



GEF-6 PROJECT IDENTIFICATION FORM (PIF)

PROJECT TYPE: Full-sized Project

TYPE OF TRUST FUND: GEF Trust Fund

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PART I: PROJECT INFORMATION

Project Title:	Promotion of Bio-Ethanol as Alternative Clean Fuel for Cooking in the United Republic of Tanzania		
Country(ies):	United Republic of Tanzania	GEF Project ID: ¹	9281
GEF Agency(ies):	UNIDO (select) (select)	GEF Agency Project ID:	150208
Other Executing Partner(s):	1. Ministry of Energy and Minerals (MEM) 2. First Vice presidents office, Department of Environment, Zanzibar 3. Vice Presidents Office – Division of Environment	Submission Date: Resubmission Date:	07/31/2015 08/14/2015
GEF Focal Area(s):	Climate Change	Project Duration (Months)	60
Integrated Approach Pilot	IAP-Cities <input type="checkbox"/> IAP-Commodities <input type="checkbox"/> IAP-Food Security <input type="checkbox"/>	Corporate Program: SGP <input type="checkbox"/>	
Name of parent program:	No	Agency Fee (\$)	233,422

A. INDICATIVE FOCAL AREA STRATEGY FRAMEWORK AND OTHER PROGRAM STRATEGIES²

Objectives/Programs (Focal Areas, Integrated Approach Pilot, Corporate Programs)	Trust Fund	(in \$)	
		GEF Project Financing	Co-financing
CC – 1 Promote Innovation, Technology Transfer and Supportive Policies and Strategies	GEFTF	2,457,078	10,450,500
Total Project Cost		2,457,078	10,450,500

B. INDICATIVE PROJECT DESCRIPTION SUMMARY

Project Objective: To promote bio-ethanol as an alternative clean cooking fuel in Tanzania						
Project Components	Financing Type ³	Project Outcomes	Project Outputs	Trust Fund	(in \$)	
					GEF Project Financing	Co-financing
1. Capacity development	TA	1.1 Improved capacity for market development on fuel grade bio-ethanol production and usage	1.1.1. Institutional capacity building strengthened 1.1.2. Key policy makers, regional officials (at least 100 cumulatively) and other target groups ⁴ (30 in each group) trained	GEFTF	110,000	540,000
2. Policy framework development for promoting bio-ethanol	TA	2.1. Improved policy environment	2.1.1. National policy on bio-ethanol production and its use for cooking as well as financial incentive developed for the consideration	GEFTF	100,000	400,000

¹ Project ID number will be assigned by GEFSEC and to be entered by Agency in subsequent document submissions.

² When completing Table A, refer to the excerpts on [GEF 6 Results Frameworks for GETF, LDCF and SCCF](#).

³ Financing type can be either investment or technical assistance.

⁴ Sugar mill owners, interested entrepreneurs on micro-distilleries, national experts, renewable energy (RE)/technical institutions, banks/financial institutions, engineering companies, NGOs/CSOs, etc.

production and financial incentives			of Government 2.1.2. National standards for fuel grade bio-ethanol and ethanol cook stoves formulated				
3. Promoting production and market network for bio-ethanol fuel and ethanol cook stoves	Inv	3.1. Partnerships and investments promoted for local production of fuel grade ethanol and ethanol cook stoves 3.2. Market network available for bio-ethanol and bio-ethanol cook stoves	3.1.1. Local manufacturing of ethanol cook stoves facilitated 3.1.2. Ethanol plants (large, medium and micro-distilleries) for a cumulative capacity of 120,000 litres per day (lpd) facilitated 3.1.3. Ethanol cook stoves retailed (around 28,000 nos.)	GEFTF	1,900,074	8,620,500	
	TA		3.1.4. Bio-ethanol fuel and ethanol cook stove retailing network designed and established		150,000	400,000	
4. Monitoring and evaluation (M&E) ⁵	TA	4.1. Effectiveness of the outputs assessed, corrective actions taken and experience documented	4.1.1. Mid-term M&E report prepared 4.1.2. End of project M&E report prepared	GEFTF	80,000	90,000	
Subtotal						2,340,074	10,050,500
Project Management Cost (PMC) ⁶				GEFTF	117,004	400,000	
Total Project Cost						2,457,078	10,450,500

For multi-trust fund projects, provide the total amount of PMC in Table B, and indicate the split of PMC among the different trust funds here: ()

C. INDICATIVE SOURCES OF CO-FINANCING FOR THE PROJECT BY NAME AND BY TYPE, IF AVAILABLE

Sources of Co-financing	Name of Co-financier	Type of Co-financing	Amount (\$)
Recipient Government	MEM	Grant	1,000,000
Recipient Government	First Vice presidents, Department of Environment, Zanzibar	Grant	800,000
Recipient Government	College of Engineering and Technology (CoET), University of Dar-es-Salaam	Grant	80,000
Recipient Government	Tanzania Bureau of Standards (TBS)	Grant	150,000
Private Sector	Distilleries ⁷ (unknown at this stage)	Equity	7,331,000
Private Sector	Cook stove manufacturers (unknown at this stage)	Equity	949,500
GEF Agency	UNIDO	Grant	60,000
GEF Agency	UNIDO	In-kind	80,000
Total Co-financing			10,450,500

⁵ Both mid-term and final evaluations are envisaged as independent evaluations

⁶ For GEF Project Financing up to \$2 million, PMC could be up to 10% of the subtotal; above \$2 million, PMC could be up to 5% of the subtotal. PMC should be charged proportionately to focal areas based on focal area project financing amount in Table D below.

⁷ Large, medium and micro-distilleries

D. INDICATIVE TRUST FUND RESOURCES REQUESTED BY AGENCY(IES), COUNTRY(IES) AND THE PROGRAMMING OF FUNDS ^{a)}

GEF Agency	Trust Fund	Country/ Regional/ Global	Focal Area	Programming of Funds	(in \$)		
					GEF Project Financing (a)	Agency Fee (b) ^{b)}	Total (c)=a+b
UNIDO	GEFTF	United Republic of Tanzania	Climate Change	NA	2,457,078	233,422	2,690,500
Total GEF Resources					2,457,078	233,422	2,690,500

a) Refer to the [Fee Policy for GEF Partner Agencies](#).

E. PROJECT PREPARATION GRANT (PPG)⁸

Is Project Preparation Grant requested? Yes No If no, skip item E.

PPG AMOUNT REQUESTED BY AGENCY(IES), TRUST FUND, COUNTRY(IES) AND THE PROGRAMMING OF FUNDS

Project Preparation Grant amount requested: \$100,000					PPG Agency Fee: \$ 9,500		
GEF Agency	Trust Fund	Country/ Regional/Global	Focal Area	Programming of Funds	(in \$)		
					PPG (a)	Agency Fee ⁹ (b)	Total c = a + b
UNIDO	GEF TF	United Republic of Tanzania	Climate Change	NA	100,000	9,500	109,500
Total PPG Amount					100,000	9,500	109,500

F. PROJECT'S TARGET CONTRIBUTIONS TO GLOBAL ENVIRONMENTAL BENEFITS¹⁰

Provide the expected project targets as appropriate. – N.A.-

Corporate Results	Replenishment Targets	Project Targets
1. Maintain globally significant biodiversity and the ecosystem goods and services that provides to society	Improved management of landscapes and seascapes covering 300 million hectare	<i>Hectares</i>
2. Sustainable land management in production systems(agriculture, range lanfs, and forest landscapes)	120million hectares under sustainable land management	<i>Hectares</i>
3. Promotion of collective management of transboundary water systems and implementation of the full range of policy, legal and institutional reforms and investments contributing to sustainable use and maintenance of ecosystem services	Water-foo-ecosystems security and conjunctive management of surface and groundwater in ta least 10 freshwater basins;	<i>Number of fresh water basins</i>
	20% of globally over-exploited fisheries(by volume) moved to more sustainable levels	<i>Percent of fisheries, by volume</i>
4. Support to transformational shifts towards a low-emission and resilient development path	750 million tons of CO _{2e} mitigated (include both direct and indirect)	<i>2,329,571 metric tons</i>
5. Increase in phase-out, disposal and	Disposal of 80,000 tons of POPs (PCB, obsolete	<i>metric tons</i>

⁸ PPG requested amount is determined by the size of the GEF Project Financing (PF) as follows: Up to \$50k for PF up to \$2m (for MSP); up to \$100k for PF up to \$3m; \$150k for PF up to \$6m; \$200k for PF up to \$10m; and \$300k for PF above \$10m. On an exceptional basis, PPG amount may differ upon detailed discussion and justification with the GEFSEC.

⁹ PPG fee percentage follows the percentage of the Agency fee over the GEF Project Financing amount requested.

¹⁰ Provide those indicator values in this table to the extent applicable to your proposed project. Progress in programming against these targets for the projects per the *Corporate Results Framework* in the [GEF-6 Programming Directions](#), will be aggregated and reported during mid-term and at the conclusion of the replenishment period. There is no need to complete this table for climate adaptation projects financed solely through LDCF and/or SCCF.

