



GLOBAL ENVIRONMENT FACILITY
INVESTING IN OUR PLANET

Naoko Ishii
CEO and Chairperson

September 18, 2017

Dear Council Member:

UNIDO as the Implementing Agency for the project entitled: *Tanzania: Promotion of Ethanol as Alternative Clean Fuel for Cooking in the United Republic of Tanzania*, has submitted the attached proposed project document for CEO endorsement prior to final approval of the project document in accordance with UNIDO procedures.

The Secretariat has reviewed the project document. It is consistent with the proposal approved by Council in October 2015 and the proposed project remains consistent with the Instrument and GEF policies and procedures. The attached explanation prepared by UNIDO satisfactorily details how Council's comments and those of the STAP have been addressed. I am, therefore, endorsing the project document.

We have today posted the proposed project document on the GEF website at www.TheGEF.org. If you do not have access to the Web, you may request the local field office of UNDP or the World Bank to download the document for you. Alternatively, you may request a copy of the document from the Secretariat. If you make such a request, please confirm for us your current mailing address.

Sincerely,



c/o Naoko Ishii
Chief Executive Officer and Chairperson

Attachment: GEFSEC Project Review Document
Copy to: Country Operational Focal Point, GEF Agencies, STAP, Trustee



GEF-6 REQUEST FOR PROJECT ENDORSEMENT/APPROVAL

PROJECT TYPE: Full-sized Project

TYPE OF TRUST FUND: GEF Trust Fund

For more information about GEF, visit TheGEF.org

PART I: PROJECT INFORMATION

Project Title: Promotion of 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. Vice President's Office – Division of Environment (VPO-DoE) 2. TIB Development Bank (TIB) 3. Sokoine University of Agriculture (SUA)	Submission Date: Resubmission Date	04/10/2017 08/31/2017
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	NA	Agency Fee (\$)	233,422

A. FOCAL AREA STRATEGY FRAMEWORK AND OTHER PROGRAM STRATEGIES²

Focal Area Objectives/Programs	Focal Area Outcomes	Trust Fund	(in \$)	
			GEF Project Financing	Co-financing
CCM-1 Program 1	Promote Innovation, Technology Transfer and Supportive Policies and Strategies	GEFTF	2,457,078	23,040,000
Total project costs			2,457,078	23,040,000

B. PROJECT DESCRIPTION SUMMARY

Project Objective: To promote ethanol as an alternative clean cooking fuel in Tanzania						
Project Components/ Programs	Financing Type ³	Project Outcomes	Project Outputs	Trust Fund	(in \$)	
					GEF Project Financing	Confirmed Co-financing
1. Capacity development	TA	1.1 Improved capacity for market development of fuel grade ethanol production and usage	1.1.1. Capacity developed on implementation of large scale roll out program 1.1.2. Technical capacity established on local ethanol stove manufacturing 1.1.3. Technology transfer achieved for ethanol production through micro distilleries	GEFTF	198,000	300,000

¹Project ID number remains the same as the assigned PIF number.

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

³Financing type can be either investment or technical assistance.

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2. Policy framework development for promoting ethanol based cooking	TA	2.1. Conducive policy and regulatory environment in place	<p>2.1.1. National safety & quality standards formulated for fuel grade ethanol and ethanol cook stoves</p> <p>2.1.2. Compliance testing facilities strengthened</p> <p>2.1.3. Ethanol supply scheduling system developed</p> <p>2.1.4. Maximum retail price regulation designed for fuel grade ethanol</p>	GEFTF	150,074	400,000
3. Roll out of ethanol based clean cook stove program	TA	3.1. Design of market intervention and strategy for implementation in Dar es Salaam	<p>3.1.1. Incentive scheme designed for ethanol cook stove retailing</p> <p>3.1.2. Technical specifications, bidding documents, etc. prepared and participating distributors and stove suppliers selected</p>	GEFTF	112,000	100,000
	Inv	3.2. Large scale rollout of 500,000 ethanol cook stoves and market for 90 million litres/year of ethanol fuel supply created	<p>3.2.1. Establishment of ethanol fuel/cook stove supply chain network facilitated contractually to cover 500,000 households</p> <p>3.2.2. Supply of 500,000 ethanol cook stoves established contractually</p> <p>3.2.3. Local investments stimulated in ethanol distilleries (micro/medium/large scale) through market demand of 90 million litres per year</p>	GEFTF	1,800,000	21,516,400
4. Monitoring and evaluation (M&E)	TA	4.1. Effectiveness of the outputs assessed, corrective actions taken and experience documented	<p>4.1.1. Mid-term M&E report prepared</p> <p>4.1.2. End of project M&E report prepared</p>	GEFTF	80,000	90,000

	Subtotal		2,340,074	22,406,400
	Project Management Cost (PMC) ⁴	GEFTF	117,004	633,600
	Total project costs		2,457,078	23,040,000

C. CONFIRMED SOURCES OF CO-FINANCING FOR THE PROJECT BY NAME AND BY TYPE

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

Sources of Co-financing	Name of Co-financier	Type of Co-financing	Amount (\$)
Recipient Government	Vice President's Office – Division of Environment (VPO-DoE)	Grants	3,500,000
CSO	Tanzania Traditional Energy and Environment Organization (TaTEDO)	Grants	8,500,000
Private Sector	Consumer's Choice Ltd.	Equity	4,500,000
Private Sector	ZOE Enterprise Lda.	Equity	6,400,000
GEF Agency	UNIDO	Grants	60,000
GEF Agency	UNIDO	In-kind	80,000
Total Co-financing			23,040,000

D. TRUST FUND RESOURCES REQUESTED BY AGENCY(IES), COUNTRY(IES) AND THE PROGRAMMING OF FUNDS

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

a) Refer to the Fee Policy for GEF Partner Agencies

E. PROJECT'S TARGET CONTRIBUTIONS TO GLOBAL ENVIRONMENTAL BENEFITS⁵

Provide the expected project targets as appropriate.

Corporate Results	Replenishment Targets	Project Targets
1. Maintain globally significant biodiversity and the ecosystem goods and services that it provides to society	Improved management of landscapes and seascapes covering 300 million hectares	<i>hectares</i>
2. Sustainable land management in production systems (agriculture, rangelands, and forest landscapes)	120 million 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-food-ecosystems security and conjunctive management of surface and groundwater in at least 10 freshwater basins;	<i>Number of freshwater basins</i>
	20% of globally over-exploited fisheries (by volume) moved to more sustainable levels	<i>Percent of fisheries, by volume</i>

⁴For 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.

⁵Update the applicable indicators provided at PIF stage. 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.

Corporate Results	Replenishment Targets	Project Targets
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)	26,519,674 metric tons (direct –8,839,891 tons; indirect –17,679,782 tons)
5. Increase in phase-out, disposal and reduction of releases of POPs, ODS, mercury and other chemicals of global concern	Disposal of 80,000 tons of POPs (PCB, obsolete pesticides)	metric tons
	Reduction of 1000 tons of Mercury	metric tons
	Phase-out of 303.44 tons of ODP (HCFC)	ODP tons
6. Enhance capacity of countries to implement MEAs (multilateral environmental agreements) and mainstream into national 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	Number of Countries:
	Functional environmental information systems are established to support decision-making in at least 10 countries	Number of Countries:

F. DOES THE PROJECT INCLUDE A “NON-GRANT” INSTRUMENT? No

(If non-grant instruments are used, provide an indicative calendar of expected reflows to your Agency and to the GEF/LDCF/SCCF Trust Fund) in Annex D.

PART II: PROJECT JUSTIFICATION

A. DESCRIBE ANY CHANGES IN ALIGNMENT WITH THE PROJECT DESIGN WITH THE ORIGINAL PIF⁶

The overall project GEF fund of USD 2,457,078 remains the same. Only re-allocation of GEF funding is done in the CEO document based on the revisions made in the components. The co-financing amount has been increased from USD 10,450,500 to USD 23,040,000. The following changes were made in the project framework based on the revision to large scale roll out strategy (see Annex F). The following are the major changes carried out in the CEO Endorsement document from the approved PIF.

No.	Statement in PIF	Revisions in CEO Endorsement document
1	28,000 cook stoves to be retailed.	500,000 cook stoves to be introduced with a large scale roll out strategy lead by private sector. The key difference was that the new approach would target conversion of at least 500,000 charcoal-using households, as opposed to a target of 28,000 households over a period of five years. This represented a more significant step in towards the longer term targets of being able to reach at least a minimum of 5 million charcoal-using households.
2	120,000 litres per day (lpd) local ethanol production to be facilitated.	Supply of fuel grade ethanol to households will be the responsibility of supply chain distributors. They are expected to source fuel grade ethanol either from local distilleries or globally. The market demand for ethanol fuel with 500,000 cook stoves will be 90 million litres per year. The ethanol production capacity needed for this supply volume will be around 450,000 lpd. As start-up initiative, minimum of 75,000 litres per day of local ethanol production is envisaged through investment of around 21 million USD in micro/medium/large distilleries.
3	Component PC 1 focus was capacity building on ethanol fuel and cook stove technology.	Component PC 1 focus is revised to capacity building on (a) Large scale roll out program implementation, (b) Ethanol fuel production and supply, (c) Ethanol cook stove technology and local manufacturing.
4	Component PC 2 was to prepare draft policy paper for Government consideration and to create standards for ethanol fuel and cook stove.	Component PC 2 is revised as: <ul style="list-style-type: none"> - create standards for ethanol fuel and cook stove - establish compliance testing facilities - develop ethanol supply and scheduling system - design regulation for maximum retail price of ethanol.
5	Component PC 3 was “Promoting production and market network for ethanol fuel and ethanol cook stoves”	Component PC 3 is revised to “Rollout of ethanol based clean cook stove program”.

⁶For questions A.1 –A.7 in Part II, if there are no changes since PIF, no need to respond, please enter “NA” after the respective question.
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No.	Statement in PIF	Revisions in CEO Endorsement document
6	COET will establish the centre for bio ethanol technology.	SUA will establish the centre for ethanol based cooking technology.
7	Focus region was urban, peri-urban and rural regions of Tanzania.	Focus region is Dar es Salaam alone. This is based on the inputs from “Tanzania Bio ethanol Cooking Programme - Programme Design & GEF Proposal Inputs Report” ⁷ . The target market for ethanol cook stoves is the middle income households who currently use charcoal for cooking. Thus, Dar es Salaam is chosen as the focus region for the proposed project where 91% of all households consume charcoal.
8	The overall emission reduction from the project was 582,340 tCO ₂ directly and 2,329,571 tCO ₂ indirectly	The overall emission reduction from the project is estimated to be 8,839,891 tCO ₂ directly and 17,679,782 tCO ₂ indirectly.

A.1. *Project Description*. Elaborate on: 1) the global environmental and/or adaptation problems, root causes and barriers that need to be addressed; 2) the baseline scenario or any associated baseline projects, 3) the proposed alternative scenario, GEF focal area⁸ strategies, with a brief description of expected outcomes and components of the project, 4) [incremental/additional cost reasoning](#) and expected contributions from the baseline, the GEFTF, LDCF, SCCF, and [co-financing](#); 5) [global environmental benefits](#) (GEFTF) and/or [adaptation benefits](#) (LDCF/SCCF); and 6) innovativeness, sustainability and potential for scaling up.

Global Environmental Problems, Root Causes and Barriers

Global patterns in population growth, urbanization and historical fuel use suggest that the number of people relying on solid fuels for cooking and heating will continue to persist at a level of over 3 billion by 2020. Increasing firewood and charcoal consumption in Sub-Saharan Africa is counterbalancing the decline in solid fuel use in Asia and Latin America. Charcoal costs have tripled over the past decade in Africa and are steadily increasing in Asian markets as well. These trends have led to the increasing demand for fuel-saving stoves globally. In some regions, this has led to the adoption of cleaner, modern and renewable fuels instead of charcoal, coal and kerosene⁹.

According to the International Energy Agency (IEA), Tanzania consumed around 23.59 million tons of oil equivalent (Mtoe) in 2013¹⁰. The energy import expenses were about USD 4.55 billion per annum which is 35% of the total country imports and almost all of them being petroleum products¹¹. The total primary energy supply mix of country is shown in figure 1.

More than 80% of the Tanzanians depend on biomass as their major energy source for household cooking and heating requirements with inefficient conversion devices. As a result, biomass represents the major share¹² in the overall energy mix of the country. 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

⁷This is provided as Annex J to this CEO document.

⁸ For biodiversity projects, in addition to explaining the project’s consistency with the biodiversity focal area strategy, objectives and programs, please also describe which [Aichi Target\(s\)](#) the project will directly contribute to achieving.

⁹<https://openknowledge.worldbank.org/bitstream/handle/10986/21878/96499.pdf>

¹⁰<http://www.iea.org/statistics/statisticssearch/report/?&country=TANZANIA&product=Indicators>

¹¹http://atlas.media.mit.edu/en/visualize/tree_map/hs92/import/tza/all/show/2013/

¹² A Review of Biomass Energy Dependency in Tanzania, 9th Eco-Energy and Materials Science and Engineering Symposium, 2011 GEF6 CEO Endorsement /Approval Template-August2016

biomass fuels clearly stand out as the most important. Low income households particularly use fuel wood and charcoal. Although there are distinct regional preferences, more than 70% of urban dwellers use charcoal and around 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 surroundings¹³.

Charcoal is generally unsustainably harvested from dry woodlands within a catchment area that extends up to 200 kilometres from urban energy markets. Fuel wood for charcoal production is collected mostly free of charge. The collection of fuel wood in rural areas is the responsibility of women and children. 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 opportunities¹⁴. Charcoal produced in the rural areas is then transported to urban centres by dealers/transporters where it is then retailed to end users through vendors¹⁵.

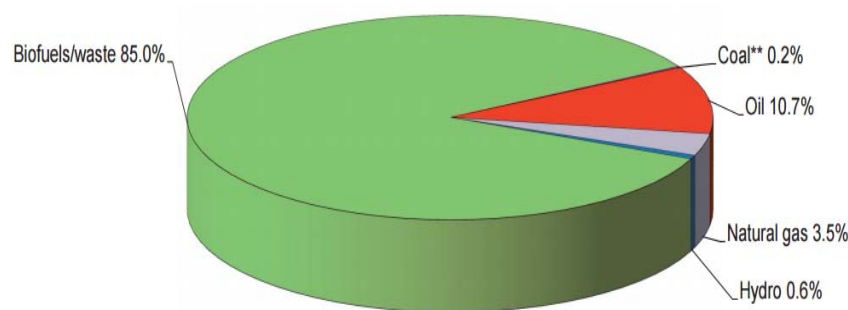


Figure 1: Energy mix in Tanzania, 2013¹⁶

According to the World Bank (Peter and Sander 2009), the price in Dar es Salaam for a 40-50 kg bag of charcoal rose from USD 3.50 to USD 13.30 between 2003 and 2007. Another report (Energy and Environment Partnership 2013) shows charcoal prices increasing from USD 0.09 to USD 0.82 per kg from 2003-2012, an average annual increase of 99%. These figures indicate a 33%-90% annual increase in price of charcoal¹⁷. This increasing trend in fuel price also impacts the economic development of low income families who cannot opt for alternate cooking solutions without appropriate interventions for switch over.

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 the deforestation is due to fuel wood demand- directly or indirectly¹⁸. In total, between 1990 and 2010, Tanzania lost 19.4% of its forest cover or around 8,067,000 hectares¹⁹ 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 watersheds²⁰. Scientists have linked the loss of snow cap on Mount Kilimanjaro to deforestation on the mountain's foothills²¹.

¹³ Global Alliance for Clean Cook stoves, Tanzania Market Assessment, March 2012. GVEP International

¹⁴ World Energy Outlook 2006 - Focus On Key Topics, IEA

¹⁵ <https://openknowledge.worldbank.org/bitstream/handle/10986/2865/551400ESW0P1201PE1Charcoal1TZ1FINAL.pdf?sequence=1>

¹⁶ <http://www.iea.org/stats/WebGraphs/TANZANIA4.pdf>

¹⁷ http://www.academicjournals.org/article/article1435403105_Lotter%20et%20al.pdf

¹⁸ Global Alliance for Clean Cook stoves, Tanzania Market Assessment, March 2012. GVEP International

¹⁹ World Bank, 2009

²⁰ Van Beukering et al, 2010

²¹ Mongabay.com, UNEP, World Bank, FAO

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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 2013, CO₂ emissions were 0.2 tons per capita²². With a population of 47.8 million²³, 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 by 7-fold and the GHG emissions are expected to double by 2030 as compared to that of the 2005 baseline²⁴. 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.

In 2015, 193 countries of the UN General Assembly adopted the *2030 Development Agenda titled "Transforming our world: the 2030 Agenda for Sustainable Development"*. Goal 7 of the agenda is "*Affordable and Clean Energy - Ensure access to affordable, reliable, sustainable and modern energy for all*". Tanzania has also adopted the development goals and is working towards the targets.

The prevailing poverty level and over-dependence on biomass based fuels are the root causes of several identified environmental problems. Deforestation due to biomass consumption poses a severe threat to biodiversity. Lack of alternative energy technologies and absence of best practices on alternate clean fuels can accelerate environmental degradation.

