that is huge and rapidly growing i.e. agro-processing SMMEs. Reviews of many households biogas projects has shown that household biogas project are only marginally viable and tend to be

difficult for companies to focus on as primary business lines. Therefore, this project will focus on the development of biogas in SMMEs so that once it is functional, the household biogas systems could then be developed as a secondary business line. Accordingly, it is foreseeable that success with the introduction of biogas in agro-processing SMMEs will also open opportunities for the replication of the technology in other SMME sectors and also see the promotion of biogas technologies in schools, hospital, rural areas, institution and in urban areas. Besides other sectors in South Africa, it is envisaged that, based on the success of this project, the industry in the country could, in the end, support similar projects in the whole of SADC region. This is particularly true given the fact that most industries in South Africa have operations in other SADC countries.

## A.2 Stakeholders

The Department of Environmental Affairs (DEA) will be the main execution partner of this project. Department of Energy (DOE) and Department of Trade and Industry (DTI) will support DEA since they are the line ministries under this project. Department of Agriculture, Forestry and Fisheries (DAFF) will also be involved as most of the industries that generate organic waste are linked to agricultural and forestry activities. DEA will ensure the linkages and cross fertilisation of the project activities with other ongoing activities, in particular activities in waste management. Accordingly, DEA will ensure smooth coordination with DoE, DAFF and DTI in this project. Other stakeholders in the project are the CSIR and NCPC. CSIR and NCPC will be technical partners under this project. So far, it is envisaged that DEA, DOE, DTI, DAFF will be represented in the project steering committee. During the PPG phase, the whole project implementation and execution structure will be developed, to include steering committee structure and composition. In areas where the demonstration projects will be located, the project will actively engage local and indigenous people at project conception and integrate them as stakeholder and beneficiaries of the project. In particular, the project will seek to engage communities that currently use the waste at the local level with a view to integrate them in the project. As part of the process of developing the full project, effort will be made to gather sex disaggregated data for target communities and stakeholder so as to ensure that gender is mainstreamed into the project design. In particular, the project will actively identify the needs of women and local groups concerned so as to integrate their needs and address their in the project. As part of efforts to create employment at the local level, the project will engage youth organisations to provide services to the project. One option would be to engage the youth on preparation or sorting of the waste prior or post its utilisation. In addition, the project could also seek to engage youth organisations in projects that valorise the residuals. Youth organisations will be identified and profiled at the beginning of the project. Youth run enterprises will be targeted for the pilot and investment projects. The project will engage with civil society organisations (CSO) in all its activities to promote synergies and, most importantly, to ensure their continued interest in the same area beyond the life of this project. So far, it is foreseen, that some CSOs will contribute towards capacity building and the development of the regulation and mobilising support for these activities. Equally important would be the role of CSO in lobbying and mobilisation of communities, policy makers etc.

## A.3 Risk

Risk	Risk level	Risk Mitigation
<b>Political risk:</b> Low government commitment to support the project.	L	The project objectives and activities are in line with national policies and objectives. DEA and DOE have taken steps to promote the valorization of waste. Therefore, the project will actively involve representatives from DEA, DAFF, DOE and DTI to ensure their full support throughout the project.
<b>Technical risk:</b> Since these technologies are relatively new there is technology risk. The technology may not perform as described mainly due to misuse	L	The following measures will be taken: suitable sites will be selected through careful analysis of target sectors and plants; identification of proven technologies; quality audit of equipment; on the job training of the operating personnel in the industry; and use lessons and experiences from other countries that are leading