Corporate Results	Replenishment Targets	Project Targets
reduction of releases of POPs, ODS, mercury and other chemicals of global concern	pesticides)	
	Reduction of 1,000 tons of Mercury	<i>metric tons</i>
	Phase-out of 303.44 tons of ODP (HCFC)	<i>ODP tons</i>
6. Enhance capacity of countries to implement MEAs(multilateral environmental agreements and sub-national policy, planning financial and legal frameworks	Development and sectoral planning frameworks integrate measurable targets drawn from the MEAs in at least 10 countries	<i>Number of countries</i>
	Functional environment information systems are established to support decision-making in at least 10 countries	<i>Number of countries</i>

PART II: PROJECT JUSTIFICATION

1. Project Description.

Global Environmental Problems, Root Causes and Barriers

According to International Energy Agency (IEA), Tanzania consumed around 22.162 Mtoe (million tons of oil equivalent) in 2012. The energy import expenses were about USD 1.5 billion per annum which is 23% of the total country imports and almost all of them being petroleum products¹¹. The total primary energy supply mix is shown in figure 1¹².

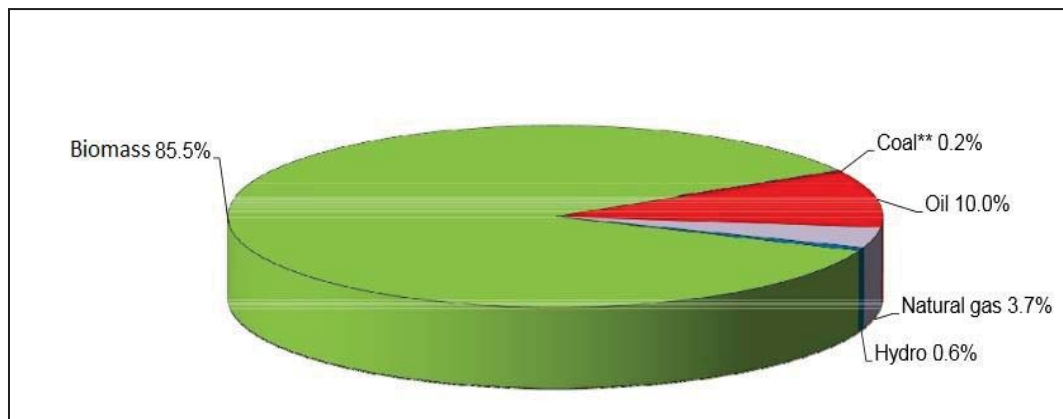


Figure 1: Energy mix in Tanzania , 2012

More than 80% of the Tanzanians depend on biomass as their major energy source for household cooking practices with very less usage efficiency. As a result, in the overall country energy mix, biomass represents the major share¹³. The common cooking devices widely used in Tanzania are traditional three-stone fire, metal charcoal stoves, improved charcoal stoves, kerosene stoves and electric cookers. While fuels for cooking are relatively diverse (firewood, charcoal, kerosene, electricity, cow dung, crop residues, wood processing residues, etc.), wood based biomass fuels clearly stand out as the most important. Low income households particularly depend on wood fuels. Although there are distinct regional preferences, in general, more than 70% of urban dwellers use charcoal, while more than 90% of the rural population use only firewood. The use of kerosene is usually limited to lighting and quick cooking purposes only. The use of liquefied petroleum gas (LPG) by the low income households is negligible, as it is expensive and also more difficult to obtain in both urban and rural surroundings¹⁴.

¹¹ IEA Key World Energy Statistics, 2013 http://www.iea.org/publications/freepublications/publication/KeyWorld2013_FINAL_WEB.pdf
http://www.iea.org/stats/balancetable.asp?COUNTRY_CODE=TZ

¹² <http://www.iea.org/stats/WebGraphs/TANZANIA4.pdf>

¹³ A Review of Biomass Energy Dependency in Tanzania, 9th Eco-Energy and Materials Science and Engineering Symposium, 2011

¹⁴ Global Alliance for Clean Cookstoves, Tanzania Market Assessment, March 2012. GVEP International

The collection of firewood in rural areas is the responsibility of mostly women and children. Firewood is collected from the forest and the government owned lands mostly free of charge and is then sold in urban areas through firewood vendors. In this regard, many children, especially young girls, are withdrawn from schools to attend to domestic chores related to the biomass collection and usage. As a result, they are deprived of education and face reduced educational and employment opportunities¹⁵. Charcoal is produced in rural areas and is transported to urban areas by the dealers/transporters where it is sold in retail to end consumers through small vendors¹⁶.

The Forestry and Beekeeping Division under the Ministry of Natural Resources and Tourism of Tanzania estimates an annual forest reduction between 130,000 to 500,000 hectares against only 25,000 hectares planted annually. It is estimated that about 70% of this deforestation is due to fuel wood harvests - directly or indirectly¹⁷. In total, between 1990 and 2010, Tanzania lost 19.4% of its forest cover or around 8,067,000 hectares¹⁸ of forest area which had high levels of bio-diversity and many endemic species. The felling of trees for the supply of fuel wood and charcoal has significant impacts on vegetation, soil and watersheds¹⁹. Scientists have linked the loss of snow on Mount Kilimanjaro to the deforestation on the mountain's foothills²⁰.

Tanzania is highly vulnerable to climate change since the key drivers of the economy (agriculture, livestock, tourism, forestry and fisheries) are climate-sensitive. This problem is also coupled with the country's low adaptive capacity to climate change. Hence, the need of the hour is to decrease the over dependence on unsustainable biomass for energy needs, and simultaneously increase the use of other non-polluting, less GHG emitting and cheaper fuel for the country's energy needs.

The current contribution of Tanzania to global climate change is limited. In 2009, CO₂ emissions were 0.2 tons per capita²¹. With a population of 47.8 million²², the country's emission is estimated to be around 9.6 million tCO₂e. According to a study by the Department for International Development (DFID), the fossil fuel based emissions are set to increase 7-fold and the GHG emissions are expected to double by 2030 as compared to that of the 2005 baseline²³. Thus, the continued economic growth of the country in a business-as-usual manner will increase the demand for energy and lead to increasing CO₂ emissions.

Initiatives have already been taken by the Government, international organizations, Non-Governmental Organizations (NGOs), etc. to introduce modern sustainable cooking solutions to the Tanzanian market. However, the overall market penetration of these energy solutions still remains very low. There is lack of an integrated market development approach, where awareness about the technology, availability of quality products in markets at affordable prices and private sector participation go hand-in-hand with each other.

The prevailing poverty level and over-dependence on biomass based fuels are the root causes of the identified environmental problems. Lack of access to modern energy services creates a vicious cycle of poverty for rural communities due to continued limited production opportunities and social facilities. Deforestation due to biomass consumption, on the other hand, poses a severe threat to biodiversity. Lack of alternative energy technology and absence of any project demonstrations on alternate fuels only lead to the acceleration of environmental degradation.

The key barriers to the adoption of clean cooking practice using alternate fuels like bio-ethanol in Tanzania²⁴ are: a) Non-availability of alternative fuels at ease and convenience compared to charcoal and firewood, makes them less

¹⁵ World Energy Outlook 2006 - Focus On Key Topics, IEA

¹⁶ <https://openknowledge.worldbank.org/bitstream/handle/10986/2865/551400ESW0P1201PE1Charcoal1TZ1FINAL.pdf?sequence=1>

¹⁷ Global Alliance for Clean Cookstoves, Tanzania Market Assessment, March 2012. GVEP International

¹⁸ World Bank, 2009

¹⁹ Van Beukering et al, 2010

²⁰ Mongabay.com, UNEP, World Bank, FAO

²¹ World Bank Data Bank, <http://databank.worldbank.org/ddp/home.do?Step=1&id=4>

²² 2012 data. <http://data.worldbank.org/indicator/SP.POP.TOTL>

²³ UKAID, "Economics of Climate Change in the United Republic of Tanzania", wUKith Development Partner Group

²⁴ Global Alliance for Clean Cookstoves, Tanzania Market Assessment, March 2012. GVEP International

competitive; b) Difficulty in sensitizing the market on new technologies within a short period of time and in a resource intensive manner; c) Requirement of significant investment for large scale ethanol production and ethanol cook stove manufacturing; and d) Difficulty in ascertaining the claimed fuel savings from the alternate/improved cooking methods.

The proposed project will address some of the above barriers to increase the usage of bio-ethanol as an alternative clean cooking fuel. Mitigation achieved through the proposed project for some of the barriers are listed under the “GEF alternative scenario and project”.

Baseline scenario

Global/Regional initiatives

Improved cook stoves have been promoted in the country since early 1980's. However, its adoption rate is still low. Although often not the primary objective, many cook stove programs aimed to reduce IAP through their activities. Below are some of the ongoing programs that focus on IAP in Tanzania. a) Tanzania Domestic Biogas Programme implemented by SNV/CAMARTEC²⁵; b) Developing Energy Enterprises Project (DEEP) implemented by GVEP²⁶; c) Up-scaling access to Integrated Modern Energy Services for Poverty Reduction, implemented by Humanist Institute for Cooperation/The Tanzania Traditional Energy Development Organization (HIVOS/TaTEDO)²⁷; and d) Tanzania Energy Development and Access Project implemented by the World Bank and the GEF.