In a global market, the potential consumer for improved and clean cooking solutions is diverse, with variable ability and willingness to pay and a range of preferences across fuel types, cook stove sizes, features based on household characteristics such as income, family size, urban or rural status, cultural practices, stove end-use (e.g., space heating or water heating) and fuel procurement approaches. Across all the consumer segments, expanding access to clean cooking requires continued innovation in design and manufacturing to lower the stove costs, consumer financing and new payment models that can minimize or even eliminate the upfront product costs²⁵.

As per Global Alliance for Clean Cook stoves report (2015), the most important barriers to the acceptance of clean cooking solutions globally are affordability of clean cooking fuels and high-quality cook stoves, low consumer willingness to pay for the incremental benefits of clean cooking solutions and limited accessibility of quality, high-performing products to the end users. Other important challenges include i) behaviour-change barriers that contribute to the persistence of baseline cooking technologies, ii) the limited business-management capacity and the financial constraints of small and medium enterprises(SMEs) active across clean and improved cooking value chains, iii) the still limited product testing capacity to enforce emerging quality standards and minimize market spoilage, insufficient investment into research and development (R&D) and iv) low sustainability in biomass fuel supply markets, and a range of regulatory constraints (i.e., taxes and poorly targeted subsidies) to foster sector development.

In most of developing countries, improved cook stove production remains a non-standardized and fragmented activity. Consumers rarely have access to information on quality, performance or safety. The absence of common stove performance protocols and standards are one of the main constraints to quality control and regulation in this informal market²⁶. The absence of high-quality cook stove testing centres is another constraint. Technical capacity to manage the centres is limited and stove-testing costs are frequently prohibitive for the small industrial manufacturers and artisans that currently produce the majority of improved stoves²⁷.

²²<https://www.iea.org/statistics/statisticssearch/report/?country=Tanzania&product=indicators>

²³ 2012 data. <http://data.worldbank.org/indicator/SP.POP.TOTL>

²⁴ UKAID, "Economics of Climate Change in the United Republic of Tanzania", UK Development Partner Group

²⁵<https://openknowledge.worldbank.org/bitstream/handle/10986/21878/96499.pdf>

²⁶<http://www.emergingmarkets.asia/consulting/news/2016/02/21/myanmar-cookstoves-market-assessment-geres/>

²⁷<https://openknowledge.worldbank.org/bitstream/handle/10986/21878/96499.pdf>

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In summary, the key barriers to the adoption of clean cooking practice using alternate clean fuels such as ethanol in Tanzania are: (a) Inadequate awareness about benefits of clean cooking stoves among end users, (b) No standards and facilities available to check and ensure the quality of cook stoves, and fuel (c) High cost of clean cook stoves which end users cannot afford, (d) Lack of technical capacity on cook stove manufacture and ethanol fuel production, (e) Lack of private sector/industry confidence to invest in the ethanol based clean cooking sector, and (f) Absence of market enabling framework to develop a clean cooking sector. The proposed project intends to address the above barriers in adopting ethanol as an alternative clean cooking fuel in the country. Mitigation potential of the proposed project is listed under the “GEF alternative scenario and project”.

Baseline scenario

Global/Regional situation

Improved cook stoves have been promoted in Sub-Saharan Africa (SSA) since the early 1980’s in an attempt to improve the efficiency of fuel wood usage and thereby reduce the quantity of usage. The overall penetration of clean cook stoves and fuels in SSA is still low, with estimates suggesting that only 10% of African households have transitioned to the use of clean cooking energy such as LPG, biogas and ethanol for most cooking needs²⁸.

During the last 10 years, Project Gaia Inc. (PGI) has been working in Ethiopia to improve household access to clean energy by making use of molasses, a by-product of large, state-owned sugar factories to produce ethanol. PGI promotes ethanol for cooking and has piloted the ethanol fuelled “Clean Cook” stove in diverse settings ranging from refugee camps to middle income households in Addis Ababa. Approximately 8,000 stoves are currently in use in Ethiopia (nearly 7,000 in refugee camps near the Jijiga area and an additional 1,000 in Addis Ababa). In July 2015, PGI and partners commissioned the first micro-scale ethanol plant in Addis Ababa. This distillery has the capacity to produce 1,000 litres of ethanol per day, supplying fuel to a low-income neighbourhood in Addis Ababa²⁹. The micro distillery is owned and operated by the Former Women Fuel wood Carriers Association (FWFCA), a local women’s cooperative. Once selling fuel wood as a source of income, the FWFCA women are now critical agents in the ethanol value chain and sell the fuel from their distillery to fellow FWFCA members and the surrounding community³⁰.

In Mozambique, NDZiLO, a private sector company, has worked on the promotion of ethanol fuel production and its use for cooking in the country. Based in Dondo in Mozambique, the ethanol production facility of NDZiLO produces 2 million litres of fuel per year from surplus cassava supplied to the company by local farmers. Since 2012, NDZiLO has distributed over 30,000 ethanol cook stoves to families around Mozambique.³¹ In Kenya, SAFI International is promoting ethanol fuel and stoves in Kibera slum region in Nairobi. The company launched the Kibera ethanol cooker project in 2013 and since then, more than 800 homes are now using the ethanol cook stoves and more than 10,000 litres of ethanol fuel has been sold.³²

National situation

Initiatives have already been taken by the Government of Tanzania, 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 a 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. In March 2016, the Vice President’s Office has released a report on “Effective management of environment and climate change”. The report includes proposed plans on “Promoting alternative energy sources to reduce charcoal consumption in Tanzania” as one of its five target sectors. The

²⁸<http://2015.newclimateeconomy.report/wp-content/uploads/2015/10/NCE-SEI-2015-Transforming-household-energy-sub-Saharan-Africa.pdf>

²⁹<http://2015.newclimateeconomy.report/wp-content/uploads/2015/10/NCE-SEI-2015-Transforming-household-energy-sub-Saharan-Africa.pdf>

³⁰<https://projectgaia.com/projects/ethiopia/>

³¹<https://projectgaia.com/projects/mozambique/>

³²<http://www.kenyacic.org/?q=content/ethanol-transforming-lives-nairobi%E2%80%99s-kibera-slums-1>
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report also estimates to bring in investment for around USD 20 million during a period of next five years to achieve its objectives in this sector.

Although often not the primary objective, many cook stove programs aimed to reduce indoor air pollution (IAP) through their activities. Below are some of the ongoing programs that focus on IAP in Tanzania. a) Tanzania Domestic Biogas Programme implemented by Stichting Nederlandse Vrijwilligers (SNV)/Centre for Agricultural Mechanisation and Rural Technology (CAMARTEC); b) Developing Energy Enterprises Project (DEEP) implemented by Global Village Energy Partnership (GVEP); c) Up-scaling access to Integrated Modern Energy Services for Poverty Reduction, implemented by Humanist Institute for Cooperation (HIVOS)/The Tanzania Traditional Energy Development Organization (TaTEDO); d) Tanzania Energy Development and Access Project (TEDAP) implemented by the World Bank and the GEF; and e) Tanzania Improved Cook Stove (TICS) programme being implemented by Energising Development Programme (EnDev)³³. 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); c) Smoke, Health and Household Energy in Tanzania implemented by the Department for International Development, UK (DFID); d) Program for Biomass Energy Conservation (ProBEC) implemented by German Federal Enterprise for International Cooperation (GTZ)/DGIS/Ministry of Energy and Mines (MEM)³⁴; and e) Air Quality Monitoring Capacity Building Project (AQMCBP) implemented by US Environmental Protection Authority (USEPA) and United Nations Environment Programme (UNEP).

Inferences and lessons learnt from these programmes include the following³⁵:

- a) Most of the consumers are not willing to pay a higher price for quality improved stoves when less efficient traditional stoves are available at cheaper price.
- b) Wood stoves have been promoted by several NGO's but have failed commercially.
- c) Innovation has occurred in the improved cook stove sector, however commercialization has mostly failed.
- d) Imported wood stoves have also been introduced into the market but the number of retailers is limited since it is a resource/investment intensive activity.

Most of the above improved cook stoves projects were targeting efficient use of charcoal and wood based fuels only. In order to reduce deforestation rates, it is essential to introduce alternative cooking fuels that are not forest resource based, and are non-polluting, less GHG emitting and affordable for the Tanzanian population at the same time. A promising alternative option is the introduction of ethanol based cooking systems. So far, there have been no notable efforts in the area of ethanol production or its use in the cooking sector in Tanzania.

Cooking practices in Tanzania

According to World Bank indicators data (2014) for Tanzania, 70% of the population lives in rural areas and 30% in urban areas³⁶. Table 1 provides a brief overview of energy consumption in a typical Tanzanian urban household.

Table 1: Share of different fuels in urban household cooking energy consumption (2012)³⁷

No.	Primary cooking & heating energy	Percentage of population (%)	Number of households (millions)	Population (millions)
1	Charcoal	71	1.97	8.29

³³<http://endev.info/content/Tanzania>

³⁴ GTZ – German Technical Cooperation

³⁵ Global Alliance for Clean Cook stoves, Tanzania Market Assessment, March 2012. GVEP International

³⁶<http://data.worldbank.org/indicator/EN.URB.LCTY.UR.ZS>

³⁷ 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).

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No.	Primary cooking & heating energy	Percentage of population (%)	Number of households (millions)	Population (millions)
2	Firewood	20	0.56	2.34
3	Paraffin, Kerosene	7	0.19	0.82
4	Electricity	1	0.03	0.12
5	Biogas	0.4	0.01	0.05
6	Other	0.4	0.01	0.05
7	Crop Residues	0.1	0	0.01
8	LPG	0.1	0	0.01
	Total	100	2.77	11.69

Household energy demand

Table 1 depicts that charcoal is the major cooking fuel in urban areas. 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 on 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.

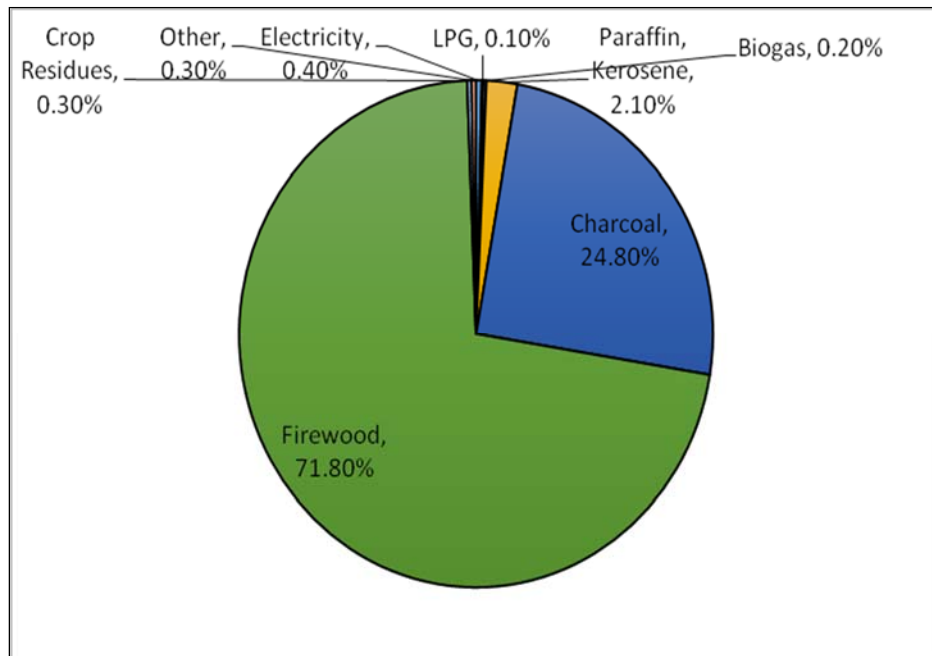


Figure 2: Share of primary cooking energy in Tanzania

Household energy demand in Dar es Salaam

In Dar es Salaam, 91% of all households consume charcoal (2012 data) for cooking, heating and other household energy requirements. In other urban areas, 59.1% of households consume charcoal (Tables 2). Approximately half of Tanzania’s annual consumption of charcoal takes place in Dar es Salaam amounting to approximately 500,000 tons³⁸.

Table 2: Household charcoal consumption in Dar es Salaam, other urban and rural regions

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	24.7	11,119,679

In terms of fuel used for cooking purposes alone, charcoal is the primary fuel in 73.5% of households in Dar es Salaam, followed by electricity, kerosene and fuel wood. Biogas, coal and other biomass residue are also used by a smaller percentage of households. The cooking energy mix of Dar es Salaam is given in figure 3.

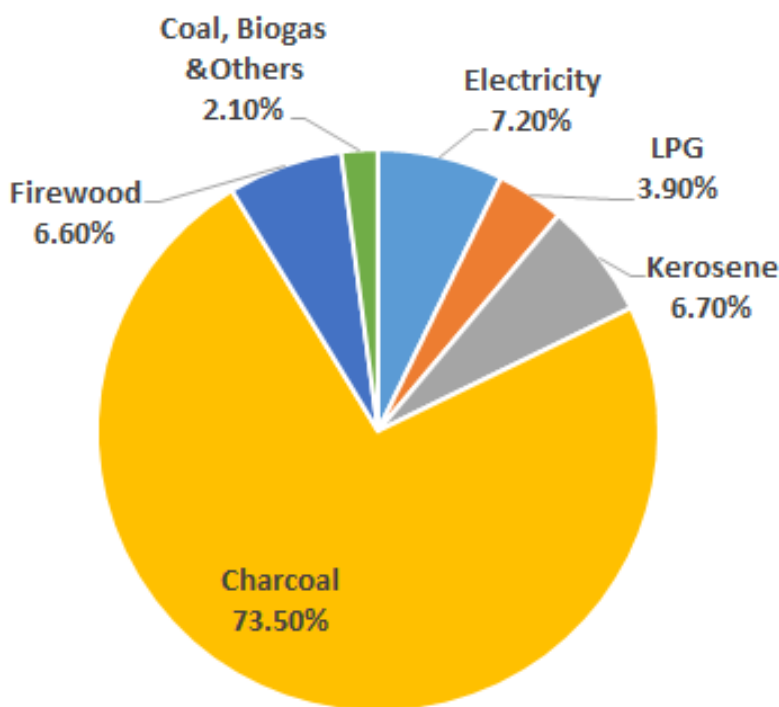


Figure 3: Cooking energy mix in Dar es Salaam³⁹

In 2009, World Bank released a policy note about the charcoal sector in Tanzania, which revealed that a 1% increase in urbanization leads to a 14% increase in charcoal consumption⁴⁰. Table 3 summarizes the average fuel consumption for different cooking fuels in Tanzanian household.

³⁸World Bank Transforming the Charcoal Sector in Tanzania

³⁹Basic Demographic and Socio-Economic Profile Report 2012

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Table 3: Tanzania cooking cost scenario (traditional cooking method)⁴¹

Fuel	Purchase unit	Usage	Cost of purchase	Fuel use per day	USD per year ⁴²
Firewood	3 pieces	1 day	500 TZS (USD 0.31)	3 pieces	114
Charcoal	40 kg sack	25 days	30,000 TZS (USD 19)	1.6 kg/day	273
LPG	13 kg cylinder	30 days	56,000 TZS (USD 35)	0.44 kg/day	422
Kerosene	1 litre	2 days	2,500 TZS (USD 1.6)	0.5 litre/day	283

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

Naliendele Agricultural Research Institute (NARI)⁴³, one of seven agricultural research zonal centres in Tanzania under the Ministry of Agriculture and Food Security, has carried out various research works on ethanol production from agro by-products in Mtwara region. Both cassava and cashew apple are available in large quantities in Mtwara and there is already interest in processing cassava and cashew apple for both starch and ethanol. Also, UN Women and United Nations Development Programme (UNDP) have already expressed interest in participating in this proposed project as a joint effort under the United Nations Development Assistance Plan (UNDAP) framework.

Private sector situation

Sugar industry and ethanol production

In Tanzania, liquid bio-fuels (ethanol and bio-diesel) potential remains relatively unexploited. 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 Table 4.

Table 4: Average annual sugar and potential ethanol production in Tanzanian sugar mills

No.	Sugar mill	Annual average sugar production (tonnes) ⁴⁴	Annual average molasses produced (tonnes) ⁴⁵	Estimated annual average ethanol production potential ('000 litres) ⁴⁶
1	KSC	120,556	40,185	8,841
2	TPC	85,480	28,493	6,268

⁴⁰http://www-wds.worldbank.org/external/default/WDSContentServer/WDSP/IB/2009/09/01/000334955_20090901084035/Rendered/PDF/502070WP0Polic1B_Ox0342042B01PUBLIC1.pdf

⁴¹http://www.cleancookstoves.org/resources_files/tanzania-market-assessment-mapping.pdf

⁴²Estimated from source data of USD per week

⁴³<http://kilimo.go.tz/naliendele/>

⁴⁴ Average annual production from five years 2009-14. <http://www.sbt.go.tz/index.php/production-data>

⁴⁵Based 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.huletts.co.za/car/sm_process.asp

⁴⁶One ton of molasses can be converted into 220 litres of ethanol. <http://www.kenyasugar.co.ke/downloads/KSI%20Strategic%20plan.pdf>

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No.	Sugar mill	Annual average sugar production (tonnes) ⁴⁴	Annual average molasses produced (tonnes) ⁴⁵	Estimated annual average ethanol production potential ('000 litres) ⁴⁶
3	MSE	36,177	12,059	2,653
4	KSL	39,932	13,311	2,928
5	ZSF ⁴⁷	24,000	8,000	1,760
	Total	5	102,048	22,450

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. KSC produces ethanol and sells it to the distilleries for beverage production. TPC produces an ethanol intermediate from molasses and sells it to distilleries for further processing to produce ethanol. The remaining factories sell their molasses as additives for animal feedstock or surface treatment for rural roads. Considering the 200 cane crushing days per year, ethanol production potential from the above mentioned mills comes to around 22 million litres per year. As per baseline study done by Project Gaia, the overall ethanol production potential based on sugarcane production data in the country is estimated to be around 124 million litres per year⁴⁸.