and lack of skills to operate the technologies.		in these areas.
<b>Implementation risk:</b> No interest from SMEs to take up biogas projects and no interest from technology providers in small to medium scale biogas systems. SMEs participating in demonstration projects go bankrupt. Waste generated from industry may be seasonal and prices may fluctuate.	M	Development of detailed activity plans will be done in close cooperation with in-country project partners, stakeholders and technology suppliers and project developers. Extensive consultations of all stakeholders will be conducted during the project preparation phase to raise awareness and mobilize interest in the project. An agreed and transparent modus operandi will be designed before the start of project implementation with roles of all counterparts clearly defined. Importance and relevance of integrated biogas will be explained to the industry in initial capacity building programs that will also provide case examples to the industry. Regular contact with manufacturers and outreach events will be organised. The selection of the units for demo projects will be based on thorough analysis of the performance and status of the SMEs. Proper initial assessment of the availability of waste streams will be conducted. This assessment will also focus on possibilities of mixing waste forms so as to mitigate supply seasonality. To mitigate supply and price variations, the SMEs will sign up enforceable contracts for supply of waste at agreed prices throughout the contract period with varied suppliers. In addition, the project will focus on SME clusters to reduce risks associated with depending on a single enterprise. Mechanisms created during earlier UNIDO interventions e.g. Cluster Development Initiatives would be leveraged.
<b>Financial risk:</b> No interest among banks and FIs for large scale uptake. Financial/credit constraints, high capital costs and an inhospitable investment environment prevent private sector from investing in the projects. The existing financial mechanisms are inadequate and could affect investment projects on a larger scale.	M	Like in many countries worldwide, efficient financial mechanisms have been set up in South Africa. Based on the national and global experience it will be possible to assist in developing suitable financial tools for South Africa that are easily accessible to beneficiaries. In addition, the project will promote linkages between existing public financing initiatives like the Green Fund and commercial financiers to promote risk sharing and as a guarantee mechanism. Banking/financing sector will be closely involved during the PPG phase. Particular efforts will be made to bring on board banking/financing sectors that are focussed on environment and industries sectors. Proper dissemination of the results will be organised to raise awareness among banking sector.
<b>Sustainability risk:</b> Failure to achieve project outcomes and objectives after successful delivery of outputs. Sustainability of industry operating the biogas systems and failure to scale up the project activities.	M	By making market players fully aware of the full economic potential of biogas and by equipping them with the capacity and tools to realize and reap the benefits of such potential, the project will generate a self-reinforcing market. In addition, the financial mechanisms that will be put in place will create a positive context that is expected to ensure the attainment of the project outcomes and their sustainability. The project may be affected by closing down or changes in operations of industries that would have invested in biogas systems. The project will mitigate this through focusing on industry clusters on one end and also focus on well industries that have good operational reputation. To ensure that financial services providers will take up biogas investments project after this project, the project will seek their active

		engagement in the demonstration projects so as to build their confidence. In addition, the project will then promote linkages with public financing mechanisms that will provide support in de-risking the investments.
<b>Environmental risk:</b> Failure to mitigate environmental risks such as the disposal of waste water from biogas systems into water bodies. Gas leakage in biogas systems. Misuse of fertilizer due to lack of information.	M	Carry out Environmental Impact Assessments (where applicable) as part of preparation of the technology interventions, including sanitary management of organic and liquid waste, ways to address potential odour problems caused by the biochemical process to covert waste to energy, etc. Integrated solutions will be proposed to ensure that the liquid waste from biogas systems is used for agricultural purposes as a fertilizer. The potential of biogas leakage will be integrated from the conception of project to operation and maintenance. The project will promote systems that operate at fixed flow rates to reduce the risk of biogas leakages and provide operation and maintenance manuals that encourage frequent gas leakage spot checks. In addition, the projects will focus on biogas systems that have on-site facilities to measure the quality of the fertilizers produced from the digestate to inform users appropriately and minimize high content of heavy metals, antibiotics, high content of nitrogen, etc.
<b>Climate Change risk:</b> Changes in climate could affect the generation of most agro-waste thereby threatening the waste-to-energy project, especially water availability.	M	The project will focus on well established industries that have the resources to mitigate shortages of feedstock due to climate variability. In addition, the project will conduct detailed climate risk assessments for major sectors using available models and integrate mitigation options in the design of specific projects.