Some of the past programs that focused on IAP include: a) Households Efficient Stoves in Rombo & Hai District, Kilimanjaro, Tanzania implemented by HIVOS/TaTEDO; b) Enabling Access to Sustainable Energy (EASE) implemented by Directorate-General for International Cooperation, Netherlands (DGIS)²⁸; c) Smoke, Health and Household Energy in Tanzania implemented by the Department for International Development, UK (DFID)²⁹; d) Program for Biomass Energy Conservation (ProBEC) implemented by German Federal Enterprise for International Cooperation (GTZ)/DGIS/MEM³⁰; and e) Air Quality Monitoring Capacity Building Project (AQMCBP) implemented by USEPA and UNEP³¹.

Inferences and lessons learnt from these programmes include the following³²:

- a) Available stoves in the market are cheap and of low quality. Most of the consumers are not willing to pay a higher price for quality improved stoves.
- b) Wood stoves have been promoted by several NGO's but have failed commercially.
- c) Innovation has occurred in the improved cook stove sector introducing new stove types, however commercialization has been slow.
- d) Imported wood stoves have also been introduced into the market but the number of retailers is low since it is a resource intensive activity.

However, most of the above clean cook stoves projects are charcoal and wood based fuels only. To reduce the deforestation rates and avoid further stressing the forests for wood collection, it is essential to introduce alternative cooking fuel that does not deplete Tanzania's forests, and is non-polluting, less GHG emitting and cheaper for the Tanzanian population at the same time. An alternative option is the usage of bio-ethanol cook stoves. However, so far, there have been no notable efforts in the area of bio-ethanol production or its use in cooking sector in Tanzania.

²⁵ SNV - Stichting Nederlandse Vrijwilligers; CAMARTEC - Centre for Agricultural Mechanisation and Rural Technology

²⁶ GVEP - Global Village Energy Partnership

²⁷ HIVOS - Humanist Institute for Cooperation; TaTEDO - Tanzania Traditional Energy Development And Environment Organization

²⁸ DGIS - Directorate-General for International Cooperation, Netherlands

²⁹ DFID – Department for International Development, UK;

³⁰ GTZ – German Technical Cooperation

³¹ US EPA – US Environmental Protection Authority; UNEP – United Nations Environment Programme

³² Global Alliance for Clean Cookstoves, Tanzania Market Assessment, March 2012. GVEP International

National initiatives

Cooking practices in Tanzania

According to Household Budget Survey (2007), 75% of the population lives in rural areas and 25% in urban areas. Table 1 provides a brief overview of energy consumption in a typical Tanzanian household:

Table 1: Share of different fuels in household cooking energy consumption (2012)³³

Primary Cooking & Heating Energy	Percentage (%) of			Households (Millions)			Population (Millions)		
	Rural population ³⁴	Urban population ³⁵	Total population ³⁶	Rural	Urban	Total	Rural	Urban	Total
Electricity	0.2	1	0.4	0.01	0.03	0.04	0.07	0.12	0.19
LPG	0.1	0.1	0.1	0.01	0	0.01	0.03	0.01	0.04
Biogas	0.1	0.4	0.2	0	0.01	0.01	0.02	0.05	0.07
Paraffin, Kerosene	0.4	7	2.1	0.03	0.19	0.22	0.13	0.82	0.95
Charcoal	8.5	71	24.8	0.54	1.97	2.51	2.83	8.29	11.12
Firewood	90.1	20	71.9	5.76	0.56	6.32	29.96	2.34	32.3
Crop Residues	0.4	0.1	0.3	0.03	0	0.03	0.14	0.01	0.15
Other	0.2	0.4	0.3	0.01	0.01	0.02	0.07	0.05	0.12
Total	100	100	100	6.39	2.77	9.16	33.25	11.69	44.94

Household energy demand

Table 1 depicts that charcoal is the major cooking fuel in urban areas, whereas in rural areas firewood is the more commonly used one. Only in very few urban areas, such as Dar es Salaam, kerosene is used as a cooking fuel and the use of electricity is less than 1%. As cooking is the main responsibility of women and girls they are disproportionately affected by the high dependency on biomass with serious negative implications for indoor air pollution, health of women and children, and women's time and work burden in fuel collection. Figure 2 shows the primary cooking energy scenario in Tanzania.

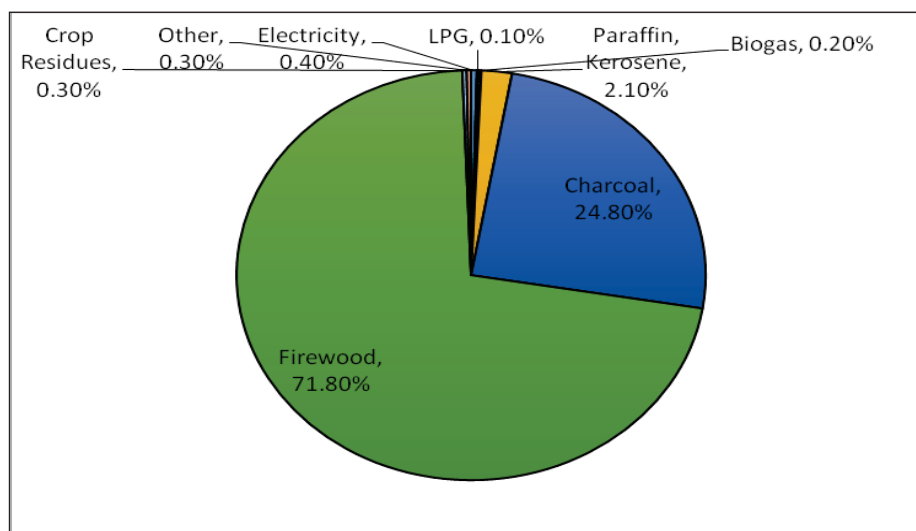


Figure 2. Share of primary cooking energy in Tanzania

³³ National Bureau of Statistics 2012 Census, 2007 Household Budget Survey and NBS-Tanzania Commission for AIDS-Tanzania HIV/AIDS and Malaria Indicator Survey 2011-12 (NBS, 2009, 2012a, 2013 a&b, NBS-TACAIDS, 2013).

³⁴ Percentage out of the total rural population

³⁵ Percentage out of the total urban population

³⁶ Percentage out of the total population

Urban household energy demand

In Dar es Salaam, 91% of all households consume charcoal (2012 data), and 3% consume firewood. In other urban areas, 59.1% of households consume charcoal, while 19% consume fuel wood (Tables 2 and 3).

Rural household energy demand

Approximately 90% of all rural households (approximately 5,800,000 households) cook with firewood (Table 2). Most rural households collect the firewood they consume themselves and about 8.5% of rural households (approximately 540,000 households, Table 3) purchase their charcoal from rural retailers.

Table 2. Tanzania fuel wood consumption by rural, Dar es salaam and other urban

Area	Total population	% using wood	Population using wood
Dar es Salaam	4,364,541	3	130,936
Other Urban	7,316,739	19	1,381,334
Rural	33,246,720	90	29,922,048
Total	44,928,000	70	31,434,345

Table 3. Tanzania charcoal consumption by rural, Dar es salaam and other urban

Area	Total population	% using charcoal	Population using charcoal
Dar es Salaam	4,364,541	91	3,971,732
Other Urban	7,316,739	59	4,321,976
Rural	33,246,720	8.5	2,825,971
Total	44,928,000	2.8	11,119,679

In 2009, World Bank released a policy note about the charcoal sector in Tanzania, in which it was revealed that a 1% increase in urbanization leads to a 14% increase in charcoal consumption³⁷. The following table below summarizes the average fuel consumption for different cooking fuels in Tanzanian household:

Table 4: Cooking cost scenario Tanzania (traditional cooking method)³⁸

Fuel	Purchase Unit	Usage	Cost of Purchase	Fuel use per day	USD per week
Firewood	3 pieces	1 day	500 TZS (USD 0.31)	3 pieces	2.19
Charcoal	40 kg sack	25 days	30,000 TZS (USD 19)	1.6 kg/day	5.25
LPG	13 kg cylinder	30 days	56,000 TZS (USD 35)	0.44 kg/day	8.12
Kerosene	1 litre	2 days	2,500 TZS(USD 1.6)	0.5 lit/day	5.46

Note: Based on interviews and derivations. Fuel usage value will vary depending on family size, location, stove and fuel mix.