In March 2014, it was reported that Agro EcoEnergy (T) Ltd. planned to invest USD 550 million in sugarcane farming for an ethanol project⁴⁹. The project is estimated to produce 130,000 tons of sugar and 10 million litres of ethanol over three years. Zanzibar Island has a distillery in ZSF. The distillery has a capacity of 6,000 litres per day (lpd) and will be increased to 10,000 lpd after rehabilitation by the end of 2016. As of now (before rehabilitation), the ethanol produced by the factory is sold to industries in Tanzanian mainland including local pharmaceutical, chemical and perfume industries. In the absence of any fuel market for cooking, the factory will continue to target these sectors.

Apart from molasses, cashew juice can also be used as potential source for ethanol production. Tanzania is one of the top cashew nut exporting countries and the annual cashew apple generation in the county is around 1,000,000 tons per year⁵⁰. There are about 40 small, medium and large-scale factories processing cashew nuts⁵¹. 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. Ethanol generation potential of cashew industries is estimated to be 80 million litres per annum⁵², even if 50% of the total cashew apple production could be utilized. Various other feed stocks such as sisal waste⁵³, coffee pulp⁵⁴, seasonal fruits, etc., are also a potential source for ethanol production. They shall be treated in micro-distilleries for ethanol production. Sisal is a major crop in Tanzania and there are pilot initiatives going on to produce ethanol from sisal wastes⁵⁵. All these potentials remain untapped.

Baseline project

⁴⁷Rehabilitation and trial operations going on. Expected to start full scale operations from November 2015.

⁴⁸ Baseline Report of Clean Cooking Fuels in the East African Community, Project Gaia, 2015

⁴⁹http://www.biofuels-news.com/industry_news.php?item_id=7758#sthash.dzdnFHXT.UxPCreFB.dpuf

⁵⁰ http://www.3adi.org/tl_files/3ADIDocuments/Country%20information/Tanzania/Cashew%20Value%20Chain%20Diagnostics.pdf

⁵¹ Investment opportunities in cashew nut industry in Tanzania, Cashew nut Board of Tanzania

⁵²160 litres of ethanol can be produced from 1 ton of cashew apple

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

⁵³<http://www.ajol.info/index.php/dai/article/view/15621>

⁵⁴https://www.researchgate.net/publication/26238122_Feasibility_of_ethanol_production_from_coffee_husks

⁵⁵<http://www.bioline.org.br/request?cs10025>

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Global/regional initiatives:

The Global Alliance for Clean Cook stoves is a public-private partnership hosted by the UN Foundation to save lives, improve livelihoods, empower women and protect the environment by creating a thriving global market for clean and efficient household cooking solutions. To allow for maximum impact in the field and strengthen the market for clean cook stoves and fuels, the Alliance has prioritized eight countries for deeper in-country engagement – Bangladesh, China, Ghana, Guatemala, India, Kenya, Nigeria, and Uganda. These focus countries form the foundation for the Alliance’s efforts to promote a thriving market for clean cook stoves and fuels, and serve as a learning lab for best-practices and toolkits that are shared with our other implementing partner countries⁵⁶.

The World Bank launched the Africa Clean Cooking Energy Solutions (ACCES) initiative in 2011. ACCES aims to promote enterprise based, large-scale dissemination and adoption of clean cooking solutions in Sub-Saharan Africa (SSA). By increasing the access to modern technologies and cleaner fuels, the initiative seeks to alleviate the adverse health, environment, and socio-economic impacts of traditional cooking practices in SSA⁵⁷.

Tanzania is one of the first countries in Africa to adopt the SE4ALL initiative, regarding it as an implementation tool for the emerging Sustainable Development Goal on Energy. It is also part of its energy sector mid-term planning component. The Tanzania SE4ALL initiative has been officially launched in July 2016 by the United Nations Development Programme (UNDP), in collaboration with the Government of Tanzania through MEM. One important target of this initiative is to increase the percentage of population with access to modern cooking solutions in the country by more than 75% in 2030. The modern cooking solutions proposed include biogas, LPG, ethanol and natural gas. One of the main objectives under this initiative is to ensure the quality of alternative cooking solutions and go for standardization of all types of cook stoves and fuels.⁵⁸

National initiatives:

Several national level initiatives have been taken in clean cooking sector in Tanzania. Some of the significant programs are: a) Tanzania Domestic Biogas Programme implemented by SNV/CAMARTEC⁵⁹; b) DEEP implemented by GVEP⁶⁰; c) Up-scaling access to Integrated Modern Energy Services for Poverty Reduction, implemented by HIVOS/TaTEDO; d) TEDAP implemented by the World Bank and the GEF; and e) TICS programme implemented by EnDev. SUA also has already carried out various research and development works in ethanol production from agro wastes, ethanol production from sisal waste, etc.⁶¹

A preliminary feasibility study was conducted by Tanzania Petroleum Development Corporation (TPDC) to install pipelines from Lindi and Mtwara region to Dar es Salaam for supplying natural gas for cooking purpose to 30,000 households. But the investment requirement for laying the natural gas pipeline network to Dar es Salaam works out to be very high⁶².

Draft Biomass Energy Strategy (BEST) for Tanzania, has the overall goal of making biomass energy sustainable in Tanzania. Its main objectives are to: improve the sustainability of the supply of biomass energy, increase production efficiency and use of biomass energy, promote alternative sources of energy wherever appropriate and affordable; and ensure an enabling institutional environment for its implementation. Few of the proposed actions under the program include (i) Promote the use and commercialisation of agricultural waste (e.g., coffee husks, sisal residues, etc.) and

⁵⁶<http://cleancookstoves.org/>

⁵⁷http://siteresources.worldbank.org/EXTAFRREGTOPENERGY/Resources/WorldBank_ACCES_AFREA_AFTEG_ESMAP_FIN_AL.pdf

⁵⁸<http://www.tz.undp.org/content/tanzania/en/home/presscenter/articles/2016/07/11/launch-of-the-sustainable-energy-for-all-se4all-initiative-in-tanzania-.html>

⁵⁹SNV– Stichting Nederlandse Vrijwilligers; CAMARTEC - Centre for Agricultural Mechanisation and Rural Technology

⁶⁰ GVEP - Global Village Energy Partnership

⁶¹http://www.ruforum.org/sites/default/files/22x_Noble%20Banadda.pdf; <http://www.bioline.org.br/request?cs10025>

⁶² Design and supervision of construction work for natural gas network in Dar es Salaam, construction of vehicle refuelling station and connection of houses to the natural gas supply network, May 2014.

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technologies to use those wastes and (ii) Commercially mainstream biomass alternatives with the objective of reducing the demand for charcoal and commercial fuel wood⁶³.

Private sector initiatives

Since 2014 SAFI International has taken initiatives in developing ethanol market in Tabata, Sinza and Mbagala units of Tanzania. The company currently markets both ethanol fuel and cook stoves through its 15-30 kiosks in those regions. It also has plans to expand its ethanol/cook stove supply market both in Tanzania mainland and also in Zanzibar.

Another NGO, SmartCook has taken initiatives to develop a market on ethanol based cooking. NDZiLO, the Mozambique Company is interested in establishing an ethanol stove factory in Tanzania. It may import ethanol fuel from its facility in Mozambique to supply its customers in Tanzania.

The proposed project will take into consideration all the above global, regional, national and private sector initiatives for successful co-operation in implementation of this proposed project.

UNIDO pilot study

UNIDO completed a pilot study during 2014-15 to test acceptance and benefits of ethanol as a domestic cooking fuel in Zanzibar where it distributed ethanol cook stoves to around 144 households and supplied ethanol from a local sugar factory 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 ethanol cook stoves were distributed to the families upon deposit of TZS 15,000 (USD 7.5). Families purchased fuel for TZS 1,600 (USD 0.8) per litre throughout the study period. 95% of participating families confirmed that ethanol fuel and the stoves were preferable to other fuels and stoves. 73% of families used the stove every day during the study period. Families also reported saving about 2.1 hours each day on cooking and fuel wood collection on average by switching to ethanol. The average particulate matter concentration in the kitchens tested was greatly reduced from 575.4 to 109 $\mu\text{g}/\text{m}^3$, which was a very significant improvement in household indoor air quality. The CO concentration in households dropped to 3.5 mg/m^3 during use of ethanol stove, significantly below the World Health Organization (WHO) 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 ethanol fuel. The scaling up of this pilot study can open up potential business opportunities for women in communities in the local small-scale production of fuel grade ethanol, marketing and retailing of fuel ethanol and ethanol cook stoves.

The Project Steering Committee of the pilot study, consisting of government officials from various ministries of Zanzibar Government, 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 was recommended. The project is continuing the supply of fuel to the participating families and is working with local partners to develop a sustainability model for clean cooking fuel and stoves business.

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

⁶³ Tanzania SE4ALL Action Agenda, December 2015
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Based on the success of the pilot study on Zanzibar Island, the Government of Tanzania requested assistance from UNIDO in developing a large scale project. Accordingly, UNIDO organised a focus group meeting to forge a strategic partnership between all relevant stakeholders (Government, ethanol producers, cook stove manufacturers, distributors in the private sector, investors and the beneficiaries) for developing an ethanol based clean cooking market. The focus group meeting recommended that retailing of large scale cook stoves would be possible based on the available resources in the country and effective design of market strategy. It also suggested to work on options to reduce the cost of cook stoves and keep the price of ethanol to be competitive with kerosene. Formulation of quality standards for ethanol fuel and cook stoves was discussed as an important aspect. Stakeholders also pointed out the need for awareness campaigns to educate people on health impacts and cost savings of using ethanol fuel and cook stoves. Based on the discussions and recommendations, the meeting concluded to implement a large scale roll out program in Dar es Salaam first and then gradually scale up in other regions of the country. The focus group meeting summary report is provided in Annex G. A validation workshop was conducted following the focus group meeting to create a better understanding amongst key partners and stakeholders on project goals, roles and responsibilities of the various actors. The workshop finalised the strategy/business model for creating maximum impact through the intervention (including the target of 500,000 households). The validation workshop report is provided in Annex H.

The proposed GEF project intends to scale up the ethanol clean cooking market based on the lessons learnt and experience gained from the above mentioned baseline activities. The proposed project will deploy a Market Enabling Framework (MEF) to develop an alternate clean cooking market based on ethanol fuel in the country. The MEF will introduce enabling and supporting measures to create a radical shift for the transition of 500,000 urban households from predominantly practising charcoal based cooking to ethanol based cooking within five years. The enabling and supporting measures will involve allocation of exclusive supply regions, subsidies, regulation of maximum retail price of ethanol, etc. Once the targeted market of 500,000 households is established, the market will then revert to free healthy competition and many of the market enabling measures including subsidies and exclusive supply territories will be no longer necessary.

GEF alternative scenario and the project

Under the business-as-usual scenario, there is no motivation for the end users to switch to clean and safe cooking practices in the near future. They will tend to use the biomass based cooking fuels only as they are cheaper and readily available. In addition, potential ethanol producers and ethanol cook stove manufactures are not interested in capital investment and product production as there is no market for the ethanol at present in the country.

Given the technical and financial constrains in switching to ethanol based clean cooking technologies, the Government of Tanzania alone cannot bring in the market switch. The role of private sector is very crucial in achieving this market switch. However, without any market enabling and support measures, the private sector will not be ready to make substantial investments in the ethanol based clean cooking sector. Without GEF intervention, the initiatives taken in the clean cooking sector by the Government and private sector would be inadequate. No holistic, country wide efforts to improve the sector would take place.

The project

The main objective of the proposed project is to stimulate the market to bring in more investments towards energy efficient ethanol cooking systems and ethanol production. The proposed GEF intervention will address the key barriers in switching to ethanol based clean cooking practices. The MEF will facilitate and encourage the private sector to make required investments in cook stove manufacture, development of market networks and production of fuel grade ethanol. Through this 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 will primarily focus in Dar es Salaam and will tend to replace the use of charcoal for cooking. In due course, it can be gradually spread to other urban and rural areas during project replication.

The proposed project envisages a large scale roll out target of 500,000 households adopting ethanol cook stoves during a period of five years. This target will be achieved through implementation of a market enabling framework developed

through a consultative process. Request for proposal will be invited from potential stove suppliers and supply chain distributors for participation under this project. Local cook stove manufacturing and ethanol production will be strongly encouraged. Maximum utilization of available feedstock for local ethanol production will be facilitated. Remaining demand for ethanol fuel will be supplied through import.

The market enabling framework developed will include all the stakeholders such as ethanol cook stove manufacturers/suppliers, ethanol fuel producers/suppliers, supply chain distributors, financial institutions such as TIB, EADB, TBS, VPO-DoE and EWURA. The roles, responsibilities and targets of each stakeholder will be clearly defined. TIB will finance the ethanol cook stove manufacturers/suppliers, ethanol fuel producers/suppliers and supply chain distributors to invest in the ethanol based cooking sector. TBS will develop the standards for ethanol fuel and ethanol cook stoves and will provide testing and quality certification for the same. Supply chain distributors will be responsible for developing market network in specific target regions. They may source fuel ethanol from fuel ethanol producers/suppliers. They may source ethanol cook stoves from the cook stove manufacturers/suppliers. EWURA will have control on the maximum retail price of ethanol fuel sold to the end users. An incentive scheme is also proposed to support the purchase price of ethanol cook stove by the end users and the scheme will be managed by TIB. VPO-DoE will be the overall co-ordinator and implementing agency for the proposed project. Figure4 shows the schematic of the project implementation arrangement.

To support the stakeholders to achieve the project targets, a large scale roll out approach is considered. As per this roll-out strategy, contract agreements will be signed with the selected number of supply chain distributors with a target to switch a fixed number of households from charcoal based cooking to ethanol based cooking. Similarly, contract agreements will be signed with selected ethanol cook stove manufacturers/suppliers to supply fixed number of ethanol cook stoves during the project. The schematic of the enabling framework is provided in figure 5.

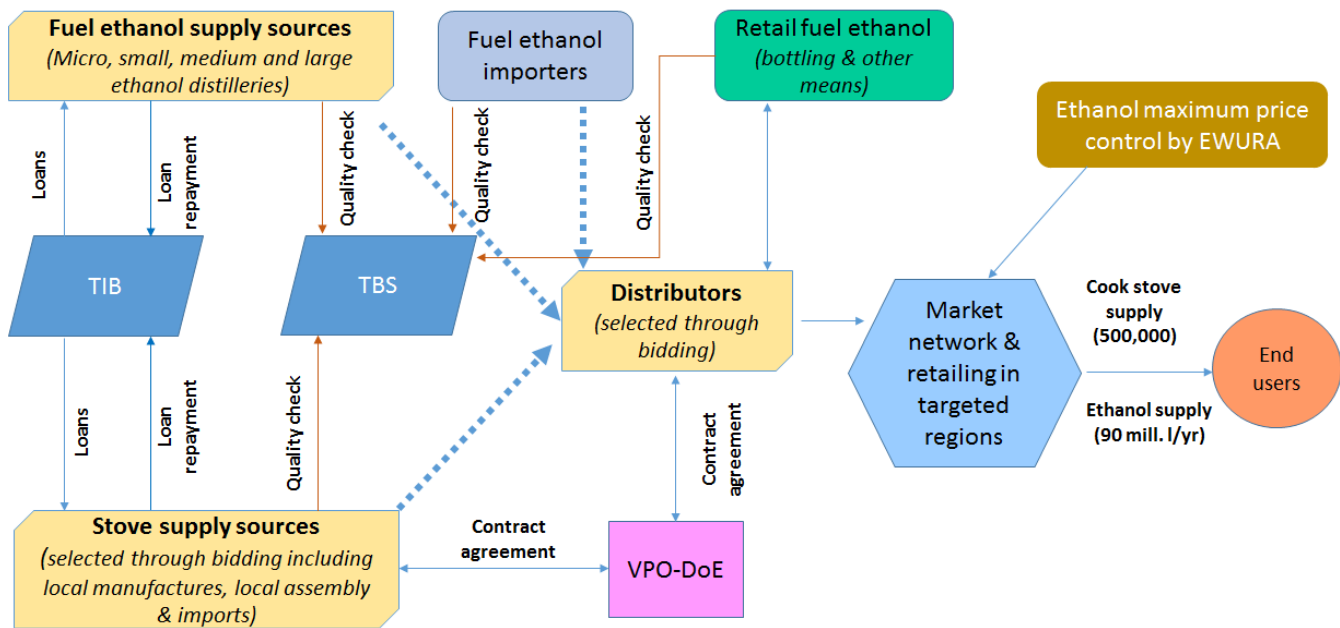


Figure 4: Schematic of the project implementation arrangement

The project consists of three substantive project components and a monitoring and evaluation component. The outcome, output and activities under each of the components are described below:

Project Component 1: Capacity development

This component will focus on removing the barriers related to capacity building and lack of technical knowledge on ethanol based cooking technologies.