#### A.4 Coordination

UNIDO is currently implementing several projects in South Africa that will have a symbiotic relationship with this project. To begin with, UNIDO established the NCPC to promote sustainable production and consumption in industry. This project will benefit from the networks and the activities of the NCPC. In addition, capacity building activities under this project will build on already exiting activities by the NCPC. The work on policy and regulatory framework will also be linked to similar work being done by the NCPC. UNIDO is also implementing a project on Industrial Energy Efficiency which has lead to a follow-up project that will be financed by GEF. Accordingly, this project will build synergistic relations with these two projects for all its activities and bring technical expertise and experience that will be of value to this project. This project will also be coordinated with the Clean Tech project in South Africa that is funded by GEF especially in capacity building and project development. Overall, this project will collaborate with other GEF projects in South Africa and other initiatives outside GEF. In particular, the GEF funded project on Renewable Energy Market Transformation build significant capacity in terms of supporting project identification and development i.e. feasibility studies through a pool of specialist. This pool will also be used by this project. In addition, the capacity development component of this project will build on the activities of the REMT project. Under component 4, it is foreseen that the experience of funding some of the projects under the REMT will be useful in supporting investment projects under this project. Within UNIDO, the project will closely link with agro-industries, investment and trade promotion, and youth employment departments to build on their already ongoing activities in South Africa.

**B. DESCRIPTION OF THE CONSISTENCY OF THE PROJECT WITH:****B.1 National strategies and plans or reports and assessments under relevant conventions, if applicable, i.e. NAPAs, NAPs, NBSAPs, national communications, TNAs, NCSAs, NIPs, PRSs, NPFE, Biennial Update Reports, etc.:**

This project addresses the energy needs as well as the need to manage waste in South Africa in line with the country's National Communications and TNA. In line with these documents, there is need to reduce GHG emission from organic waste to mitigate climate change. South Africa has demonstrated its commitment to the need to manage waste across all sectors. Accordingly, the country has enacted the Waste Act (Act 59 of 2008) and the National Waste Management Strategy that requires the country to determine a waste information baseline. In particular, the National Waste Management Strategy that was approved in 2011 sets targets to promote waste minimization, reuse, recycling and recovery. Accordingly, DEA has established the South African Waste Information System to help in monitoring progress towards these targets. Therefore, by seeking to ensure that SMEs make use of the organic waste that they produce and convert it to energy and other by-products, this project contributes to the national development priorities of South Africa and UNFCCC priorities of South Africa as in the national communications and TNA. Furthermore, the project is fully aligned with all recent national policies and strategies seeking to promote renewable energy generation. The SARI identified the linkages between renewable energy, industries and job creation. Furthermore, this project seeks to identify a niche area in that it seeks to promote the generation of energy in local industries thereby reducing reliance on national grid, but also create IPPs that will provide energy to the grid.

**B.2. GEF focal area and/or fund(s) strategies, eligibility criteria and priorities:**

The project fits into the GEF Strategic Program 3: Promoting Investment in Renewable Energy Technologies and Strategic Programme 1 - Promote the Demonstration, deployment and transfer of innovative low-carbon technologies. In line with the objectives of these two areas, this project will result in technologies being demonstrated, new renewable energy capacity being installed, conducive policy and regulatory frameworks established, capacity of actors along the technology value chain increased and GHG emissions avoided. The project will result in further GHG emissions beyond the life of the project thereby demonstrating the catalytic effect of GEF financing.

**B.3 The GEF Agency's comparative advantage for implementing this project:**

The GEF Council document GEF/C.31/rev.1 gives UNIDO comparative advantage for this Strategic Program under the intervention Type Capacity Building/Technical assistance. The project has a strong industrial focus, i.e. a strong linkage between the renewable energy systems and energy use in the productive sectors, which is UNIDO's overall mandate. UNIDO is especially well placed to implement this project because of its experience and expertise in renewable energy projects, its long history of cooperation with key stakeholders, and its high standards of fiduciary responsibility. UNIDO's other project in South Africa do focus on industrial energy efficiency, strengthening SMEs, trade and capacity building, industrial upgrading, development of industrial policy, among others. These key activities of UNIDO in the industrial sector do directly lead to this project as this project will ensure that industry addresses the environmental challenges emanating from the waste they produce but in the process generate immediate benefits for the industries.