Private sector initiatives

Sugar industry and bio-ethanol production

In Tanzania, liquid bio-fuels (bio-ethanol and bio-diesel) remain relatively unexploited. Bio-ethanol is mainly produced from molasses, a by-product of sugar cane processing. The average sugar production and ethanol production potential in Tanzanian sugar mills are given in the following table:

³⁷ http://www-wds.worldbank.org/external/default/WDSContentServer/WDSP/IB/2009/09/01/000334955_20090901084035/Rendered/PDF/502070WP0Polic1BOx0342042B01PUBLIC1.pdf

³⁸ http://www.cleancookstoves.org/resources_files/tanzania-market-assessment-mapping.pdf

Table 5: Average annual sugar and potential ethanol production in Tanzanian sugar mills

No.	Sugar mill	Annual average sugar production (tonnes) ³⁹	Annual average molasses produced (tonnes) ⁴⁰	Estimated annual average ethanol production potential ('000 litres) ⁴¹
1	KSC	120,556	40,185	8,841
2	TPC	85,480	28,493	6,268
3	MSE	36,177	12,059	2,653
4	KSL	39,932	13,311	2,928
5	ZSF ⁴²	24,000	8,000	1,760
	Total	306,144	102,048	22,451

Note: KSC - Kilombero Sugar Company Limited; TPC - Tanganyika Planting Company Limited; MSE - Mtibwa Sugar Estates Limited; KSL - Kagera Sugar Limited, ZSF - Zanzibar Sugar Factory

Currently, molasses generated in Tanzanian sugar factories are not being fully utilized for the ethanol production. Only two sugar factories produce ethanol from their molasses: KSC and TPC. The remaining factories sell their molasses as additives for animal feedstock or surface treatment for rural roads. Among KSC and TPC, only KSC produces ethanol and sells it to the distilleries for liquor production. TPC produces an ethanol intermediate from molasses and sells it to distilleries for further processing to produce ethanol.

In March 2014, it was reported that Agro EcoEnergy (T) Ltd. planned to invest USD 550 million in sugarcane farming for an ethanol project⁴³. The project is estimated to produce 130,000 tons of sugar and 10 million litres of ethanol over three years. Also, Zanzibar island has a distillery in Zanzibar Sugar Factory. Currently the factory and distillery unit is being rehabilitated and it is expected to start production by November 2015. The distillery has a current capacity of 6,000 liters per day (lpd) and will be increased to 10,000 lpd after rehabilitation. As of now (before rehabilitation) the ethanol produced by Zanzibar sugar factory was sold to industries in Tanzanian mainland including local pharmaceutical, chemical and perfume industries. In the absence of any fuel market for cooking, the Zanzibar sugar factory will continue to target this sector.

Considering the cane crushing days of 200 per year, daily ethanol production capacities of the above mentioned mills come to around 120,000 lpd. Apart from molasses, cashew juice can also be used as potential source for ethanol production. Tanzania is one of the top cashew nuts exporting countries and the annual cashew apple generation in country is around 1,000,000 tons per year⁴⁴. There are about 40 small, medium and large-scale factories processing cashew nuts⁴⁵. A very small proportion of fresh cashew apples (by-product of cashew nut production) are used in making locally fermented drinks (Nipa) in the villages. Bio-ethanol generation potential of cashew industries is estimated to be 130,000 tons per annum⁴⁶, which is untapped.

Based on the above data, the annual ethanol production potential (for cooking fuel purpose) in the country is estimated to be around 27 million litres per year⁴⁷. Various other feedstock such as sisal waste, coffee pulp, seasonal fruits, etc., are also a potential source for bio-ethanol production. They shall be treated in micro-distilleries for

³⁹ Average annual production from five years 2009-14. <http://www.sbt.go.tz/index.php/production-data>

⁴⁰ Based on the assumption that for every 100 tons cane crushed, 30 tons of fibrous residue (bagasse) and about 12 tons sugar and 4 tons molasses are made. http://www.hulets.co.za/car/sm_process.asp

⁴¹ One ton of molasses can be converted into 220 litres of ethanol. <http://www.kenyasugar.co.ke/downloads/KSI%20Strategic%20plan.pdf>

⁴² Rehabilitation and trial operations going on. Expected to start full scale operations from November 2015.

⁴³ http://www.biofuels-news.com/industry_news.php?item_id=7758#sthash.dzdnFHXT.UxPCreFB.dpuf

⁴⁴ http://www.3adi.org/tl_files/3ADIDocuments/Country%20information/Tanzania/Cashew%20Value%20Chain%20Diagnostics.pdf

⁴⁵ Investment opportunities in cashewnut industry in Tanzania, Cashewnut Board of Tanzania

⁴⁶ 16 litres of ethanol can be produced from 100 kg of cashew apple.

<http://www.emergingkerala2012.org/pdf/Food%20Processing/BIOETHANOL%20Procudtion%20from%20Cashew%20Apple.pdf>

⁴⁷ Considering annual ethanol production potential of KSC, TPC, MSE KSL & ZSF mentioned in the table and planned ethanol production at Agro EcoEnergy (T) Ltd.

ethanol production. However, more details of such sources and their availability are not known at this stage. The availability of these sources will be studied in detail during PPG stage.

Baseline project

UNIDO has completed a pilot study (2014-15) on ethanol as cooking fuel in Zanzibar where it distributed imported ethanol cook stoves (CLEANCOOK) to around 144 households and supplied ethanol for a period of 3 months. The components of the pilot study included : a) Baseline survey of household cooking energy and supply; b) Feasibility assessment on ethanol usage as household cooking fuel; and c) Acceptability assessment for ethanol usage as household fuel d) as well as impact of introduction of clean cooking fuel to households.

The CLEANCOOK stove was distributed to the families upon the deposit of TSH 15,000 (USD 7.5). Families purchased fuel for TSH 1,600 (USD 0.8) per litre throughout the study period. 95% of participating families believed that ethanol fuel and the stove were preferable to other fuels and stoves. 73% of families used the stove every day during the study. Families also reported saving 2.1 hours each day on cooking and fuelwood collection on average by switching to ethanol. The average particulate matter concentration in the kitchens tested was greatly reduced from 575.4 to 109 $\mu\text{g}/\text{m}^3$, a very significant improvement in household air quality. The CO concentration in households dropped to 3.5 mg/m^3 during use of the CLEANCOOK stove, significantly below the World Health Organization guideline of 10 mg/m^3 . It is widely recognized that clean cooking is key to lift women out of poverty and improve their health. Therefore, the pilot study has put a special focus on gender dimensions, resulting in positive responses, particularly on the part of women. Many women noted the ease with which they could prepare quick meals and the cleanliness of the stoves and bio-ethanol fuel. The scaling up of this programme can open up potential business opportunities for women in communities in the local small-scale production of fuel-grade bio-ethanol, marketing and retailing of fuel ethanol and ethanol cook stoves.

The Project Steering Committee, consisting of government officials from various ministries, has given recommendations for the continued distribution of fuel and garnered government support and approval for ethanol fuel for household use. Based on the positive findings from the pilot study and support from local government, a commercial scale-up of the pilot project is recommended. The project is continuing the supply of fuel from Zanzibar Sugar Factory to participating families and is working with local partners to develop a sustainability model for clean cooking fuel and stoves business.

Considering the relevant lessons learned and results of the pilot study, the proposed GEF project intends to collaborate with all key stakeholders and partners, that also include women's associations to pave the way for a vibrant and sustainable household bio-ethanol cooking fuel market and contribute towards improving access to a cleaner and safer household cooking fuel in Tanzania. Existing clean cook stoves projects, ideally, should reduce the dependency on forests for firewood and charcoal production. However, in most of the cases, practically, it does not happen.

The proposed GEF project will scale-up the activities of the above mentioned baseline initiatives, concentrating more on replacing charcoal and firewood as well as kerosene cook stoves with bio-ethanol cook stoves⁴⁸. This in return will reduce the dependency on firewood and hence, also reduce deforestation. The proposed project will use the underutilized agro feedstock such as molasses (from the existing sugar industries), cashew apple, sisal waste and other seasonal fruit/agro wastes for bio-ethanol generation. This will also boost up the agriculture sector, as they will get additional revenues from their by-products/wastes. New skills will be learnt by the semi-skilled and skilled labourers in bio-ethanol production or in manufacturing of cook stoves. New business opportunities will be opened up for NGOs, women self-help groups and such organizations in manufacturing, marketing and retailing of cook stoves. The end users will benefit from the improved lifestyle with smoke free kitchens and homes. Thus the proposed project will add values or additional benefits in each section of its production and supply chain.

⁴⁸ The project will also include Kerosene stove replacements, if any such situation arises. Due to the relatively less percentage of kerosene stoves that may be replaced, it is not mentioned explicitly here.

GEF alternative scenario and project

A countrywide intervention to introduce ethanol fuel and cook stoves is now being undertaken for the first time in Tanzania. To begin with, this proposed project would focus on urban and peri-urban areas and gradually spread to rural areas. The project proposes the following three main activities namely, a) Promoting the production and sustainable supply of bio ethanol through partnership with sugar industries and promoting private sector investments; b) Facilitation of local manufacturing of bio-ethanol cook stoves and c) Establishing the retailing network for bio-ethanol cook stoves and bio-ethanol fuel.