Outcome 1.1. Improved capacity for market development of fuel grade ethanol production and usage

Impact of the intervention

From the outcome of this project component, it is expected that the following barriers are removed:

Barriers/Challenges	How it is addressed
Inadequate knowledge, technology and skill available for implementing large scale roll out programs	Creation of centre for capacity building activities and trainings provided to: <ul style="list-style-type: none"> • Key policy makers • Government ministries • Interested private sectors/entrepreneurs • Banks/financial institutions • RE/technical institutions • Local engineering companies
Lack of local technical capacity on ethanol cook stove manufacture	<ul style="list-style-type: none"> • Training to interested private sectors/entrepreneurs, NGOs and local engineering companies • Adaptation of guidebooks, manuals to Tanzania conditions
Lack of local technical capacity on ethanol production.\	<ul style="list-style-type: none"> • Training to renewable energy institutions, interested private sectors/entrepreneurs and local O&M companies • Training to agro industries in installing micro distilleries • Adaptation of guidebooks, manuals to Tanzania conditions

Following are the activities planned to achieve the project outcome of improved capacity of stakeholders on large scale roll out strategy, market development of ethanol based cooking, fuel grade ethanol production and its usage.

Output 1.1.1. Capacity developed on implementation of large scale roll out program

Large scale roll out program of this kind is new to Tanzania. Successful implementation of the program therefore requires a concentrated and conscious effort from all the stakeholders. It is necessary to build up capacity and knowledge on design, planning, preparation, rollout and monitoring of such ambitious targets. The focus groups will include ministries (Vice-Presidents Office – Department of Environment (VPO-DoE), Energy and Water Utilities Regulatory Authority (EWURA), Tanzania Bureau of Standards (TIB), Ministry of Energy and Minerals (MEM), Ministry of Industry, Trade and Marketing (MITM), etc.), policy makers, ethanol cook stove suppliers/manufacturers, supply chain distributors, ethanol suppliers, sugar mill owners, interested entrepreneurs on micro-distilleries, national experts, renewable energy (RE)/technical institutions, banks/financial institutions, engineering companies, Non-Governmental Organizations (NGOs)/Civil Society Organizations (CSOs), etc. Appropriate training materials for different recipients will be prepared.

A centre for capacity building activities will be established under this project at Sokoine University of Agriculture (SUA). This arrangement will reduce the infrastructure development and operating costs for such a centre. Existing staff of the SUA will be trained in the operation and management prior to the start of the strengthened centre. Capacities of various other institutions like NARI and other universities/institutions will be strengthened through SUA in order to have a wider outreach of capacity building activities. SUA can collect a nominal fee for the training to run the centre

sustainably even after the project period. It is estimated to train minimum of 100 people cumulatively from various focus groups under this output.

Output 1.1.2. Technical capacity established on local ethanol stove manufacturing

Specific trainings aimed at local manufacturing of ethanol cook stoves will be organized through SUA under this proposed project. Interested entrepreneurs and private sectors will be trained in design, manufacture, marketing of ethanol cool stoves. Trainings to banks/financial institutions will be conducted to enhance their knowledge and build up their confidence in financing the ethanol cook stove units, including the use of application of COMFAR software. Skills of various target groups such as local engineering companies, NGOs, as well as individuals will be developed in production of ethanol stove components and their servicing. This will facilitate sustainable operation of the roll out program and the replication projects.

Available guidebooks, manuals, studies and reports on ethanol cook stoves design and usage will be customised to adapt to Tanzanian conditions. It is estimated to conduct minimum of 5 training sessions for various focus groups under this output.

Output 1.1.3. Technology transfer achieved for ethanol production through micro distilleries

Specific trainings aimed at establishing micro distillers for ethanol production will be provided to the agro industries, interested entrepreneurs, renewable energy institutions, engineering companies, etc. Trainings to banks/financial institutions will be conducted on the ethanol production projects in cashew and other potential feedstock processing industries to enhance their knowledge and build up their confidence in financing the projects, including the use of application of COMFAR software. Operation and Maintenance (O&M) companies will be given training in O&M of micro distilleries. Available guidebooks and strategies on ethanol production at micro level will be customised to adapt to Tanzanian conditions. This will benefit the potential investors. It is estimated to conduct minimum of 5 workshop sessions for various focus groups and train at least 10 engineering service companies on ethanol production technology under this output.

Project Component 2: Policy framework development for promoting ethanol based cooking

Strengthening of regulations and standards will ensure that only quality ethanol cooking products are sold in the market. This component outcome will focus on developing such policy environment in Tanzania.

Outcome 2.1. Conducive policy and regulatory environment in place

Impact of the intervention

From the outcome of this project component, it is expected that the following barriers are removed:

Barriers/Challenges	How it is addressed
No existing standards for ethanol cook stoves and fuel grade ethanol	Safety and quality standards for ethanol cook stoves and fuel grade ethanol developed
Lack of facilities to check and certify the quality of cook stoves and fuel grade ethanol	Compliance testing facilities strengthened under TBS and SUA
No existing system to plan, estimate and schedule the ethanol supply for the clean cooking market	Ethanol fuel supply scheduling system developed and it is kept under constant monitoring of MEM
Pricing of fuel grade ethanol is left to market	EWURA will have a check and control on the maximum

Barriers/Challenges	How it is addressed
fluctuations.	retail price of fuel grade ethanol for the project duration

Following activities will be carried out in creating a conducive environment for different aspects of ethanol based clean cooking market development.

Output 2.1.1.: National safety & quality standards formulated for fuel grade ethanol and ethanol cook stoves

As of now, no technical standards exist in Tanzania for fuel grade ethanol and ethanol cook stoves. Tanzania Bureau of Standards (TBS) has taken initiatives to develop standards in line with ISO regulations. The proposed project will, work with TBS and Ministry of Industry, Trade and Marketing (MITM), for continued support for such initiatives and establishment of these standards. Any existing standards in the African region will also be referred to and taken into consideration so that the fuel and cook stoves under this project comply with regional standards for future replication. A database would be established with SUA to determine which cook stoves meet the international standards set by the ISO for emissions and fuel efficiency and disseminate the information through labelling and/or consumer education.

Output 2.1.2. Compliance testing facilities strengthened

Facilities will be established to conduct compliance testing on regular basis and on request from ethanol producers and stove manufactures. TBS will be the lead institution in establishing such compliance testing facilities. A guideline will be prepared for the set up and operation of such testing facilities. Compliance testing facilities will be established at TBS, SUA and other possible RE/technical universities. Testing of fuel quality will be done at two levels: firstly, at the bulk supply level to distributors and secondly in the final bottles/retailing units when supplied to end users.

In order to ensure quality of cook stoves and ethanol fuel, mechanisms for testing and certification of products for each batch of production/manufacturing will be envisaged. A nominal fee shall be charged for such testing and quality certification. This will help support the sustained operation of facilities at TBS/SUA. It is to be noted that the compliance testing is mandatory and only the tested and certified ethanol cook stove models and fuel grade ethanol through these compliance facilities will be allowed to be retailed under this project.

Output 2.1.3. Ethanol supply scheduling system developed

Availability of ethanol fuel is an important aspect of this proposed project. The end users must be saved from any fuel scarcity after the purchase of ethanol cook stoves. Otherwise, the end users may switch back to the use of charcoal stove. To prevent such occurrences, a supply scheduling system for Dar es Salaam alone will be designed and deployed under the supervision of MEM. The supply schedule will estimate the ethanol requirement based on the achievement of proposed cook stove targets periodically.

The system will also make sure that there is enough supply of ethanol for a given number of households at any given time for Dar es Salaam city. If there are any deviations, the supply chain distributors will be given directions to take steps to ensure the required ethanol supply. One option will be to include contract terms with supply chain distributors for keeping a minimum stock for next three months' demand at any given time.

Output 2.1.4. Maximum retail price regulation designed for fuel grade ethanol

Similar to availability of ethanol, end users must be protected against sudden increase in ethanol price. Based on the study of current market situation, it is proposed that the maximum retail price of fuel grade ethanol should be capped at TZS 1,600 per litre for the five year project duration, to be competitive with the price of kerosene. Any price revisions will be done only after careful review and discussion with all stakeholders involved in the program. The supply price of ethanol in the market will be set, monitored and enforced by Tanzanian Energy and Water Utilities Regulatory Authority (EWURA), which is the energy regulator in the country. All supply chain distributors must supply ethanol within this maximum stated price only to their consumers in respective regions.

Project Component 3: Roll out of ethanol based clean cook stove program

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The project aims at retailing around 500,000 ethanol cook stoves in Dar-Es-Salaam to replace charcoal stoves. For this purpose, the proposed project envisages a large scale roll out of ethanol cook stove program. The ethanol cook stove suppliers will be selected through a bidding process and awarded contracts to supply a fixed number of stoves during the 5 year project period. Similarly, supply chain distributors will be selected through a bidding process and awarded contracts to market and retail ethanol stoves and fuel in a provided region during the 5 year project period.

During initial rollout, the cook stoves/ethanol may be imported until the time the local skill and knowledge transfer is developed and production units are established. The project approach is designed based on the “Tanzania bio ethanol cooking programme design& GEF proposal inputs” report (refer Annex J) prepared as part of the PPG activities. The typical layout of Market Enabling Framework to achieve the proposed targets is provided in figure 5.

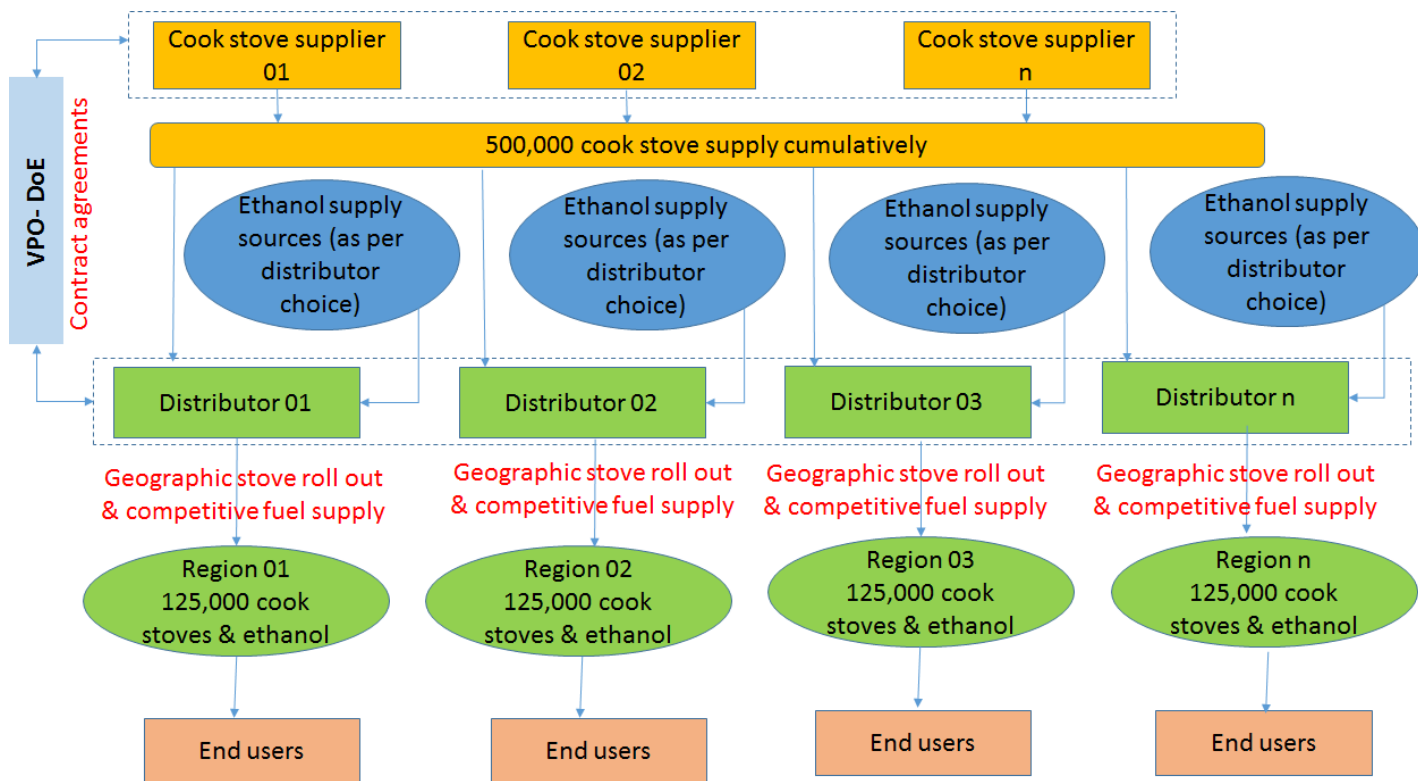


Figure 5. Typical layout of Market Enabling Framework

Impact of the intervention

From the outcomes of this project component, it is expected that the following barriers are removed:

Barriers/Challenges	How it is addressed
Inadequate awareness about benefits of clean cooking stoves among end users	Awareness will be created by supply chain distributors through pamphlets, mass media advertisement, posters and manuals at all retail outlets, etc., to end users as a part of their contract agreement
High cost of ethanol cook stoves which end users cannot afford	Incentive scheme designed to benefit end users by reduction of purchase price of ethanol cook stoves

Barriers/Challenges	How it is addressed
Absence of market enabling framework to develop ethanol cooking sector	Market enabling framework put in place through: <ul style="list-style-type: none"> • Contracts signed with selected bidders as supply chain distributors to develop ethanol market network with exclusive supply regions for a fixed period along with maximum price regulation for ethanol fuel • Contracts signed with selected bidders to supply ethanol cook stoves with agreed supply targets and stove cost
Lack of private sector/industry confidence to invest in ethanol based clean cooking sector	Loans will be facilitated through TIB to encourage private sector/industry investment in ethanol based clean cooking sector
No existing market network available to end users for purchase for ethanol cook stoves and fuel	<ul style="list-style-type: none"> • Development of market network facilitated through investments from selected supply chain distributors. • Bottling plants established by supply chain distributors for retailing to end users • Establishment of sales outlets and service points by supply chain distributors
Absence of quality ethanol cook stove supply sources	<ul style="list-style-type: none"> • Investment made on import, local assembly or local manufacture of ethanol cook stoves by suppliers • Quality of cook stoves tested and certified at compliance facilities
Lack of fuel grade ethanol supply sources	<ul style="list-style-type: none"> • Investment made by private sector on supply of fuel grade ethanol through imports or local sources • Investment made by sugar mills, entrepreneurs on micro/medium and large scale ethanol distilleries to meet the market demand

Outcome 3.1. Design of market intervention and strategy for implementation in Dar es Salaam

The activities under this outcome will result in finalisation of schemes, procedures and business partnerships to kick start the implementation of large scale roll out in Dar es Salaam city.

Output 3.1.1. Incentive scheme designed for ethanol cook stove retailing

High cost of cook stove is one challenge that the project plans to overcome. An incentive scheme is proposed for this, so that part of the ethanol cook stove cost is provided by the project and the remaining part is paid by the end users. The incentive will be executed and managed by financial institutions such as TIB, East African Development Bank (EADB). The production cost of ethanol stoves is estimated to be 22 USD for single burner and 37 USD for a double burner stove. The project will provide an incentive of 9 USD for each ethanol cook stove retailed, either single or double burner. This way, the price of a stove at end user level will be 13 USD for single burner and 28 USD for double burner. The cost details of the incentive scheme are presented in Table 5.

A detailed incentive scheme will be designed during implementation stage. A step by step guideline for application, documentation, filing, submission of payment requests, payment procedures, etc. will be formulated. The scheme will

also detail the transparent audit mechanism involved in confirmation of the number of cook stoves retained. The supply chain distributors must prepare 3 payment bill copies during the sale of cook stove – one customer copy, one claim copy and one office copy. The claim copy must be submitted to TIB along with claim of incentive by the distributor. Upon confirmation of audit on number of such stoves retained, the payment of incentive to the supply chain distributor will be done. The typical incentive scheme is shown in figure 6.

Table 5: Incentive scheme for cook stoves

Cook stove type	Total cost (USD)	Incentive from project (USD)	Net price for end users (USD)
Single burner	22	9	13
Double burner	37	9	28



Figure 6: Typical process of incentive scheme (for single burner ethanol cook stove)

Output 3.1.2. Technical specifications, bidding documents, etc. prepared and participating distributors and stove suppliers selected

Under this project activity, the technical specifications for cook stove and ethanol fuel to be supplied under this proposed project will be prepared. The tender documents will be prepared that will include the requirements, conditions of services, payment terms of subsidies, etc. The announcement of tenders, review of bids and short listing of contractors will follow international practices under the supervision of UNIDO.

Qualified bidders will be selected as supply chain distributors to establish ethanol cook stove and fuel supply market networks within a fixed geographic area over 5 years. Around three or four contracts each for separate areas or territories will be typically awarded with around 150,000 households in each area and target to retail around 125,000 cook stoves. Each exclusive geographical supply territory will have a required sales and household penetration target to

be achieved over the 5 year period. It is noted here that exclusive geographical supply territory applies only for ethanol cook stove market (along with some initial ethanol supply) and not for ethanol fuel market. For the ethanol fuel market, normal trading and free market competition will immediately come into play. After the 5 year period and achievement of household switch targets, the exclusive territorial contracts for cook stove will also lapse and normal trading and free market competition will apply.