**PART III: APPROVAL/ENDORSEMENT BY GEF OPERATIONAL FOCAL POINT(S) AND GEF AGENCY(IES)**

**A. RECORD OF ENDORSEMENT OF GEF OPERATIONAL FOCAL POINT (S) ON BEHALF OF THE GOVERNMENT(S):** see attachment.

NAME	POSITION	MINISTRY	DATE (MM/dd/yyyy)
Mr. Zaheer Fakir (Operational Focal Point)	Chief Director, International Relations and Governance	Ministry of Water and Environmental Affairs, South Africa (Department of Environmental Affairs); Tel: 012 310 3828; Email:zfakir@environment.gov.za	12/18/2013

**B. GEF AGENCY(IES) CERTIFICATION**

This request has been prepared in accordance with GEF/LDCF/SCCF/NPIF policies and procedures and meets the GEF/LDCF/SCCF/NPIF criteria for project identification and preparation.

Agency Coordinator, Agency name	Signature	DATE (MM/dd/yy yy)	Project Contact Person	Telephone	Email Address
Philippe Scholtès, Officer-in-Charge, Programme Development and Technical Cooperation Division (PTC), UNIDO GEF Focal Point		03/21/2014	Alois Posekufa MHLANGA, Industrial Development Officer, UNIDO	+431260265169	 a.mhlanga@unido.org



## environmental affairs

Department:  
Environmental Affairs  
REPUBLIC OF SOUTH AFRICA

December,18.2013

To : Mr. Philippe Scholtes  
Director and Officer-In-Charge  
UNIDO Programme Development and Technical Cooperation Division  
Vienna, Austria

Fax: +431 260263589.

**Subject: Endorsement for a project “Promoting organic waste-to-energy and other low-carbon technologies in small and medium-scale enterprises in South Africa”**

In my capacity as GEF Operational Focal Point for South Africa, I confirm that the above project proposal (a) is in accordance with my government's national priorities and our commitment to the relevant global environmental conventions; and (b) was discussed with relevant stakeholders, including the global environmental convention focal points.

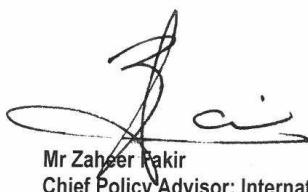
I am pleased to endorse the preparation of the above project proposal with the support of the GEF Agency listed below. If approved, the proposal will be prepared and implemented by UNIDO, the Department of Environmental Affairs, the Department of Science and Technology, the Department of Trade and Industry, and Department of Energy. I request UNIDO to provide a copy of the project document before it is submitted to the GEF Secretariat for CEO endorsement.

The total financing from GEFTF being requested for this project is US\$ 4,721,760, inclusive of project preparation grant (PPG), if any, and Agency fees for project cycle management services associated with the total GEF grant. The financing requested for the project is detailed in the table below.

Source of Funds	GEF Agency	Focal Area	Amount (in US\$)			
			Project Preparation	Project	Fee	Total
GEF TF	UNIDO	CC		4,222,110	401,100	4,623,210
			90,000		8,550	98,550
<b>Total GEF Resources</b>			<b>90,000</b>	<b>4,222,110</b>	<b>409,650</b>	<b>4,721,760</b>

I consent to the utilization of South Africa's allocations in GEF-5 as defined in the System for Transparent Allocation of Resources (STAR).

Sincerely,



A handwritten signature in black ink, appearing to read "Zaher Rakir".

Mr Zaher Rakir  
Chief Policy Advisor: International Governance & Relations

Copy to:

**Mr Maesela Kekana**, Conventional Focal Point – UNFCCC. [mjkekana@environment.gov.za](mailto:mjkekana@environment.gov.za)

**Ms Malta Qwathaneka**, Conventional Focal Point – UNCBD and UNCCD:  
[mqwathaneka@environment.gov.za](mailto:mqwathaneka@environment.gov.za)

**Ms Noluzuko Gwayi**, Conventional Focal Point for Stockholm (POPs): [ngwayi@environment.gov.za](mailto:ngwayi@environment.gov.za)