Project Component 1: Capacity development

For sustainable capacity building activities, there is a need to set up or identify a centre for providing a strong platform for bio-ethanol production and usage as an alternate cooking fuel. Under this project component, capacity development will be carried out as follows:

Output 1.1.1.: Institutional capacity building strengthened

CoET will be the centre for such institutional capacity building. This arrangement will reduce the infrastructure development and operating costs for such a centre. Existing staff of the CoET will be trained in the operation and management prior to the start of the strengthened centre. Capacities of various other institutions like Sokione University of Agriculture and other universities/institutions will be strengthened through CoET in order to have a wider outreach of capacity building activities. CoET can collect a nominal fee for the training to run the centre sustainably even after the project period.

Appropriate training materials for different recipients will be prepared. Available guidebooks and strategies on bio-ethanol production at large, medium and micro level will be customised to adapt to Tanzanian conditions. This will benefit the potential investors. Likewise, studies, reports and user manuals for bio-ethanol cook stove usage will be documented under the CoET. It will also establish a database for production units of bio-ethanol stove.

In addition, there is lack of information on other feedstock sources for bio-ethanol production. The centre would conduct appropriate research, data collection and establish an information database for all the potential feedstock for bio-ethanol production, its availability and location of availability, etc.

Output 1.1.2.: Key policy makers, regional officials (at least 100 cumulatively) and other target groups⁴⁹ (30 in each group) trained

Without appropriate supporting policy and regulatory environment, no technology development can take place. Therefore, it is essential to engage policy makers and region officials to develop capacity by providing customised training to at least 100 women and men during the project period.

Specific trainings aimed at sugar mills and other interested entrepreneurs (related to establishing ethanol production plants at medium and micro level) will also be conducted for at least 30 women and men personnel. Awareness raising materials will be prepared and used accordingly. Around 30 women and men personnel from the banks and financial institutions will be trained for assessing/conducting due diligence on the bio-ethanol production projects in sugar mills, cashew and other potential feedstock processing industries. Trainings to banks/financial institutions will be conducted as a priority to enhance their knowledge and build up their confidence in financing the projects.

Various target groups such as local engineering companies (at least 30 women and men), as well as male and female entrepreneurs interested in the retailing of bio-ethanol fuel and bio-ethanol cook stoves, will also receive trainings to facilitate sustainable operation of the demonstration and replication projects. Efforts will be taken to ensure that both

⁴⁹ Sugar mill owners, interested entrepreneurs on micro-distilleries, national experts, renewable energy (RE)/technical institutions, banks/financial institutions, engineering companies, NGOs/CSOs, etc.

women and men have equal opportunity to participate in and benefit from all capacity building activities. During the PPG phase, a gender-analysis will be conducted to define concrete targets of female participation and to identify a strategy to give equal opportunities to both women and men.

Project Component 2: Policy framework development for promoting bio-ethanol production and financial incentives

Tanzania lacks regulatory frameworks to monitor this new biofuel sector. An integrated policy framework is needed that takes into account agriculture, land use, water availability, transport and energy needs in order to guide the biofuel sector. Weak or absence of institutional and legal frameworks also significantly impede biofuel development in Tanzania⁵⁰. The current “Guidelines for Sustainable Liquid Biofuels Development in Tanzania” compiled by NBTF are inadequate to guide the development of ethanol biofuel for cooking sector in Tanzania. Under this component, a new national policy to promote bio-ethanol production and its usage in households for cooking will be established. During the PPG stage, a gap analysis will be conducted on policy aspects and the support required for the bio-ethanol fuel producers and bio-ethanol stove producers to setup their production centres.

Output 2.1.1.: National policy on bio-ethanol production and its use for cooking developed for the consideration of Government

The policy would include the setting of targets for bio-ethanol production, usage in households, charcoal and firewood replacement, industries eligibility criteria for participation, incentives and promotional measures (including any tax exemption for import of raw material for ethanol production), gender dimensions of bio-ethanol cooking, etc. The policy will also enable and engage private sector actors to build regional/national bio-ethanol cook stove production centres to reduce the cost of manufacturing, shipping, freight and tariffs. The policy regulations will aim to produce biofuel only from the underutilized feedstock such as molasses (from the existing sugar industries), cashew apple, sisal waste, coffee pulp and other seasonal fruit wastes such that it will not affect the food basket of the country. New energy crop cultivation is not envisaged under this project and the biofuel production will be supported to go hand in hand with the agricultural development.

This project component will also include the creation of financial incentives for investors taking part in the project. This would include instruments such as soft loans, incentives, capital subsidies, credit mechanism, loan guarantees, etc. implemented by UNIDO in collaboration with the MEM and a financial institution. Financial plans for end-users of bio-ethanol cook stove would be studied and the most appropriate one would be adopted, also considering the opportunities for women to access financial incentives. This would include microloans, top-up loans and fuel saving schemes, etc. The exact modalities of the financial plans and specific involvement of the financial institutions will be established during the PPG stage. These incentives would be used for demonstrations as well as the replication projects.

Output 2.1.2.: National standards for fuel grade bio-ethanol and ethanol cook stoves formulated

As of now, no technical standards exist in Tanzania for fuel grade bioethanol and bio-ethanol cook stoves. Hence, the project will, work with TBS and Ministry of Industry, Trade and Marketing (MITM), for creating these standards. A database would be established with CoET to determine which cook stoves meet the international standards set by the ISO for emissions and fuel efficiency and disseminate the information through labeling and/or consumer education. Similarly, TBS would be testing and certifying the ethanol fuel produced by the distilleries for stove usage. If required, such testing may be conducted at CoET labs also.

⁵⁰ <http://cf.tfcg.org/pubs/Biofuels%20in%20Tanzania%202011.pdf>

Project Component 3: Promoting production and market network for bio-ethanol fuel and ethanol cook stoves

Output 3.1.1.: Local manufacturing of ethanol cook stoves facilitated

The project aims to support the local manufacturing of bio-ethanol cook stoves and dissemination through retailing network. Locally fabricated bio-ethanol stoves can remove technology barriers significantly in terms of importation and related cost, and can boost the replication potential considerably.

Output 3.1.2.: Ethanol plants (large, medium and micro-distilleries) for a cumulative capacity of 120,000 litres per day (lpd) facilitated

Under this output, large scale distilleries (sugar cane mills), medium scale and micro distilleries (cashew apple, coffee pulp, sisal waste based, etc.) for a cumulative capacity of 120,000 lpd (with an annual production of around 20 million litres) will be developed in various regions in Tanzania.

Existing ethanol plants in sugar mills will be encouraged to increase the productivity of fuel grade ethanol. Other sugar mills, cashew and other potential feedstock processing plants will be encouraged to install new ethanol plants through grants and other incentives. It is expected to produce 100,000 lpd of ethanol at large or medium distilleries from sugar mills and cashew industries under this program. Mainly these industries will supply ethanol to meet the demand from the urban and peri-urban regions of Tanzania. Micro-distilleries (capacity less than 1000 lpd) will be developed in rural areas for the cumulative capacity of 20,000 lpd and they will use cashew apple, coffee pulp and other such seasonal feedstock available locally as their source of ethanol production. These distilleries will be screened using the “Guidelines for sustainable liquid biofuels Development in Tanzania” and “Biofuels Screening Toolkit”, prepared under UNEP, UNIDO, FAO/GEF global project, “Establishing Sustainable Liquid Biofuels Production Worldwide (A Targeted Research Project)”, to identify the potentially critical issues. The evaluations will be done for 3 sustainability indicators namely: a) Environmental; b) Economic; and c) Social.

The project will also cooperate with the Ministry of Agriculture and other related industries to improve the productivity of the sugar industry and install distilleries as value additions, which would sustain the sugar industry. Detailed feasibility studies will be prepared during the PPG stage and detailed technical designs will be prepared for the proposed demonstration projects, during the GEF project implementation period.

Output 3.1.3.: Ethanol cook stoves retailed (around 28,000 nos.)

After the establishment of the bio-ethanol cook stove market network, the project aims at retailing around 28,000 ethanol cook stoves in the urban, peri-urban and rural areas to replace charcoal, firewood and kerosene stoves. Kerosene consumption is high for cooking mainly at Dar es Salaam only. Hence, kerosene replacement is not considered at this point of time. However, during the project period, the actual condition, whether charcoal or kerosene replaced will be considered for CO₂ reduction estimation. A portion of the GEF grant (USD 252,000 cumulatively) will be used to provide incentive towards the production of ethanol cook stoves within the limits set by the principles of incremental cost.

The cost of ethanol and ethanol stoves will be determined after consideration of social acceptance of the target population through necessary studies and surveys. This factor would be considered on the design of the stove (for example, number of burners in the stove), development of retailing centres, etc. If required, a part of the GEF grant may be used to subsidize the bio-ethanol price, until such time, Government of Tanzania, comes with a comprehensive policy on the promotion of bio-ethanol for cooking. Such a requirement will be studied and elaborated during the PPG stage.

The project will also aim at leasing/renting the bioethanol cook stoves initially. The idea is to avoid burdening the users with the full cost of stove purchase, until a regular and affordable fuel supply is ensured. The modalities and procedures will be worked out during the PPG stage.