Similarly, two or three qualified bidders will be selected for the supply of cook stoves. Each selected bidder will be awarded a fixed supply volume of 100,000 or 200,000 stoves within the contract. They may source the cook stoves through imports or local assembly or local manufacture. In either approach, the cook stoves will be subjected to quality testing and certification by TBS as per standards developed under this project.

Assistance and guidance will be provided through MITM for issuance of licenses and permits required for setting up the local manufacturing units. Loans for investment needs for setting up the plants will be facilitated through the financial partner, TIB Development Bank (TIB).

Outcome 3.2. Large scale rollout of 500,000 ethanol cook stoves and market for 90 million litres/year of ethanol fuel supply created

Activities under this outcome will focus on achieving the proposed project targets in terms of household penetration, ethanol supply and investments in the sector.

Output 3.2.1. Establishment of ethanol fuel/cook stove supply chain network facilitated contractually to cover 500,000 households

Contract agreements will be signed between VPO-DoE and the selected supply chain distributors to develop a supply chain network to jointly retail ethanol cook stoves and fuel in Dar es Salaam. As per the contract, each supply chain distributor must establish the ethanol market network in their respective areas. Methods of sale, bottling of ethanol, mode of delivery, etc., will be left to the selection of the contracted supply chain distributors. Interested NGOs, co-operatives, such as SACCOS, Tanzania Saccos for Women Entrepreneurs (TASWE) with an existing network, will be encouraged by supply chain distributors to set up ethanol storage bulks and retail shops. Proper training and awareness in handling ethanol during transportation, storage and supply will be provided to staff working in these supply networks.

The supply chain distributors can make tie-ups with financial institutions and co-operatives to provide credit options, easy monthly instalments, etc., to the end users to overcome the upfront cost of ethanol cook stoves. The incentive provided through TIB for each stove retailed will also help to bring down the cost of ethanol cook stoves at the end users level. 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 ethanol fuel and cook stoves will be provided to the retailers and end users through manuals and in-hand training at the time of purchase.

The ethanol cook stoves will be promoted by the selected supply chain distributors who will work closely with the end users. They will be offering products as per requirements of the end users in their region. They will also conduct regular capacity building activities such as road shows, exhibitions, door step demonstrations to the end users. Such initiatives will help in overcoming the socio-cultural factors relevant for switching to ethanol fuel stoves.

The supply chain distributors must procure the quality tested ethanol stoves only from the contracted cook stove suppliers. It is estimated that the ethanol requirement for the project implementation (for 500,000 cook stoves) at the end of 5 years will be 90 million litres per year. The supply chain distributors will be responsible to make the ethanol fuel available for their customers need. They can either purchase from local ethanol distilleries or import from other countries through other ethanol suppliers. Both cook stoves and ethanol fuel, either locally produced or imported, will be subjected to quality testing and certification by TBS as per standards developed under this proposed project. Testing of ethanol fuel must also be carried out after the bottling is done for retailing purpose.

Once all the contracted supply chain distributors have achieved their targets, the proposed target of 500,000 households switching to ethanol based cooking will be achieved. The scope of distributor activities is given in figure 7.

Output 3.2.2. Supply of 500,000 ethanol cook stoves established contractually

Contract agreements will be signed between VPO-DoE and the selected cook stove suppliers to supply 500,000 ethanol cook stoves to contracted supply chain distributors during the project duration. During the initial stage, the cook stoves may be imported if required until the time the local skill and knowledge transfer is developed and production units are established. It is estimated that the cook stoves production cost will be 22 USD for single burner and 37 USD for a double burner stove. The project will provide an incentive of 9 USD for each ethanol cook stove retailed.

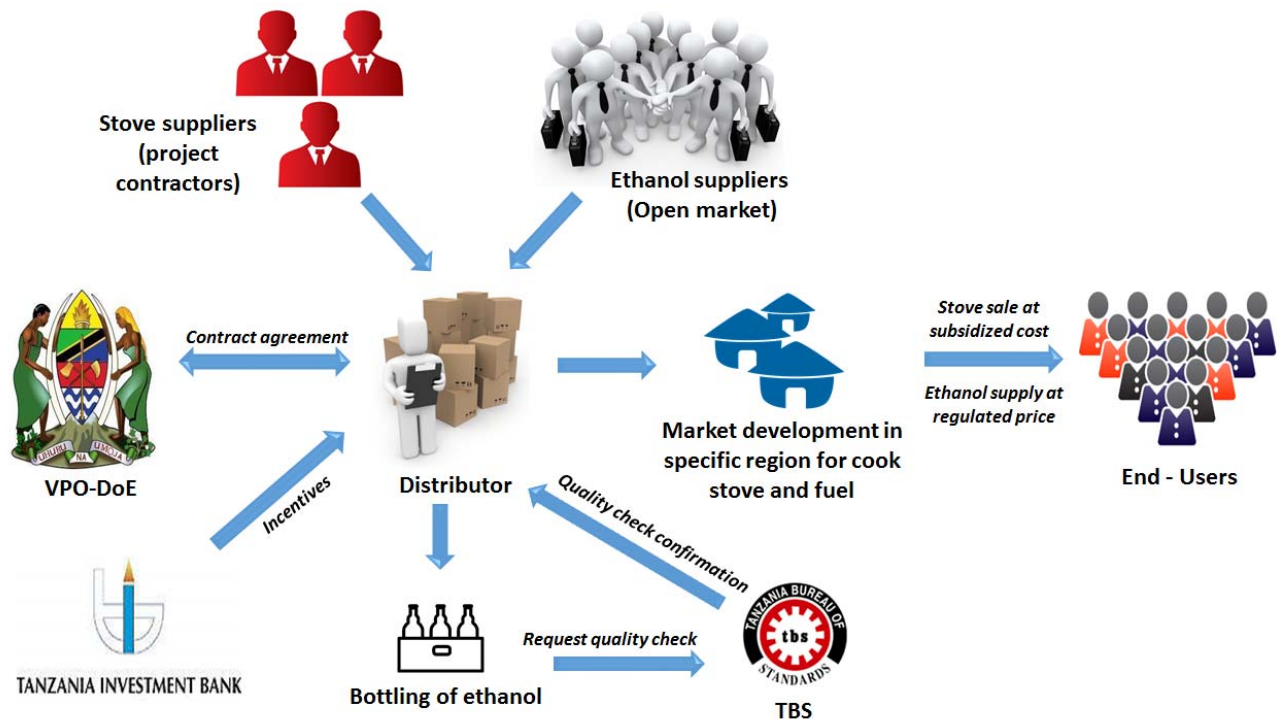


Figure 7: Scope of distributor activities

The proposed project will support the local manufacturing of ethanol cook stoves through loans provided by TIB. Locally fabricated ethanol stoves can remove technology barriers significantly in terms of importation and related cost and can boost the replication potential considerably. An investment of USD 4 million as loans from TIB is estimated for local cook stove manufacture. Ethanol cook stove companies that are already working in SSA regions, such as Clean Cook, SAFI, SmartCook, NDZilo and other interested entrepreneurs, will be encouraged to set up a local assembly or manufacturing unit in Tanzania. Assistance and guidance will be provided through MITM for issuance of licenses and permits required for setting up the local manufacturing units. All cook stoves either imported or locally produced will be subjected to quality testing and certification by TBS as per standards developed under this project. The scope of cook stove supplier activities is given in figure 8.

Output 3.2.3. Local investments stimulated in ethanol distilleries (micro/medium/large scale) through market demand of 90 million litres per year

The market demand for fuel ethanol with 500,000 cook stoves will be 90 million litres per year. The ethanol production capacity needed for this supply volume will be around 450,000 lpd. As per the available data and studies, the ethanol production potential of Tanzania is around 300,000 lpd (refer details in page 13 and 14 of this report). Focusing on the production of this volume alone would be very difficult to motivate within 5 years due to the very high investments

needed given the lack of existing market. As a start-up initiative, minimum of 75,000 litres per day of local ethanol production is envisaged. USD 6 million has been allocated for investment through loans from TIB under this activity.

Once the ethanol fuel market is developed, the ethanol production industry will tend to increase its production in response to the increasing demand. In due course, the local ethanol production can be increased and dependence on imports can be reduced accordingly. Existing ethanol distilleries in sugar mills will be encouraged to increase their current production of fuel grade ethanol. Other sugar mills, cashew and potential feedstock processing plants will be encouraged to install new ethanol distilleries in response to the increase in the market demand for fuel grade ethanol.

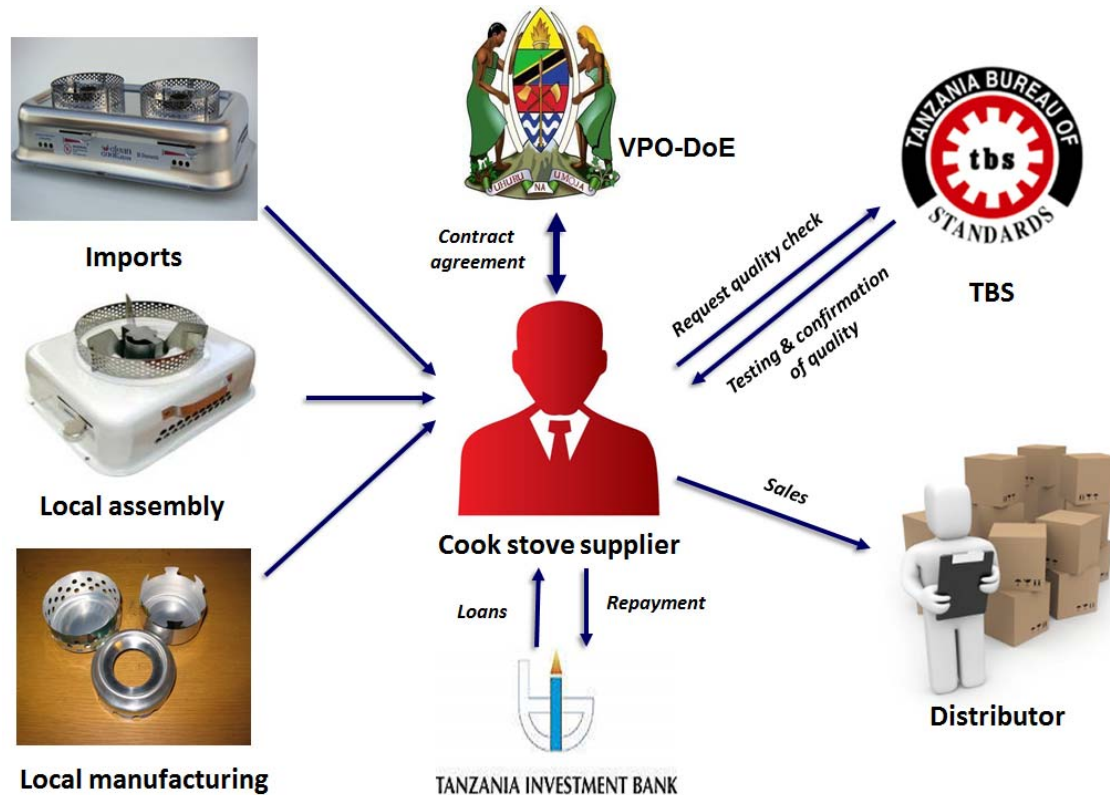


Figure 8: Scope of cook stove supplier activities

The maximum retail price of the ethanol fuel shall be capped at TZS 1,600 per litre⁶⁴ to be competitive with kerosene price. There shall be strict control over this maximum retail price of fuel for the contract period of 5 years to safeguard end users from rapid price increase after purchase of ethanol stoves. EWURA will be responsible to oversee the maximum retail price regulation of fuel grade ethanol during the project period.

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.

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

The monitoring of project progress is essential for the adequate and timely delivery of results. This project component covers project monitoring and oversight by UNIDO in close coordination with VPO-DoE and other relevant government agencies. Initial activities under this component include the organization of an inception workshop, the

⁶⁴Tanzania Bio ethanol Cooking Programme - Programme Design & GEF Proposal Inputs Report, under section “Household market related points”, page 19
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definition of progress and impact indicators and the design of a detailed monitoring plan and methodology. Particular attention will be paid to gender aspects and gender mainstreaming throughout project implementation.

Outcome 4.1. Effectiveness of the outputs assessed, corrective actions taken and experience documented

Following are the two activities carried out to assess, evaluate and document the overall success of the proposed project.

Output 4.1.1. Mid-term M&E report prepared

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 30th 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

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 distilleries) and retailing of 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 collected 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 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 charcoal usage with ethanol as alternative clean fuel for cooking. This project also envisages promoting micro distilleries for producing fuel grade ethanol as a means of generating employment opportunities, generate income to farmers from agro-wastes and expanding the use of clean cooking fuels to other urban and rural areas during replication. Facilitation of investments in local fabrication of 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 total estimated investment to develop the ethanol based cooking market is USD 16.3 million (USD 1.8 million from GEF and around USD 14.5 million from co-financing). The GEF funding will be used to meet the incremental cost of developing supply market and facilitation of local cook stove manufacturing/ethanol production. The GEF grant provided (around USD 1.8 million) is approximately 11% of total incremental cost of around USD 16.3million needed for the new market network development, ethanol production and cook stove manufacturing.

Global environmental benefits

The project targets around 500,000 ethanol cook stoves in Dar es Salaam in five years. For calculation purpose, it is assumed that these cook stoves will replace charcoal stoves. Annual charcoal usage of around 292 million kg⁶⁵ can be avoided resulting in the reduction of 1,039,987 tCO₂e each year. Though the proposed project will aim to provide best

⁶⁵ Based on the assumption that each household consumes an average of 584 kg of charcoal every year. Calorific value of charcoal is 31.8 MJ/kg.

Charcoal emission factor: 112,000 kg of CO₂ per TJ on net calorific value basis

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products and quality after sale services, there might be operating failures during 10 years of cook stove's lifetime. Conservatively, it is assumed that percentage of ethanol cook stoves in use will start decreasing from 6th year onwards and at least 50% of ethanol cook stoves retained will be still operational at the end of 10th year. Considering an operational life time of 10 years⁶⁶ for the ethanol cook stoves and above assumptions, this project would result in the reduction of 8,839,891tCO₂e directly. As a result of the project's intervention in the area of policy development, creation of conducive investment environment, awareness creation among the end-user, etc., it is expected that another 1,000,000 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 a total emission reduction of 17,679,782 tCO₂e, throughout its lifetime.

The total GEF resources of around USD 2.46 million will be used to mitigate CO₂ emission at the rate of USD 0.28/t CO₂ directly and around USD 0.14/tCO₂ indirectly.

It is noted here that for estimation purpose, it is considered that ethanol cook stove will replace charcoal stoves in this project. But in actual practise, it may also replace kerosene, LPG and electricity based cooking systems as per regional conditions. Thus, the project will result in emission reduction from avoidance of fossil fuel based cooking as well. This will be additional to the global environmental benefits stated above.

Innovativeness, Sustainability and Potential for Scaling up

This project is innovative in the following aspects:

- a) Large scale roll out of ethanol cook stoves
- b) Fuel grade ethanol production concept is new to Tanzania
- c) Promotion of micro-distilleries to create employment and generate income to farmers from agro-wastes
- d) Local fabrication of ethanol stoves
- e) Usage of ethanol for household cooking

The proposed project has the potential to revolutionize the household energy sector through introduction of sustainable and clean fuel creating tremendous value for the women and children in terms of lifestyle, health through elimination of indoor air pollution, increased opportunity for education& employment, etc.

The project's innovative approach to collectively enhance domestic energy efficient cooking technology and know-how, increase the energy access and stimulate the small industries development is also in compliance with the UNIDO's mandate to support domestic technology development, research and innovation in the developing countries.

Sustainability is ensured through following market mechanisms:

- a) Strengthened SUA to sustain the human and institutional capacity in ethanol production, cook stove fabrication and usage;
- b) Partnership with global stove manufacturers to promote local fabrication of cook stoves;
- c) Local manufacturing of fuel grade ethanol, through partnership with sugar manufacturers and entrepreneurs to run micro distilleries;
- d) Suggesting recommendations to Government to support ethanol based clean cooking market; and
- e) Gender mainstreaming of the intervention during the whole project cycle.

TIB, the financial partner of this proposed project, is the first development finance institution in the country established by the Government of Tanzania. One of the bank's objectives is to coordinate linkages and efforts among the stakeholders involved to promote small and medium scale enterprises to ensure a sustained productive economic

⁶⁶http://sites.duke.edu/adhoc_httpssitesdukeedubioethanolpro/our-product/clean-stove/
<https://cleancookstoves.org/binary-data/RESOURCE/file/000/000/231-1.pdf>

growth. Throughout its thirty years of existence, TIB has been a household name in financing capital investments in the country. This strong experience in sustainable project investments and fund management by TIB will also help the proposed project to ensure its sustainability⁶⁷.

UNIDO has been implementing a number of renewable energy projects in Tanzania for productive uses, including GEF-4 project "Mini-grids based on small hydropower sources to augment rural electrification" and the 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 technology transfer project in Thailand entitled "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 projects both within the country and in other countries 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 dominated (fuel wood and charcoal) cooking to ethanol based clean cooking option. This will lead to associated positive impacts on agriculture markets as well through added value to its by-products and wastes. Energy efficient and high quality ethanol cook stoves will be introduced to Tanzania markets in large scale for the first time through this project.

Scaling up: Banks equipped with adequate training from this project can provide finance for the interested private sectors towards scaling up of ethanol production and cook-stove production. Technology transfer of the ethanol production technology in large, medium and micro scale levels 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 sector, NGOs, women self-help groups, etc. to start businesses in the ethanol sector. Necessary capacity building will be provided for them through Project Component 1. Besides, through East African Centre for Renewable Energy and Energy Efficiency (EACREEE), scale up this intervention to 5 partner states in East Africa Countries (EAC) is possible and it can create huge impacts.

A.2. Child Project? If this is a child project under a program, describe how the components contribute to the overall program impact.

NA

A.3. Stakeholders. Identify key stakeholders and elaborate on how the key stakeholders' engagement is incorporated in the preparation and implementation of the project. Do they include civil society organizations (yes /no)? and indigenous peoples (yes /no)? ⁶⁸

Vice President's Office – Division of Environment (VPO-DoE)

The Division of Environment under Vice President's Office is responsible for the overall environmental policy and regulation, formulation, coordination and monitoring of environment policy implementation in the country. VPO-DoE is the main executing partner and will host the Project Management Unit (PMU) and will chair the Project Steering Committee (PSC). Selection of contractors through international bidding for cook stove supply and supply chain distributors and signing of mutual contract agreement is the responsibility of VPO-DoE. In total, it will be responsible for executing the proposed project, the delivery of the planned outputs and the achievement of the expected outcomes.

Ministry of Energy and Minerals (MEM)

MEM delivers various services related to development of energy and minerals resources in Tanzania through the participation of various stakeholders including public, private, public-private partnerships, local communities, NGOs and civil society. It will assist in achieving the expected outcome of the project. MEM will work on the policy aspects,

⁶⁷<http://www.mpakasi.com/business-gateway/financial-services/tanzania-investment-bank-tib/>

⁶⁸As per the GEF-6 Corporate Results Framework in the GEF Programming Directions and GEF-6 Gender Core Indicators in the Gender Equality Action Plan, provide information on these specific indicators on stakeholders (including civil society organization and indigenous peoples) and gender.

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inter-ministry communication facilitation and policy matters for wide adaptation of the technology and services in Tanzania. It will be responsible for monitoring the cook stoves and ethanol production/supply in the market.

Ministry of Industry, Trade and Marketing (MITM)

MITM will have a lead role in establishing the local fabrication units of 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 ethanol production.

Tanzania Bureau of Standards (TBS)

TBS was established to undertake measures for quality control of products of all descriptions and to promote standardization in industry and commerce in Tanzania. It will be responsible for creation of quality standards for fuel grade ethanol and ethanol cook stoves. It will also design a certification process for reliable testing and certification of ethanol fuels and cook stoves made available in the markets.

Energy and Water Utilities Regulatory Authority (EWURA)

EWURA will be responsible for monitoring of the maximum retail price regulation of ethanol. It will continuously monitor the maximum retail price of fuel grade ethanol during the project period.

Sokoine University of Agriculture (SUA)

SUA is a public university in Morogoro, Tanzania, specializing in agriculture. SUA has already carried out research and development work in ethanol production from agro wastes, ethanol production from sisal waste, etc. It will be one the executing partner of the proposed project. It will serve as the centre for institutional capacity building in ethanol technology. It will also establish and maintain an information database on all the potential feedstock for ethanol production, its availability and location of availability, details of cook stove suppliers, details of ethanol distilleries, standards for ethanol and cook stoves, etc.

TIB Development Bank (TIB)

It was formerly known as Tanzania Investment Bank and is a government-owned development bank in Tanzania. The bank is the first development finance institution established by the Government of Tanzania. It will be one of the executing partners of the proposed project. Under this project, TIB will provide loans to private sectors and entrepreneurs to set up local ethanol distilleries (large/medium/micro scale) and cook stove manufacturing units. It will also be responsible for managing the incentive scheme under this proposed project.

Supply chain distributors

Development of a supply chain market network for the proposed project will be through private partners selected through international bidding during implementation stage. They will be responsible for the combined sale of ethanol stoves and ethanol fuel to the end users in their respective regions. They must ensure the continuous availability of ethanol fuel to the end users for the complete project duration of 5 years.

Ethanol cook stove suppliers

The cook stove supply for the proposed project will be through private partners selected through international bidding during implementation stage. They will be responsible to supply an agreed number of stoves during the project duration. The private partners may set up local manufacturing units or import cook stoves from their manufacturing units in other countries. Selected ethanol cook stove suppliers will be encouraged to set up local stove manufacture units through loans from TIB.

Fuel grade ethanol suppliers

The ethanol supply sources for the project demand will be from sugar factories and other medium/micro distilleries. Supply chain distributors will be free to choose their ethanol supply sources. Selected ethanol distilleries will be encouraged to set up local production plants in Tanzania.

Others

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

The proposed project will seek collaboration, knowledge sharing and close co-operation with industrial associations such as Tanzania Chamber of Commerce, Industry and Agriculture (TCCIA), Tanzania Federation of Industries (TFI), Tanzania Renewable Energy Association (TAREA) and Civil Society Organizations (CSOs) including women development organizations.

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 such as TASWE 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 sectors, as farmers will get additional revenue from their by-products/waste. Indigenous people who depend on the relevant agriculture sector will benefit from the additional revenue gained through the project. This will also create local employment in rural communities and prevent their migration. They may also benefit from an 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 people as the project does not involve any land conversions, crop replacement, etc.

A.4. Gender Equality and Women's Empowerment. Elaborate on how gender equality and women's empowerment issues are mainstreamed into the project implementation and monitoring, taking into account the differences, needs, roles and priorities of women and men. In addition, 1) did the project conduct a gender analysis during project preparation (yes /no)?; 2) did the project incorporate a gender responsive project results framework, including sex-disaggregated indicators (yes /no)?; and 3) what is the share of women and men direct beneficiaries (women 99%, men 1%)?⁶⁹

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-neutral. In fact, due to diverging needs and rights regarding energy consumption and production, women 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 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, the project includes the gender dimension during the whole project cycle. To mainstream gender into the project, an in-depth gender analysis is done and various entry points for defining gender aware project outcomes, outputs as well as activities are identified and engaging women in various activities are targeted (refer to Annex I for gender analysis report).

⁶⁹Same as footnote 8 above.

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 hearth; but also affects around 265,000 cooks and kitchen helpers working in the food/restaurant sector. Household cooking is mainly the responsibility of women in Africa. Women are involved in preparation, collection and storage of cooking fuel/charcoal. Instead of 100%, it is conservatively considered that 99% of project beneficiaries are women. Remaining percentage of direct beneficiary is assumed to be men who are mainly working as cooks and kitchen helpers in the food/restaurant sector.

Relevant gender dimensions are considered, and the project log-frame is 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, PSC 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 Environmental and Social Management Plan (ESMP), etc. (see Annex K).

A.5 Risk. Elaborate on indicated risks, including climate change, potential social and environmental risks that might prevent the project objectives from being achieved, and, if possible, the proposed measures that address these risks at the time of project implementation.

Component	Risk	Proposed mitigation measure	Risk level
Technical risk	Implementation of large scale roll out projects in cooking sector was not carried out in Tanzania before.	<ul style="list-style-type: none"> • A centre will be established at SUA to provide training on implementation of large scale roll out projects. • All stakeholders will be provided training on design, planning, preparation, rollout and monitoring of such ambitious targets. • Technical assistance will be provided by UNIDO through its international experts as and when required 	Low
	Ethanol cook stove is a new technology and	<ul style="list-style-type: none"> • Ethanol cook stove technology and its usage has been successfully proved for African conditions in 	

Component	Risk	Proposed mitigation measure	Risk level
	may not yield the desired results	<p>countries like Ethiopia, Kenya and Mozambique.</p> <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. Introduction of ethanol cook stoves is an extension of these activities. Adequate training will be provided through SUA on ethanol cook stove manufacturing. This project will set up standards and compliance testing facilities to ensure that only ethanol cook stove models with tested and proven quality are retailed under this project. 	
	Ethanol production in sugar mills and cashew processing industries is not common in Tanzania	<ul style="list-style-type: none"> 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 ZSF, ethanol production has been practiced for a very long time. Hence, there is adequate experience in ethanol production. Fuel grade ethanol production is just an extension of the existing ethanol production making it fit for cooking purpose alone. Trainings will be organized by SUA to build capacity on local ethanol production. Proven technology supplier will be selected. This would mitigate the perceived risk. 	Low
Financial risks	Non-availability of funds to support large scale roll out strategy	Letter of financial commitment from the co-financing partners is obtained.	Low
Socio-economic risk	Households lack interest in buying ethanol cook stoves	<ul style="list-style-type: none"> Awareness workshops, media advertisements will be made by supply chain distributors as part of their contract to increase households' confidence in ethanol cook stoves. Household will be benefited from the reduced ethanol cook stove price offer under the project. 	Moderate
	Supply of target cook stoves not achieved	Contract agreement will be signed with cook stove suppliers on their respective supply targets. Their performance and achievement of targets will be constantly monitored.	
	Supply requirement of fuel grade ethanol not	Contract agreement will be signed with supply chain distributors to ensure fuel supply to their consumers.	

Component	Risk	Proposed mitigation measure	Risk level
	achieved	Their performance and achievement of targets will be constantly monitored.	
	Poor quality cook stove/ethanol supplied in market	Quality standards will be formulated and only tested cook stove models and fuel grade ethanol will be allowed to be supplied under this project. Contract agreements with the supply chain distributors and cook stove suppliers will clearly state such requirements.	
	High price fluctuations of fuel grade ethanol	Maximum retail price of fuel grade ethanol will be kept under constant monitoring by EWURA.	
	End users not benefitted from incentive provided from project	The design of incentive scheme will clearly define the terms and conditions of incentive claims such that there is no loop hole to prevent benefit of incentive reaching the end users.	
Sustainability risk	Ethanol based cooking market may collapse after supporting measures are withdrawn at the end of project period	<ul style="list-style-type: none"> • Retailing of 500,000 cook stoves will create a solid partnership of supply chain industries such as suppliers, dealers, cook stove manufacturers, ethanol distilleries, etc. This will ensure sustainability of the project. • SUA will conduct training to private sector on collection of a nominal fee. This will support capacity building activities even after project period. • Success of project will encourage other financial institutions similar to TIB to provide loans to the investors in ethanol based cooking system market. 	Moderate
	Scarcity of feedstock	During extreme shortage of feedstock in the country for ethanol production, supply of ethanol will be ensured through imports. The ethanol supply companies will be made responsible for this.	
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</p>	<p>The programme design report (Chapter 3 of Annex J) has carefully studied the social-economic aspects of using various types of cook stove fuels. Also, the lessons learnt, issues faced from previous projects in this sector and the respective need for a market enabling framework is designed (Chapter 4 of Annex J) in that report to mitigate this risk.</p> <p>Accordingly, 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 Gender Equality and Empowerment of Women (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</p>	Low

Component	Risk	Proposed mitigation measure	Risk level
	qualified female population within engineering sector. Socio-cultural risk of switch over from charcoal based cooking	contribution of the project to improving gender equality in the energy field. Continuous campaigns will be organized for the public on socio-cultural changes; improvement in lifestyle and health, etc., to foster the transition from cooking using charcoal to ethanol based cooking.	
Climate change risk	Scarcity of feedstock due to flood or droughts	In this project, supply of fuel to end users is the responsibility of supply chain distributors. Whenever, there is scarcity of feedstock locally, supply chain distributors have to import fuel ethanol to meet the demand. In addition, the project will consider all possible options of ethanol production from agro wastes such as molasses, sisal waste, coffee pulp, cashew apple and other seasonal fruit wastes. Thus, scarcity of any particular feedstock will not significantly affect the ethanol production for the project.	

A.6. Institutional Arrangement and Coordination. Describe the institutional arrangement for project implementation. Elaborate on the planned coordination with other relevant GEF-financed projects and other initiatives.

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 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. The proposed project will take necessary experiences and lessons learnt from the other GEF projects to ensure the attainment of the proposed objective. The project will also co-ordinate and complement in mutual fields of capacity development, awareness creation, sharing resources data, etc. with similar other on-going GEF projects in waste-to-energy sector and sustainable development. UNIDO has been the implementing agency in two of above listed climate change GEF projects. Its experience from these previous projects will be effectively utilized in this proposed project.

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), and 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 Department of Agri-Business Development (AGR), Department of Trade, Investment and Innovation (TII), etc., will be actively involved in developing economic activities to the beneficiary communities.

In addition, the project is developed in co-ordination with the objectives of SE4ALL programme, the recent initiative of GoT. One of the objectives of the Tanzania Government under the SE4ALL is to have a roll out of BLEN (biogas,

LPG, ethanol and natural gas) for cleaner cooking solutions. This project would perfectly match the Government initiatives with the positive approach (Tanzania SE4ALL Action Agenda, December 2015).

This particular project will also help in Tanzania Government's aim under BEST in conserving biomass, especially through avoiding charcoal use, which is the highest in Dar es Salaam. Thus, the project is line with the measures to enhance climate resilience.

Also from the UN side, there is a lot of interest to partner as part of a community empowerment project– UN Women and UNDP have already expressed interest in participating in a joint effort under the UNDAP framework.

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.

Additional Information not well elaborated at PIF Stage:

The proposed GEF project implementation arrangement is given below:

Implementing Agency

UNIDO is the only GEF Implementing Agency involved in this project and no specific arrangement with other GEF Agencies is sought.

Executing Agency

Vice Presidents Office – Division of Environment (VPO-DoE) will be the main executing agency coordinating with UNIDO. Sokoine University of Agriculture (SUA), TIB Development Bank (TIB) will be other executing partners.

Other partners include MEM, MITM, Tanzania Bureau of Standards (TBS), EWURA, EADB, supply chain distributors, ethanol distilleries, cook stove manufacturers, NGOs and other private sector stakeholders.

Project Implementation Arrangement

The project will be implemented by UNIDO, which is responsible in the achievement of the expected outcome through its guidance, in collaboration with VPO-DoE, MEM, MITM, TBS, EWURA, SUA, TIB, EADB, Private investors and related government departments and ministries.

UNIDO

UNIDO will be specifically responsible for:

- Oversight and supervision of the overall execution of the project
- Reporting on the project performance to the GEF
- Procurement of the technology and services needed for delivering the planned outputs under the four project components
- Approving the national expertise needed for delivering the planned output under the four project components
- Managing, supervising and monitoring the work of the international teams and ensuring that the deliverables are technically sound and consistent with the project requirements.

UNIDO will fulfil this responsibility by mobilizing services of its other technical, administrative and financial branches at UNIDO Headquarters and the UNIDO Office in Tanzania. UNIDO will facilitate procurement of international services and equipment purchases where applicable through its standard rules and regulations.

Any amendments to the project will be done in accordance with the GEF policy C39. Inf. 3 and UNIDO rules and regulations.

Project Management Unit

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A Project Management Unit (PMU) will be established within the VPO-DoE. PMU will also be the PSC secretariat. The PMU will consist of a National Project Coordinator (NPC), National Project Manager (PM), the Project Administrative Assistant (PAA) and technical advisors. The responsibilities of PMU will be as follows:

- Daily management of project execution
- Coordination of all project activities carried out by the national experts and other partners
- Day-to-day management, monitoring and evaluation of project activities as per planned project work
- Organization of the various seminars and trainings to be carried out

Throughout the period of project execution, the PMU will receive the necessary management advisory support from UNIDO.

Project Steering Committee

A Project Steering Committee (PSC) will be established consisting of all relevant stakeholders (key stakeholders including VPO-DoE, MEM, MITM, TBS, SUA, EWURA, TIB, private sector representatives and UNIDO) for providing strategic guidance and review of project progress. It will also facilitate co-ordination among project shareholders and maintain transparency in ensuring the ownership and to support the sustainability of the project. PSC will be responsible for:

- Providing strategic guidance in line with the country's needs and priorities;
- Promoting partnership among stakeholders;
- Reviewing project progress reports;
- Approving the work plan based on this project document;
- Initiating remedial action to remove impediments in the progress of project activities that were not envisaged earlier.

The committee will be chaired by VPO-DoE. The final composition of the PSC will be defined during the project execution start-up phase. The PSC will meet once a year. At the beginning of the project execution, a detailed work plan for the entire duration of the project will be developed by UNIDO in collaboration with the PMU, Government of Tanzania and the international teams of experts. The work plan will be used as a management and monitoring tool by PMU and will be reviewed and updated appropriately on a biannual basis. Figure 9 shows the project management structure.