Output 3.1.4: Bio-ethanol fuel and ethanol cook stove retailing network designed and established

Technical assistance will be provided for detailed technical plant design of the demonstration of micro distillery projects, tender document preparation, tendering, equipment supplier selection, etc. Under this project, ethanol market network will be established by studying various models such as direct selling by ethanol producers with their retail outlets, hub-and-spoke retailing by medium and small entrepreneurs, retailing through the existing kerosene retail outlets, womens self help groups and other similar networks⁵¹, etc. The most appropriate model would be chosen for the establishment of ethanol retailing centres. Interested NGOs, co-operatives with existing network among rural regions will be encouraged in setting up bio-ethanol storage bulks and retail shops. Proper training and awareness in handling bio-ethanol during transportation, storage and supply will be provided to staff working in these supply networks.

The ethanol cook stove retailing network shall be established under the same ethanol fuel supply network so that consumers could buy both products at a single outlet. Local manufacturers of ethanol cook stoves will also be encouraged to establish their own marketing network through commercial shops. Possible tie-ups with financial institutions and co-operatives will be studied for credit options, easy monthly instalments, etc. Awareness on safety handling and use of ethanol will be created through posters at all retail outlets, pamphlets and mass media advertisement. Proper training in handling bio-ethanol fuel and ethanol cook stoves will be provided to the retailers and end users through manuals and in-hand training during the time of purchase.

Project Component 4: Monitoring & Evaluation (M&E)

Output 4.1.1.: Mid-term M&E report prepared (independent evaluation)

The project will be subjected to mid-term review and final evaluation. The independent mid-term evaluation will be carried out at the end of the 24th month of the GEF project and follow up corrective actions will be taken if needed.

Output 4.1.2.: End of project M&E report prepared (independent evaluation)

An independent final evaluation will be conducted three months prior to the terminal review meeting. The final evaluation will look at the impact and sustainability of results, including the contribution towards capacity development and the achievement of global environmental and social benefit goals. The final evaluation will also provide recommendations for follow-up activities. The project will involve continuous monitoring. However, monitoring expenses will be covered with co-financing budget. Both mid-term and final evaluations will be carried out by independent M&E experts. Any other interim evaluations will be conducted internally as per project requirements.

After completion of the technical component, the project performance monitoring will be conducted to study the technical, financial, environmental and socio-economic aspects of the demonstration projects (ethanol production plants) and retailing of bio-ethanol fuel and ethanol cook stoves. Full scale project demonstration site visit and seminars will be organized and the project experiences will be disseminated to various interested stake holders in order to increase the replication potential of the project. Various tools such as leaflets, website, etc. will be used for effective dissemination.

Methodologies/tools will be developed to use the collated information for better planning and decision making. Case studies will be prepared and presented to increase more investments in similar projects using the trained capacity that

⁵¹ For instance Power works with CARE's existing Village Saving and Loans Associations (VLSAs) that comprise of over onemillion members and Village Agents (VAs); Solar Sisters; Barefoot engineers, etc.

is created. An annual report and periodical newsletter on best practices, information on country level projects and key indicators of progress made under the project will be prepared and distributed to key stakeholders and agencies.

Incremental/Additional cost reasoning:

The project aims to replace the firewood and charcoal usage with bio-ethanol as alternative clean fuel for cooking. This project also envisages promoting micro distilleries for producing fuel grade bio-ethanol as a means of generating employment opportunities and expanding the use of clean cooking fuels to rural areas. Facilitation of investments in local fabrication of bio-ethanol cook stoves is an important activity under this project. All these activities carried out for the first time are incremental to the existing scenario of traditional cooking practices. The GEF funding will be used to meet the incremental cost of bio-ethanol production, cook stove manufacturing and use. The GEF provides a grant of around USD 1,793,708 which is approximately 24% of total incremental cost of around USD 10 million needed for bio-ethanol production and cook stove manufacturing.

Global environmental benefits

The project seeks to retail around 28,000 bio-ethanol cook stoves in urban, peri-urban and rural areas. For calculation purpose, it is assumed that these cook stoves will replace charcoal stoves. Annual charcoal usage of around 16.4 million kg⁵² can be avoided resulting in the reduction of 58,234 tCO₂ each year. Considering an operational life time of 10 years⁵³ for the ethanol cook stoves, this project would result in the reduction of 582,340 tCO₂ directly.

As a result of the project's intervention in the area of policy development, investment environment creation, awareness creation among the end-user, etc., it is expected that another 84,000 cook stoves will be produced and sold in other regions of Tanzania, 10 years after the completion of the GEF project. This would result in an total emission reduction of 2,329,571 tCO₂, throughout its lifetime using GEF's GHG emission calculation manual.

The total GEF resources of around USD 2.46 million will be used to mitigate CO₂ emission at the rate of USD 4.2/t CO₂ directly and around USD 1.7/t CO₂ indirectly. These initial estimates will be refined during the PPG phase.

Innovativeness, Sustainability and Potential for Scaling up

This project is innovative in the following aspects:

- a) Fuel grade ethanol production concept is new to Tanzania;
- b) Local fabrication of ethanol stoves; and
- c) Usage of bio-ethanol for household cooking in urban, peri-urban and rural settings.

The proposed project has the potential to revolutionize the cooking energy sector through introduction of clean and sustainable clean fuel creating tremendous value for the women and children in terms of lifestyle, health, indoor pollution and employment.

Sustainability is ensured through following market mechanisms:

- a) Strengthened CoET to sustain the human and institutional capacity on bio ethanol production, cook stove fabrication and usage;
- b) Soft loan or incentives to micro-distilleries investors and cook stove fabricators;

⁵² Based on the assumption that each household consumes an average of 584 kg of Charcoal every year. Calorific value of ethanol is 21.1 MJ/kg and that of Charcoal 31.8 MJ/kg. Efficiency of bio-ethanol stove is around 43% and that of Charcoal stove is around 35%. *Based on this it is estimated that 1 litre of bio-ethanol will replace 0.8 kg of Charcoal.* Charcoal emission factor: 112,000 kg of CO₂ per TJ on net calorific value basis

⁵³ http://sites.duke.edu/adhoc_httpssitesdukeedubioethanolpro/our-product/clean-stove/
<https://cleancookstoves.org/binary-data/RESOURCE/file/000/000/231-1.pdf>

- c) Partnership with global stove manufacturers to promote local fabrication of cook stoves;
- d) Local manufacturing of fuel grade bio ethanol, through partnership with sugar manufacturers and small entrepreneurs to run micro distilleries.
- e) Streamline policies to support ethanol as a cooking fuel.
- f) Gender mainstreaming of the intervention during the whole project cycle.

During the last decade, UNIDO has been implementing RE projects in Tanzania for productive uses. Recently it started implementing the GEF-4 project “Mini-Grids Based on Small Hydropower Sources to Augment Rural Electrification” and GEF-5 Project "Promotion of waste-to-energy (WTE) applications in agro-industries of Tanzania". In addition, UNIDO is currently implementing a GEF 4 ethanol project in Thailand titled “Overcoming Policy, Market and Technological Barriers to Support Technological Innovation and South-South Technology Transfer: The Pilot Case of Ethanol Production from Cassava”. UNIDO’s experiences from such project activities can be used here as and when required to run the project sustainably

Market transformation: The proposed project envisages a significant market transformation from biomass-based cooking to bio-ethanol based cooking. The project will also focus on rural markets through installation of micro-distilleries for bio-ethanol production. This will also lead to associated positive impacts on agriculture markets as well through added value to its by-products and wastes. Energy efficient and quality bio-ethanol cook stoves will be introduced to Tanzania markets for the first time through this project.

Scaling up: Successful demonstration of the ethanol production technology in large, medium and micro scale level would result in the replication of the project activities in Tanzania. Installation of micro-distilleries can be scaled up through replication projects to serve the energy needs of rural households across the country. This will boost the confidence of entrepreneurs, private sectors, NGOs, women self-help groups, etc. to start businesses in the bio-ethanol sector. Necessary capacity building will be provided for them through Project Component 1.1. Banks, equipped with adequate training from this project, shall provide finance for interested private sectors for scaling up of ethanol production and cook-stove production. Improved government policy framework under project component 2.1 will also support and encourage these scaling up of the projects.

Besides, through East African Community Secretariat and UNIDO established EAC Centre for RE and EE (EACREEE), scale up this intervention to 5 member states in EAC is possible and it can create huge impacts.

2. *Stakeholders.* Will project design include the participation of relevant stakeholders from [civil society](#) and [indigenous people](#)? (yes /no) If yes, identify key stakeholders and briefly describe how they will be engaged in project design/preparation.

MEM is the main executing partner and will take the lead role as the project steering committee chair and, is responsible for implementing the proposed programme, the delivery of the planned outputs and the achievement of the expected outcomes. MITM will have a lead role in establishing the local fabrication units of bio-ethanol cook stoves, licensing them and providing necessary supports. It will also be responsible for coordinating with interested entrepreneurs/ethanol producers/sugar mills, cashew processing industries for fuel grade bio-ethanol production.