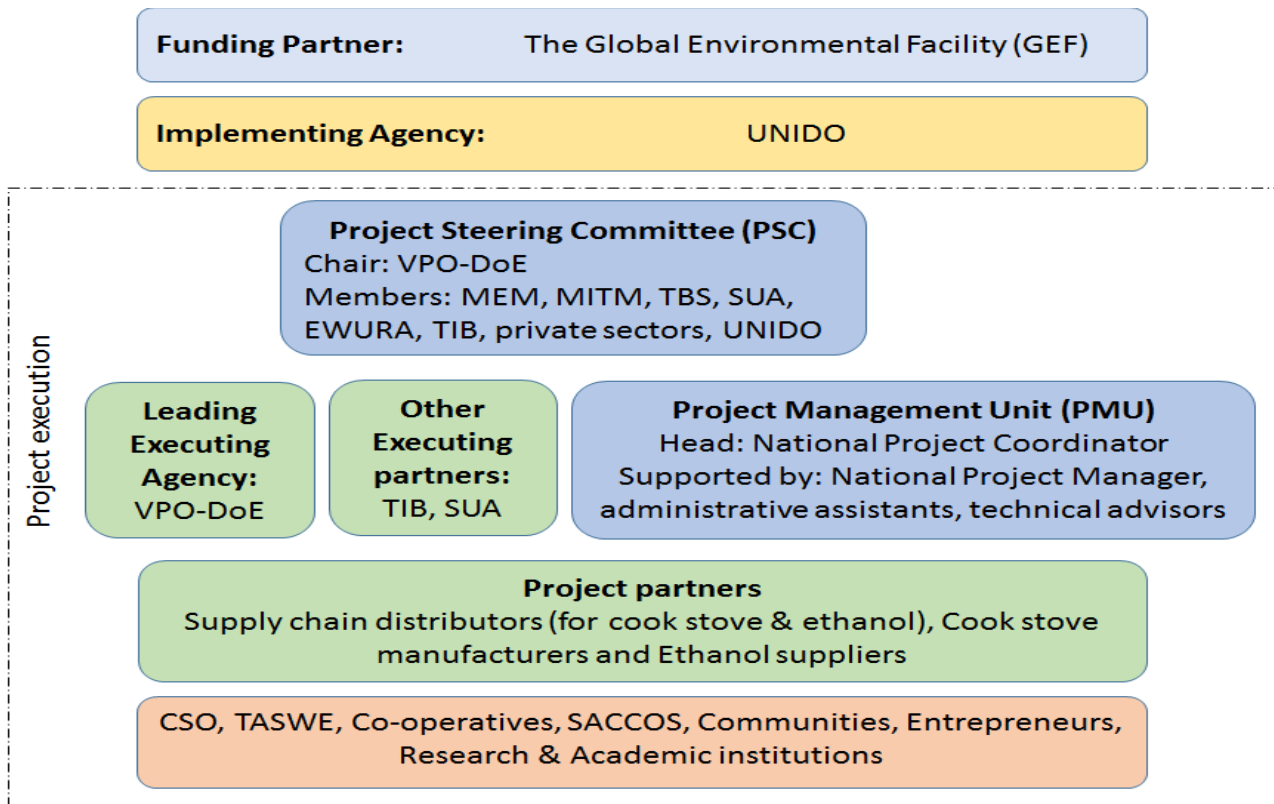


Figure 9: Project management structure

The PMU will initiate the process selecting the project partners. Ethanol cook stove suppliers will be selected through international bidding process. They will sign a contract agreement with the PMU to supply a target number of ethanol cook stoves. They may either import the cook stoves or import the component and locally assemble the stoves or set up local manufacturing units. In any case, their cook stoves must be tested and certified by TBS.

Similarly, the supply chain distributors will be selected through international bidding process. They will sign a contract agreement with the PMU to create market network in target regions. Supply chain distributors must procure the ethanol cook stoves from selected ethanol cook stove suppliers. However, they are free to select ethanol fuel suppliers of their choice. If bottling of ethanol fuel is done by supply chain distributors, it must be tested and certified by TBS. Incentive will be provided to the supply chain distributors through TIB for each ethanol cook stove retailed by them.

Sugar factories, medium and small scale distillers will be encouraged to invest in ethanol production and supply to the supply chain distributors. They may avail finance from TIB. Training and capacity building sessions will be conducted by SUA for all the stakeholders involved in the project. TBS will develop standards for ethanol fuel and cook stoves. It will also create compliance testing facilities to provide quality testing and certification services.

MEM will keep monitoring the cook stoves and ethanol production/supply in the market. MITM will assist in establishing the local fabrication units of ethanol cook stoves, licensing them and providing necessary supports. EWURA will monitor the maximum retail price of ethanol sold in the market.

UNIDO will closely coordinate with the ongoing and planned relevant initiatives to ensure maximum synergies and the overall impact of the Climate Change related technical assistance to Tanzania. It is also stated here that full or partial title and ownership of equipment purchased under the project may be transferred to the national counterparts and/or project beneficiaries during the project implementation as deemed appropriate by the UNIDO Project Manager in consultation with the project stakeholders.

A.7 *Benefits*. Describe the socioeconomic benefits to be delivered by the project at the national and local levels. How do these benefits translate in supporting the achievement of global environment benefits (GEF Trust Fund) or adaptation benefits (LDCF/SCCF)?

Benefits at national level

Through this GEF project, the use of charcoal for cooking purpose in Dar es Salaam will be considerably replaced with more sustainable and clean ethanol cooking fuel. This will decrease the over-dependence on unsustainable biomass and simultaneously increase the use of non-polluting, less GHG emitting and sustainable fuel for the country's cooking energy needs. This will also reduce the stress on woodlands and forests for collection of fuel wood for charcoal production. At national level, it helps in reducing the deforestation rate and GHG emissions due to energy consumption. As per the project targets, the charcoal reduction through the intervention is estimated to be around 0.3 million tons/year. This reduction will potentially save around 37,500 ha⁷⁰ of forest land each year from being exploited for charcoal production. Thus, this project translates in supporting the achievement of global environment benefits by supporting transformational shifts towards a low-emission and resilient development path by use of ethanol in place of charcoal.

New skills in ethanol production or in manufacturing of cook stoves will be learnt by the semi-skilled and skilled labourers. New business opportunities will be opened up for NGOs, women self-help groups and such organizations in manufacturing, marketing and retailing of cook stoves. It is estimated that the intervention will create 1,000 job opportunities directly through supply chain networks and 4,000 employments indirectly by supporting the supply networks. It is expected that employment opportunities will be created in the following sectors as a result of this project:

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

The proposed project will also look at underutilized agro feedstock such as molasses (from the existing sugar industries), cashew apple, sisal waste and other seasonal fruit/agro wastes for ethanol generation thereby reducing post-harvest losses. This will also boost up the agriculture sector, as they will get additional revenues from their by-products/wastes supplied for ethanol production. All these will result in improved business opportunities and reduction in poverty levels in the country.

Benefits at local level

The project will revolutionize the cooking sector that will simultaneously improve health, lifestyle, economic and social status of millions of women and children. The end users will benefit from the improved lifestyle with smoke free kitchens and homes. The average particulate matter concentration in the kitchens will be reduced from 575.4 to 109 $\mu\text{g}/\text{m}^3$ (WHO standard: 50 $\mu\text{g}/\text{m}^3$) which is around 80% reduction. The CO concentration in households using ethanol fuel will be dropped from 35 mg/m^3 to 3.5 mg/m^3 (Zanzibar pilot study) which is around 90% reduction. This is significantly below the World Health Organization guideline of 10 mg/m^3 . This will provide a safer environment to women and children. Thus, approximately 500,000 women and 1 million children in households in Dar es Salaam will directly benefit from the project once the project targets are achieved. On the whole, it will result in improved health of around 2 million people in Dar es Salaam⁷¹. Quickcooking will allow women to get more productive hours per day that can contribute to increasing the family income and leading to poverty reduction. Dependence on charcoal fuel is reduced thus preventing households from price fluctuations and availability of charcoal during rainy seasons. Thus, the proposed project will add values or additional benefits in each section of its production and supply chain.

⁷⁰ 1 million tons of charcoal use results in 109,500 ha of forest loss. (Environmental Burden of Charcoal Production and Use in Dar es Salaam, Tanzania, 2011)

⁷¹ 4 persons per household in Dar es Salaam (Tanzania Population Census 2012)

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A.8 Knowledge Management. Elaborate on the knowledge management approach for the project, including, if any, plans for the project to learn from other relevant projects and initiatives (e.g. participate in trainings, conferences, stakeholder exchanges, virtual networks, project twinning) and plans for the project to assess and document in a user-friendly form (e.g., lessons learned briefs, engaging websites, guidebooks based on experience) and share these experiences and expertise (e.g., participate in community of practices, organize seminars, trainings and conferences) with relevant stakeholders.

A database will be developed by SUA to manage the guidebooks, training materials and strategies on 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 NGOs/CSOs, community groups, individual firms, government agencies, industries, etc., who are interested in production, transportation and marketing of ethanol fuel and ethanol cook stoves. Apart from guidebooks and manuals, an exclusive website will be created with a user friendly interface. The website will serve as a database for ethanol production and will link with other global initiatives as well as relevant projects. Supply chain distributors will also carry out training sessions, prepare brochures, pamphlets on the benefits of ethanol usage to be distributed to the people. This will also compliment to the knowledge management activities under the proposed project.

East African Community Secretariat and UNIDO's regional centres for renewable energy and energy efficiency such as, ECOWAS (Economic Community of West African States) Regional Centre for Renewable Energy and Energy Efficiency (ECREEE), East African Centre for Renewable Energy and Energy Efficiency (EACREEE), and Southern African Centre for Renewable and Energy Efficiency (SADCREEE) will also act as knowledge hubs for knowledge sharing and exchange.

B. DESCRIPTION OF THE CONSISTENCY OF THE PROJECT WITH:

B.1 Consistency with National Priorities. Describe the consistency of the project with national strategies and plans or reports and assessments under relevant conventions such as 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 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. switching from wood fuel to charcoal, kerosene, liquefied petroleum gas (LPG), electricity, etc.

- *National Energy Policy of Tanzania (2003)*: It aimed at establishing 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 stressed 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 the 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 the 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 ethanol fuels to replace charcoal. 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 ethanol generation. This will boost up the agriculture sector, as they will get additional revenues from their by-products/wastes.
- *Intended Nationally Determined Contributions (INDCs), 2015*: Climate change projections in Tanzania indicate a consistent change in key climate variables, including warming from 0.5⁰C in 2025 up to around 4⁰C in 2100, with more warming over the South Western part of the country. Mean seasonal rainfall is projected to decrease consistently and progressively for the most parts of the country, but more significantly over the North-eastern highlands, where rainfall is projected to decrease by up to 12% in 2100. More than 70% of all natural disasters in Tanzania are climate change related and are linked to recurrent droughts and floods. Tanzania will reduce GHGs between 10-20% by 2030 relative to the BAU scenario of 138 - 153 million tCO₂e gross emissions, depending on the baseline efficiency improvements, consistent with its sustainable development agenda.

The proposed GEF project puts forth ethanol cook stove as a viable option which is efficient and less polluting than biomass based cooking and is therefore in line with all the above national strategies and plans.

C. DESCRIBE THE BUDGETED M & E PLAN:

Project monitoring and evaluation (M&E) will be conducted in accordance with established UNIDO and GEF procedures. The M&E activities are defined by Project component 4 and the concrete activities for M&E are specified and budgeted in the M&E plan. Monitoring of the project will be based on indicators (for project component 1, 2 and 3) defined in the strategic results framework given in Annex A (which details the means of verification) and the annual work plans. Monitoring and Evaluation will make use of the GEF Tracking Tool, which will be submitted to the GEF Secretariat three times during the duration of the project: at CEO Endorsement, at mid-term, and at closure.

UNIDO as the Implementing Agency will involve the GEF Operational Focal Point and project stakeholders at all stages of project monitoring and evaluation activities in order to ensure the use of the evaluation results for further planning and implementation. According to the Monitoring and Evaluation policy of the GEF and UNIDO, follow-up studies like Country Portfolio Evaluations and Thematic Evaluations can be initiated and conducted. All project partners

and contractors are obliged to (i) Make available the studies, reports and other documentation related to the project; and (ii) Facilitate interviews with the staff involved in the project activities.

The overall objective of the M&E process is to ensure successful and quality implementation of the project by: i) Tracking and reviewing the execution of project activities; ii) Taking early corrective action if performance deviates significantly from the original plans; and iii) Adjusting and updating project strategy and implementation plan to reflect possible changes on the ground results achieved and the corrective actions taken.

a. Monitoring

A detailed monitoring plan for tracking and reporting on project time-bound milestones and accomplishments will be prepared by UNIDO in collaboration with the established PSC and project partners at the beginning of project implementation and will then be updated periodically. Monitoring activities will be carried out on the basis of the periodic reports developed by the PSC with the frequency aligning to the quarterly reports.

By making reference to the impact and performance indicators defined in the Project Results Framework, the monitoring plan will track, report and review the project activities and accomplishments in relation to:

- a. Implementation
- b. Conduct of various capacity building trainings and their usefulness
- c. Level of awareness and technical capacity of relevant institutions in the ethanol based cooking technology
- d. Implementation of incentive scheme, its operation and impacts on project implementation
- e. Achievement of project targets
- f. CO₂ emission reduction resulting from the implementation
- g. Replication potential in Tanzania and SSA
- h. CO₂ emission reduction potential from other replication projects
- i. Effectiveness and usefulness of the dissemination activities such as trainings, seminars, site visits, performance reports, project website, leaflets, etc.

b. Reporting

The PMU will present a report to UNIDO every six months with detailed information on the progress of the project as per the annual implementation plan and activities that have been carried out during the period of each report. An annual report shall be submitted by the PMU at the end of each project cycle year with a summary of activities carried out over the year and will be the basis of Project Implementation Reviews (PIRs). The annual report will also cover the benefits gained and impacts made on the implementation of the project. In addition, the report will include the evidence to demonstrate the progress made in the achievement of the indicators highlighted in the Project Results Framework.

c. Evaluation

The project will be subjected to mid-term and final evaluations. The project will be monitored from the beginning and a mid-term evaluation will be carried out at the end of the 2.5years of the GEF project and follow up corrective actions will be taken. This evaluation will focus on various activities of the project such as development of market networks, cook stove manufacturing units, installation of ethanol distilleries, assessment of the effectiveness of the trainings, establishment of training centre, issuance of subsidies, etc. carried out until the that time.

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 to capacity development and the achievement of global environmental benefit goals. The final evaluation will also provide recommendations for follow-up activities. Table 6 provides the tentative budget summary for the total evaluation, which has been included in Project Component 4.

Table 6: GEF M&E budget

Activity	GEF (USD)	Co-financing (USD)	Responsible party
Mid-term evaluation	30,000	20,000	<ul style="list-style-type: none"> • Independent M&E expert to provide feedback to the PMU • PMU submits the final inputs / reports to the UNIDO Project Manager
Final evaluation	35,000	25,000	Independent M&E expert for submission to UNIDO Project Manager
Conduct of lessons learning and information dissemination workshops, publications and websites	15,000	45,000	National consultants

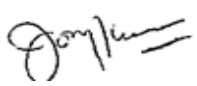
Legal Context

The Government of the United Republic of Tanzania agrees to apply to the present project, mutatis mutandis, the provisions of the Standard Basic Assistance Agreement between the United Nations Development Programme and the Government, signed and entered into force on 30 May 1978.

PART III: CERTIFICATION BY GEF PARTNER AGENCY(IES)

A. GEF Agency(ies) certification

This request has been prepared in accordance with GEF policies⁷² and procedures and meets the GEF criteria for CEO endorsement under GEF-6.

Agency Coordinator, Agency Name	Signature	Date (MM/dd/yyyy)	Project Contact Person	Telephone	Email Address
Mr. Philippe R. Scholtès, Managing Director, Programme Development and Technical Cooperation, UNIDO-GEF Focal Point		08/31/2017	Josy Thomas, Project Manager, PTC/ENE/RRE	+43-1- 26026- 3727	j.thomas@unido.org 

⁷²GEF policies encompass all managed trust funds, namely: GEFTF, LDCE, SCCF and CBIT
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ANNEX A: PROJECT RESULTS FRAMEWORK (either copy and paste here the framework from the Agency document, or provide reference to the page in the project document where the framework could be found).