Selected Universities will receive necessary training on bioethanol technology and CoET will be converted into a strengthened training and information dissemination centre. CoET is already working with various international organisations in energy efficiency and climate change sectors. The initiatives involve biofuel cluster in Dar-Es-Salaam, sisal cluster in Tanga, etc. The sisal cluster is preparing to produce biofuel from sisal by-products. The biofuel cluster initiative in Dar-Es-Salaam is in the developmental stage. The Chemical and Process Engineering (CPE) discipline in CoET has carried out research and development works in ethanol distillery design, ethanol production from sisal waste, etc. TBS and CoET will be mainly responsible for the establishment of standards for bio-ethanol cook stoves and bio-ethanol fuel.

The private sector such as sugar mills, cashew processing industries and other entrepreneurs, who develops large, medium and micro-distilleries will work with the project to receive technical supports to install ethanol production units and retailing centres. It is expected that Bagamoyo EcoEnergy Ltd. (BEE), the ethanol manufacturing unit of Agro EcoEnergy (T) Ltd., will become one of the key partners for the project from the private sector. They also have a corporate social responsibility program which includes the provision of housing for their staff and sugar cane out-growers. This makes them a very good candidate for the in-house introduction of ethanol fuel cook stoves. There are other sugar mills and cashew processing industries showing great potential, however, all such possibilities would be investigated during the PPG stage. Similarly, Zanzibar Sugar Factory has shown interest in the project which may help them in expanding their market through the ethanol cooking fuel supply.

Other RE/technical institutions and financing institutions will be recipients of training on bio-ethanol production and ethanol cook stove production. This would encourage them to support the development of similar initiatives even after the end of the project.

It is expected that employment opportunities will be created in the following sectors as a result of this project:

- a) Bio-ethanol production units (labours, engineers, plant managers);
- b) Transportation of produced bio-ethanol to the distribution centres;
- c) Operation of the ethanol distribution centres;
- d) Manufacturing of bio-ethanol cook stoves;
- e) Transportation of bio-ethanol cook stoves to the retailing centres; and
- f) Operation of the bio-ethanol cook stove retailing centres

The overall success of the project lies in the outreach of technologies to the end users. Hence, the project will encourage and support all types of promotional activities to involve the end users. The end user's engagement will involve the participation in the awareness creation programme, capacity development programme, purchase of ethanol cook stoves, feedback on study/surveys to be conducted, etc.

Due to the strong gender dimensions of technologies related to cooking, stakeholders will also include local and international associations and agencies promoting gender equality and women's empowerment, in particular those focusing on energy needs and entrepreneurship as well as CSOs.

The proposed project will boost up selected agriculture sector, as farmers will get additional revenues from their by-products/wastes. Indigenous people who depend on relevant agriculture sector will benefit from the additional revenues through the project. This will also create local employment in rural communities and restrict their migrations. They may also benefit from improved lifestyle by the use of ethanol cook stoves. The benefits for the indigenous people depend on the relevant sector to which they are associated. However, there will not be any negative impacts on the indigenous peoples as the project does not involve any land conversions, crop replacement, etc.

3. *Gender Considerations.* Are [gender considerations](#) taken into account? (yes /no).

UNIDO recognizes that gender equality and the empowerment of women have a significant positive impact on sustained economic growth and inclusive industrial development, which are key drivers of poverty alleviation and social progress. Commitment of UNIDO towards gender equality and women's empowerment is demonstrated in its policy on Gender Equality and the Empowerment of Women (2015), which provides overall guidelines for establishing a gender mainstreaming strategy, UNIDO has also developed an operational energy-gender guide to support gender mainstreaming of its sustainable energy initiatives.

UNIDO recognizes that energy interventions are expected to have an impact on people and are, therefore, not gender-neutral⁵⁴. In fact, due to diverging needs and rights regarding energy consumption and production, women

⁵⁴ ENERGIA "Turning Information into Empowerment: Strengthening Gender and Energy Networking in Africa. Leusden, 2008; Joy Clancy "Later Developers: Gender Mainstreaming in the Energy Sector", 2009

and men are expected to be affected differently by the project (in terms of their rights, needs, roles, opportunities, etc.). The project aims to demonstrate good practices in mainstreaming gender aspects into promoting bio-ethanol as an alternative cooking fuel in Tanzania, wherever possible and avoid negative impacts on women or men due to their gender, ethnicity, social status or age. Consequently, it will be considered to include the gender dimension during the whole project cycle. To mainstream gender into the project, currently an in-depth gender analysis is in development and will be available during PPG phase to identify entry points for defining gender aware project outcomes, outputs as well as activities.

Around 3.8 million households (mainly women) cook on open fires in an enclosed space and nearly 1 million additional households are exposed to carbon monoxide from traditional charcoal stoves. Use of wood based traditional cook stoves are also associated with health hazards caused by poor combustion systems resulting in excessive carbon monoxide emissions and indoor air pollution (IAP). IAP is estimated to cause 65.74 deaths per 1,000 live births and 18,900 deaths every year in the country directly impacting the health of more than 10.6 million women, men and children using traditional cook stoves and another 1.9 million urban people using charcoal stoves. Exposure is particularly high among women and young children, who spend the most time near the domestic hearth⁵⁵; but also affects around 265,000 cooks and kitchen helpers working in the food/restaurant sector⁵⁶.

During the project development (PPG) phase, continued discussions will be held with the UNIDO energy-gender expert to ensure that the relevant gender dimensions are considered, and the project log-frame will be developed to reflect key gender dimensions of the respective outputs, activities, indicators and targets.

Guiding principle of the project will be to ensure that both women and men are provided equal opportunities to access participate in and benefit from the project, without compromising the technical quality of the project results. In practical terms,

- Gender-sensitive recruitment will be practiced at all levels where possible, especially in selection of project staff. Gender responsive TORs will be used to mainstream gender in the activities of consultants and experts. In cases where the project does not have direct influence, gender-sensitive recruitment will be encouraged. Furthermore, whenever possible existing staff will be trained and their awareness raised regarding gender issues.
- All decision-making processes will consider gender dimensions. At project management level, Project Steering Committee meetings will invite observers to ensure that gender dimensions are represented. Also, at the level of project activity implementation, effort will be made to consult with stakeholders focusing on gender equality and women's empowerment issues. This is especially relevant in policy review and formulation.
- To the extent possible, efforts will be made to promote participation of women in training activities, both at managerial and technical levels.

When data-collection or assessments are conducted as part of project implementation, gender dimensions will be considered. This can include sex-disaggregated data collection, performing gender analysis as part of ESIA's, etc.

4 Risks.

Component	Risk	Proposed Mitigation Measure	Risk Level
Technical risk	Bio-ethanol production in sugar mills and cashew processing industries is not common in Tanzania	<ul style="list-style-type: none"> • Bio-ethanol production from sugar mills and cashew processing industries is a proven technology all over the world, especially, in countries like Brazil, India, South Africa, etc. • In Zanzibar Sugar mill, ethanol production has been practiced for a very long time. Hence, there is adequate experience in bio-ethanol production. 	Low

⁵⁵ World Health Organisation, Household air pollution and health, March 2014, <http://www.who.int/mediacentre/factsheets/fs292/en/>

⁵⁶ Global Alliance for Clean Cookstoves, Tanzania Market Assessment, March 2012. GVEP International

Component	Risk	Proposed Mitigation Measure	Risk Level
		<ul style="list-style-type: none"> Fuel grade ethanol production is just an extension of the existing ethanol production to fit into fuel grade one. Proven technology supplier will be selected. This would mitigate the perceived risk. 	
	Bio-ethanol cook stoves is a new technology and may not yield the desired results	<ul style="list-style-type: none"> Improved cook stove market is already available in Tanzania through various initiatives/programmes by international organizations and civil society organizations (CSOs). Introduction of bio-ethanol cook stoves is an extension of these activities. This project aims to build up on those programmes in retailing the bio-ethanol cook stoves. 	Low
Financial risks	General perception that investments in bio-ethanol production plant yield low returns. Hence, the investors are not willing to invest	<ul style="list-style-type: none"> Detailed techno-economic feasibility studies will be carried out to establish the financial viability of the demonstration projects. UNIDO and other executing partners will mobilize investors and enterprises to invest in the demonstration projects. Moreover, financial incentives are provided to attract investments in bio-ethanol production. Letter of financial commitment from the cofinanciers will be obtained before start of the project 	Low
Sustainability risk	Failure to achieve the expected project outcome	<ul style="list-style-type: none"> The installations will be done only after conducting a proper resource assessment study and market study Local engineering and O&M companies will be trained in O&M of bio-ethanol production plants. Also, the O&M staff of the demonstration projects will be trained by the respective suppliers. 	Moderate
	Households lack interest in buying ethanol cook stoves	<ul style="list-style-type: none"> By making end users (i.e. in particular women) fully aware of the potential for ethanol cook stove and equipping them with the capacity and tools to realize and reap the benefits of such potential, the project will produce a supportive environment that will lead to achieving the expected project outcome. To address this risk, the proposed project follows a holistic approach of imparting knowledge, providing incentives and market driven approach. 	Low
Climate change risk	Flood at the project sites caused by climate change	The demonstration plant buildings and site offices will be located on an elevated area to prevent flooding. All buildings and structures will be designed and built appropriately to avoid destruction by floods.	Low
	Scarcity of sugar cane	The molasses generated in the sugar factories will be utilized for the ethanol production	
Social and gender risk	<p>Risk of resistance against, or lack of interest in, the project activities from stakeholders, especially with regard to the active promotion of gender equality.</p> <p>Low participation rates of suitable female candidates due to lack of interest, inadequate project activity or missing qualified female population within</p>	This Project will pursue thorough and gender responsive communication and ensure stakeholder involvement at all levels, with special regard to involving women and men, as well as CSOs and NGOs promoting GEEW, and a gender expert. This shall mitigate social and gender related risks, promote gender equality, create a culture of mutual acceptance, and maximize the potential contribution of the project to improving gender equality in the energy field.	Low

Component	Risk	Proposed Mitigation Measure	Risk Level
	engineering sector.		

5. Coordination.

The proposed project will supplement the efforts of the GEF and other national projects to achieve the global GHG emission reduction. The proposed project will facilitate the wide adoption of the ethanol as an alternative cooking fuel to reduce the indoor air pollution (IAP) and also the charcoal and firewood usage.

GEF initiatives

Currently, Tanzania has 11 approved GEF projects under implementation within the climate change focal area. Out of those, four projects have been completed, four are under implementation and three are under CEO approval stage. So far, no project has focused on sustainable clean cooking in Tanzania. However, the proposed project will take necessary experiences and achievements from the other GEF projects to ensure the attainment of all objectives.

Other initiatives

The project would seek synergy and derive useful reference from other organizations and NGOs/CSOs promoting clean cook stove initiatives such as: a) Tanzania Domestic Biogas Programme (SNV/CAMARTEC), b) Developing Energy Enterprises Project DEEP (GVEP), c) Up-scaling access to Integrated Modern Energy Services for Poverty Reduction (HIVOS/TaTEDO) d) Tanzania Energy Development and Access Project (World Bank, GEF).

Poverty reduction through productive activities is a priority for UNIDO and therefore, UNIDO's substantive branches such as Agro Business Development Branch, Business, Investment and Technology Services Branch, etc., will be actively involved in developing economic activities to the beneficiary communities.

The proposed project will seek close coordination with all the above initiatives and other concerned stakeholders to ensure that relevant lessons and experiences learned are incorporated into the project. More in-depth consultation will be carried out during the PPG phase to identify possible collaborative activities.

6. Consistency with National Priorities. Is the project consistent with the National strategies and plans or reports and assessments under relevant conventions? (yes /no). If yes, which ones and how: NAPAs, NAPs, ASGM NAPs, MIAs, NBSAPs, NCs, TNAs, NCSAs, NIPs, PRSPs, NPFE, BURs, etc.

The proposed project will support the following government policies and strategies targeted to increase the percentage of renewable energy (RE) in the overall energy mix, and reduction of charcoal and unsustainable firewood usage in the country:

- *National Environmental Policy (1997)*: It advocated the use of environmentally sound technologies that protect the environment and cause less pollution; as well as the use of resources in a sustainable manner and the handling of residue waste in a more acceptable manner than the technologies for which they are substituted.

With respect to energy, the policy objectives include: a) Minimization of wood fuel consumption through the development of alternative energy sources and wood fuel energy efficiency; b) Promotion of sustainable renewable resources; c) Assessment and control of development and use of energy; and d) energy efficiency and conservation.

- *Initial National Communication to United Nations Framework Convention on Climate Change (UNFCCC) (2003)*: This identified the land use change in forestry, energy and agricultural sectors as the main sources of human induced GHG emissions in Tanzania. The mitigation measures towards GHG emissions in energy sector are as follows:

- Use of efficient devices in households, commercial and industrial sectors; and
- Development of RE sources and use of clean technologies in electricity production

In the household sector, some of the suggested mitigation options include: a) Improving the efficiency of electrical appliances; b) Increasing the efficiency of biomass cook stoves; and c) Switching to better fuel, e.g. like switching from wood fuel to charcoal, kerosene, liquefied petroleum gas (LPG), electricity, etc.

- *National Energy Policy of Tanzania (2003)*: It aimed at establishing an efficient energy production, procurement, transportation, distribution and end-use systems in an environmentally sound and sustainable manner. Specific to the household sector, the national energy policy stress the following: a) Encouraging efficient end-use technologies and good household practices; b) Encouraging energy efficient buildings and wider application of alternative sources of energy for cooking, heating, cooling, lighting and other applications; and c) Ensuring safe utilization of household energy appliances through regulation of safety standards.
- *National Strategy for Growth and Poverty Reduction (NSGPR 1 of 2005 and NSGPR 2 of 2010)*: These insisted on developing and promoting the utilization of indigenous energy resources as well as the diversification of energy sources.
- *National Adaptation Programme of Action (NAPA) (2006)*: The NAPA report identified the following activities in energy sector: a) Exploring and investing in alternative clean energy sources; b) Developing community based mini-hydropower; c) Improving biomass to energy conversion efficiency (improved charcoal production technology, improved charcoal and wood stoves, use of biomass waste briquettes, biomass waste gasification, promote fuel crop); d) Increasing use of geo-thermal power generation; e) Harnessing the proven coal resources; f) Promoting the application of cogeneration in the industry sector; and g) Enhancing natural gas utilization.
- *National Portfolio Formulation Exercise (NPFE) (2011)*: The NPFE report places the prime focus on three sectors - namely, Climate change, biodiversity conservation and sustainable land management. One of the national priorities under Climate change focal area is to promote low-carbon technologies. Another national priority under sustainable land management focal area is to generate alternative income generating activities for the farmers. The proposed project will bring in clean and energy efficient bio-ethanol fuels to replace charcoal and fire woods. The proposed project will use underutilized agro feedstock such as molasses (from the existing sugar industries), cashew apple, sisal waste and other seasonal fruit/agro wastes for bio-ethanol generation. This will boost up the agriculture sector, as they will get additional revenues from their by-products/wastes.

The proposed GEF project puts forth ethanol cook stove as a viable option which is efficient and less polluting than biomass cook stoves, wood, charcoal and kerosene and is therefore in line with all above national strategies and plans.

7. Knowledge Management.

A database will be developed by CoET to manage the guidebooks, training materials and strategies on bio-ethanol production (large, medium and micro scale distilleries) and ethanol cook stoves manufacturing; whenever possible sex-disaggregated data. This will benefit users such as, the Non-Government Organizations (NGOs)/Civil Service Organizations (CSOs), community group, individual firm, government agencies, industries, etc., who are interested in production, transportation and marketing of bio-ethanol fuel and ethanol cook stoves. Apart from guidebooks and manuals, exclusive website will be created with user friendly interface. The website will serve as a database for bio-ethanol production and will link with other global initiatives as well as relevant projects. Besides, through East African Community Secretariat and UNIDO's regional centres for RE and EE such as ECREEE, EACREEE and SADCREEE will act as knowledge hubs for knowledge sharing and exchange.

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


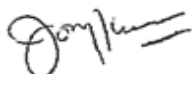
A. RECORD OF ENDORSEMENT⁵⁷ OF GEF OPERATIONAL FOCAL POINT (S) ON BEHALF OF THE GOVERNMENT(S):

(Please attach the [Operational Focal Point endorsement letter\(s\)](#) with this template. For SGP, use this [SGP OFP endorsement letter](#)).

NAME	POSITION	MINISTRY	DATE (MM/dd/yyyy)
Dr. Julius Ningu	GEF Operational Focal Point	Vice President's Office	20 April 2015

B. GEF AGENCY(IES) CERTIFICATION

This request has been prepared in accordance with GEF policies⁵⁸ and procedures and meets the GEF criteria for project identification and preparation under GEF-6.

Agency Coordinator, Agency name	Signature	Date (MM/dd/yyyy)	Project Contact Person	Telephone	Email
Mr. Philippe R. Scholtès, Managing Director, Programme Development and Technical Cooperation Division - PTC, UNIDO GEF Focal Point		08/14/2015	Mr. Jossy Thomas, Project Manager, PTC/ECC/RRE	+43 -1- 26026-3727	j.thomas@unido.org 

C. ADDITIONAL GEF PROJECT AGENCY CERTIFICATION (APPLICABLE ONLY TO NEWLY ACCREDITED GEF PROJECT AGENCIES)

For newly accredited GEF Project Agencies, please download and fill up the required [GEF Project Agency Certification of Ceiling Information Template](#) to be attached as an annex to the PIF.

⁵⁷ For regional and/or global projects in which participating countries are identified, OFP endorsement letters from these countries are required even though there may not be a STAR allocation associated with the project.

⁵⁸ GEF policies encompass all managed trust funds, namely: GEFTF, LDCF, and SCCF