Project Narrative		Objectively verifiable indicators				
		Indicator	Baseline	Target (quantified and time-bound)	Source of verification	Risks and Assumptions
Goal	Production and use of fuel grade ethanol and its use in cooking sector	<ol style="list-style-type: none"> 1. Number of households switched to ethanol cook stoves 2. tCO₂ emission reduced 	<ol style="list-style-type: none"> 1. Cooking sector depends mainly on wood and charcoal based cooking 2. Around 9.6 million tCO₂e emission per year from overall energy consumption in country 	<ol style="list-style-type: none"> 1. Retail at least 500,000 ethanol cook stoves to households 2. Make available supply of 90 million litres ethanol per year 3. Achieve 8,839,891 tCO₂e of emission reduction directly (through 500,000 ethanol stoves) 4. Achieve 17,679,782 t CO₂e of emission reduction indirectly (through replication plants) 	<ol style="list-style-type: none"> 1. Physical verification at the households, ethanol distilleries and cook stove plants 2. End of project M&E report 	Support from Government and private investors
Objective of the project	To promote ethanol as alternative clean fuel for cooking in the United Republic of Tanzania	USD investment in development of supply market, ethanol production and cook stove plants	Low level of existing ethanol production in the country and no existing market for fuel grade ethanol	At least approximately USD 14.5 million investment in ethanol production and cook stove market	<ol style="list-style-type: none"> 1. REA reports 2. End of project M&E report 	Support from Governments, VPO-DoE, MEM, MITM, and private investors
Project Component 1: Capacity development						
Outcome 1	Improved capacity for market development on fuel grade	<ol style="list-style-type: none"> 1. Creation and operation of the special centre for improving 	Insufficient human and institutional capacity in large scale program roll out, fuel grade ethanol	<ol style="list-style-type: none"> 1. Establish the centre at SUA within first six months from the start of the GEF project 2. Undertake capacity building 	<ol style="list-style-type: none"> 1. Physical verification of the centre 2. Training reports 	Continuous support from Government, training participants and SUA

Project Narrative		Objectively verifiable indicators				
		Indicator	Baseline	Target (quantified and time-bound)	Source of verification	Risks and Assumptions
	ethanol production and usage	<p>the human and institutional capacity</p> <p>2. Number of trained personnel by the centre</p>	production and its usage	activities to at least 100 beneficiaries	3. End of project reports	
Output 1.1.1	Capacity developed on implementation of large scale roll out program	<p>1. Creation and operation of the centre</p> <p>2. Number of trainings organized</p>	Lack of awareness and knowledge among stakeholders in implementing large scale roll out program	<p>1. Creation and operation of the centre within 6 months of the GEF project start</p> <p>2. Educate and train at least 100 personnel cumulatively from key policy makers, regional officials and other target groups.</p> <p>3. At least 10 women policy makers to be trained</p>	<p>1. Physical verification of centre</p> <p>2. Records of trainings conducted</p> <p>3. End of project M&E report</p>	Continuous support of the SUA and Government of Tanzania
Output 1.1.2	Technical capacity established on local ethanol stove manufacturing	<p>1. Number of trainings organized</p> <p>2. Number of persons trained</p>	No existing practice of local ethanol cook stove manufacture	<p>1. Conduct at least 5 trainings. At least one qualified woman trainer will be engaged.</p> <p>2. Prepare training materials, guidelines, manuals, study materials, etc.</p>	<p>1. Training materials, guidelines, manuals, study materials, etc.</p> <p>2. End of project M&E report</p>	Continuous support of the key policy makers, SUA and other stakeholders
Output 1.1.3	Technology transfer achieved for ethanol production through micro	1. Number of workshop conducted and engineering service companies/entr	No existing practice of ethanol production from micro distilleries.	<p>1. Conduct at least 5 workshops. At least one qualified woman trainer will be engaged.</p> <p>2. Train at least 10 engineering service</p>	<p>1. Records of workshop conducted</p> <p>2. Training materials, guidelines, manuals, study materials, etc.</p>	Continuous support of the key policy makers, SUA and other stakeholders

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Project Narrative		Objectively verifiable indicators				
		Indicator	Baseline	Target (quantified and time-bound)	Source of verification	Risks and Assumptions
	distilleries	<p>preneurs trained</p> <p>2. Available guidebooks, manuals on micro distilleries adapted to Tanzania conditions</p>		<p>companies/entrepreneurs</p> <p>3. Prepare guidelines for feasibility study and business plan to develop micro distilleries</p>	3. End of project M&E report	
Project Component 2: Policy framework development for promoting ethanol based cooking						
Outcome 2	Conducive policy and regulatory environment in place	Standards for fuel ethanol and ethanol cook stoves created and ethanol supply regulation in place	No existing policy or standards for fuel ethanol and ethanol cook stoves	<ol style="list-style-type: none"> 1. National standards for fuel grade ethanol formulated 2. National standards for ethanol cook stoves formulated 3. Compliance testing facilities established 4. Ethanol supply schedule for project requirement prepared 5. Maximum retail price of ethanol is kept under control 	<ol style="list-style-type: none"> 1. National standards manual for fuel grade ethanol 2. National standards manual for ethanol cook stoves 3. Physical verification of compliance testing facilities 4. Report on ethanol supply chain schedule and price regulations 5. End of project M&E report 	Continuous support of Government, TBS and SUA
Output 2.1.1	National safety & quality standards formulated for fuel grade ethanol and	Standards developed by TBS for fuel grade ethanol and ethanol cook stoves	No existing standards for fuel ethanol and ethanol cook stoves	<ol style="list-style-type: none"> 1. National standards manual for fuel grade ethanol 2. National standards manual for ethanol cook stoves 	<ol style="list-style-type: none"> 1. Reports on standards for fuel grade ethanol and cook stoves 2. End of project M&E report 	Sustained support from government, key policy makers, TBS and SUA

Project Narrative		Objectively verifiable indicators				
		Indicator	Baseline	Target (quantified and time-bound)	Source of verification	Risks and Assumptions
	ethanol cook stoves					
Output 2.1.2	Compliance testing facilities strengthened	Quality test certifications provided to ethanol stove models and fuel grade ethanol	No guideline or facility to certify the quality of ethanol stove models and fuel grade ethanol	1. Guidelines prepared on set up and operation of compliance testing facilities 2. At least 2 compliance testing facilities established in TBS and SUA	1. Guidelines report for compliance testing facilities 2. Physical verification of compliance testing facilities 3. Certification reports provided to ethanol cook stove models and fuel grade ethanol	Sustained support from government, TBS, SUA, other national and international experts
Output 2.1.3	Ethanol supply scheduling system developed	Guidelines prepared to monitor fuel grade ethanol supply chain	No existing authority or scheme to monitor fuel grade ethanol supply	Work plan prepared to ensure fuel grade ethanol supply to be in line with project targets	1. Ethanol supply scheduling system report 2. End of project M&E report	Sustained support from government, key policy makers, MEM and EWURA
Output 2.1.4	Maximum retail price regulation designed for fuel grade ethanol	Market price of fuel grade ethanol within the regulations	Absence of regulatory mechanism for fuel grade ethanol price control	Maximum retail price regulation for fuel grade ethanol formulated	1. Maximum retail price regulation report 2. End of project M&E report	Sustained support from government, key policy makers and EWURA
Project Component 3: Roll out of ethanol based clean cook stove program						
Outcome 3.1	Design of market intervention and strategy for implementation	1. Incentive scheme ready and bidding process completed for selection of	No strategy in place to develop ethanol cook stove market	1. Incentive scheme for ethanol cook stove formulated 2. Technical specifications, bidding documents	1. Report on incentive scheme for ethanol cook stove 2. Published bidding documents 3. Bids received from	Support from Government and private investors

Project Narrative		Objectively verifiable indicators				
		Indicator	Baseline	Target (quantified and time-bound)	Source of verification	Risks and Assumptions
	n in Dar es Salaam	contractors 2. Number of contractors selected for cook stoves supply and supply chain distribution		prepared and published 3. Bidding process completed and selection of contractors for cook stoves supply and supply chain distribution	contractors selected for cook stoves supply and supply chain distribution	
Output 3.1.1	Incentive scheme designed for ethanol cook stove retailing	Incentive scheme and its funding sources	No mechanism to incentivize cook stove manufacturers	Incentive scheme designed to cover 500,000 cook stoves	1. Report prepared on incentive scheme 2. End of project M&E report	Sustained support of Government and private investors
Output 3.1.2	Technical specifications, bidding documents, etc. prepared and participating distributors and stove suppliers selected	Identification of participating distributors and cook stove suppliers	No cook stove suppliers or supply chain distributors available	1. Preparation of tender document and publishing of tenders 2. Contractors selected (2 or 3) for stove supply 3. Contractors selected (3 or 4) for supply chain distribution	1. Technical specification prepared for ethanol stoves and fuel 2. Published tender document and bids received 3. Bids received from contractors selected for cook stoves supply and supply chain distribution	Sustained support of Government and private investors
Outcome 3.2	Large scale rollout of 500,000 ethanol cook stoves and market for 90 million litres/year of ethanol fuel	1. Number of ethanol cook stoves retailed 2. Local production of fuel ethanol and local manufacturing	1. No practice of fuel ethanol for cooking in households 2. No existing marketing networks available for ethanol fuel	1. Ethanol cook stoves manufactured and retailed (around 500,000 nos.) 2. Annual supply of 90 million litres of fuel ethanol made available 3. Market network available to cover 500,000	1. Physical verification of operating ethanol distilleries 2. Physical verification of the ethanol cook stove manufacturing units 3. Physical verification at end users/households	Support from Government and investment from private investors

Project Narrative		Objectively verifiable indicators				
		Indicator	Baseline	Target (quantified and time-bound)	Source of verification	Risks and Assumptions
	supply created	of ethanol cook stoves started	and ethanol cook stoves	households	4. End of project report	
Output 3.2.1	Establishment of ethanol fuel/cook stove supply chain network facilitated contractually to cover 500,000 households	Availability of ethanol fuel and cook stoves for easy purchase by end users	No existing ethanol fuel or cook stove marketing network	<ol style="list-style-type: none"> 1. Development of market network by each contractor for around 150,000 households as per agreement 2. 4.5 million USD incentive provided for cook stove retailing 3. Participation of minimum 10 co-operatives, SACCOS, NGOs, etc., in market network 4. At least 3 women self-help groups involved in market network 	<ol style="list-style-type: none"> 1. Field visit to sale outlets 2. Ethanol fuel supply records 3. Ethanol cook stove sale records 4. Availability of after sale services in focus regions 	Sustained support from Government, ministries and selected supply chain distributors
Output 3.2.2	Supply of 500,000 ethanol cook stoves established contractually	Availability ethanol cook stoves for purchase by supply chain distributors	No existing ethanol cook stove supply sources	<ol style="list-style-type: none"> 1. Investment made by cook stove suppliers to provide 500,00 cook stoves either through local production or import 2. At least 4 million USD investments made in local ethanol cook stove units 	<ol style="list-style-type: none"> 1. Physical verification to cook stove manufacturing units 2. Quantity of cook stoves supplied to project households 3. End of project M&E report 	Continuous engagement of supply chain distributors, cook stove suppliers, ethanol distilleries
Output 3.2.3	Local investments stimulated in ethanol distilleries	Investments made in establishing local ethanol distilleries	No market demand for fuel ethanol for cooking purpose	<ol style="list-style-type: none"> 1. At least 6 million USD investments made in local ethanol production. 2. Around 75,000 lpd of ethanol production units 	<ol style="list-style-type: none"> 1. Physical verification to ethanol production plants 2. Quantity of ethanol supplied to project households 	Continuous engagement of supply chain distributors, cook stove suppliers, ethanol distilleries

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Project Narrative		Objectively verifiable indicators				
		Indicator	Baseline	Target (quantified and time-bound)	Source of verification	Risks and Assumptions
	(micro/medium/large scale) through market demand of 90 million litres per year	(micro/medium/large scale)		established	3. End of project M&E report	
Project component 4: Monitoring and Evaluation (M&E)						
Outcome 4.1	Effectiveness of the outputs assessed, corrective actions taken and experience documented	Achievement of global environmental benefits and socio-economic benefits	No evaluation system in place to monitor and track project benefits	Independent mid-term and final evaluation to capture the impact and sustainability of results	Mid-term and final evaluation report	Continuous support from GEF, Government, stakeholders and international experts
Output 4.1.1	Mid-term M&E report prepared	Progress made in project targets, deviations and investments made	No evaluation system in place to monitor and track project benefits	Independent mid-term evaluation to capture the impact and sustainability of results	Mid-term evaluation report	Continuous support from GEF, Government, stakeholders and international experts
Output 4.1.2	End of project M&E report prepared	Achievement of project targets and improvement in gender mainstreaming	No evaluation system in place to monitor and track project benefits	1. Independent final evaluation to capture the impact and sustainability of results 2. Conduct of dissemination workshops	1. Final evaluation report 2. Dissemination workshops materials	Continuous support from GEF, Government, stakeholders and international experts

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

S. No.	Comments	Response	Reference in CEO document
Comments from STAP			
1.	The objective of this project is to promote bio-ethanol as an alternative clean cooking fuel for Tanzania. Given that more than 80% of Tanzanians depend on biomass as their major energy source, this type of project is worthwhile.	The project objective remains the same – to promote ethanol based clean cooking solution in Tanzania. The project target is revised from 28,000 cook stoves to 500,000 cook stoves. The local ethanol production target is revised from 120,000 lpd to 75,000 lpd. This revision was done through consultations with all stakeholders and from the Stakeholder Validation Workshop conducted in July 2016 taking into consideration that Nearly 75% of the households in Dar es Salaam depend on charcoal based cooking.	Please refer to the following sections of this CEO Endorsement document: Table in page 5, Fig. 3 on page 11
2.	Market development for this clean cooking fuel requires capacity building of staff from institutions and key government policy makers. Standards for producing the fuel and stoves are required given they will be manufactured locally. Partnerships, promotion and business networks will be encouraged.	<p>Capacity building is planned for all relevant stakeholders specially focussed on implementation of large scale roll out strategy. The focus group would involve ministries, policy makers, ethanol cook stove suppliers/manufacturers, supply chain distributors, ethanol suppliers, sugar mill owners, interested entrepreneurs on micro-distilleries, national experts, renewable energy (RE)/technical institutions, banks/financial institutions, engineering companies, Non-Governmental Organizations (NGOs)/Civil Society Organizations (CSOs), etc. Capacity building also includes local ethanol production and cook stove manufacturing. SUA is selected as the centre for such sustained capacity building activities.</p> <p>There are no existing standards for ethanol based cook stove and fuel grade ethanol in the country. Standards and specifications will be developed under responsibility of TBS.</p> <p>Cook stove suppliers, fuel grade ethanol suppliers and supply chain distributors will be selected through international bidding process. Contract agreements will be signed with selected bidders to supply stoves and ethanol to achieve project targets.</p> <p>This project is built through Private Public Partnership (PPP) for promoting fuel ethanol for cooking and establishing excellent enabling environment through business network for the sustainability of the project.</p>	Please refer to the following sections of this CEO Endorsement document: Project Component (PC) 1 on pages 18-20; PC 2 on pages 20 - 21 ; PC 3 on pages 21-27; and Fig. 4 on page 18.

S. No.	Comments	Response	Reference in CEO document
3.	A major share of the funding (around 70% of the total) is to come from ethanol producing distilleries. Yet these have not yet been identified, and therefore it can be assumed there is no commitment. There seems little benefit from proceeding with the project until these partners are in place.	As per the Market Enabling Framework as detailed in PC 03, contract agreements will be made with cook stove suppliers, fuel grade ethanol suppliers and distributors at the start of project implementation to make the required investment as per project design. Co-financing commitment has been sourced from Vice President's Office, Department of Energy and private investors, which will serve as loan and incentive scheme which will stimulate the market. Other partners are very much interested and had been enquiring and following up regarding the project commencement.	Please refer to PC 3 on pages 25-27.
4.	There is no doubt that replacing fuel wood or charcoal with ethanol fuel will reduce deforestation (and hence national GHG emissions), improve health through cleaner burning stoves, and reduce the drudgery of fuel wood collection. The cost of charcoal or kerosene versus ethanol for cooking in urban areas is not known. Resulting reductions in black carbon – a short-lived climate pollutant – will also contribute to climate mitigation.	<p>The cost comparison of various cooking fuels is provided in Table 3: Tanzania cooking cost scenario in page 11 of this CEO document. The analysis of cost aspects is also provided in Chapter 3 of "Tanzania bio ethanol cooking programme design & GEF proposal inputs" (Annex J). As per these comparisons, ethanol based cook stove are the best alternatives compared with LPG and kerosene. The price of cook stoves and fuel grade ethanol under this project are also fixed competitively based on these analyses only.</p> <p>Black carbon is part of the particulate matter (PM) emitted from burning charcoal. Benefits of its reduction helps in reduced indoor air pollution and improved health benefits. These are stated in section 'A.7 Benefits'.</p>	<p>Please refer to the following sections of this CEO Endorsement document:</p> <p>Table 3 on Page 12 and Section A.7 on pages 39-40.</p>
5.	The sugarcane industry is mature and there has been some interest in producing ethanol, as well as sugar as co-products. Other sources of ethanol from the fermentation of sugars, exist, including from crop waste products such as cashew nut "apples". The production of ethanol is relatively straight-forward, though capacity building will be required, an integrated policy framework established and strict legal controls put in place in production plants to avoid the distilled ethanol being taken out of the plant and taken as an alcoholic drink. Having many micro-distilleries will be a challenge to police the potential harmful use of ethanol to both individuals and society. Local stove manufacture is also a commendable goal.	<p>As stated in PC 03, the proposed project will sign contract agreements with selected fuel grade ethanol suppliers who will be responsible to make available the required quantity of fuel grade ethanol for the project. They may procure fuel from large ethanol distilleries in sugar factories, medium or micro scale distilleries based on cashew apples, sisal wastes, etc. and through imports. Once the local ethanol production capacity is increased and starts to supply for the project, the import requirement would be decreased.</p> <p>The ethanol supplied will be denatured to make it unfit for consumption or other purpose. Thus, it will be made sure that the ethanol procured for this project is not used for any other purpose. MEM will have a monitoring over this production and supply of fuel grade ethanol in the market.</p> <p>The project plans to have standards for fuel grade ethanol and the fuel coming to the market under this project will be stamped by TBS.</p> <p>Local ethanol cook stove manufacture is encouraged through capacity building and investment activities described in outputs 1.1.2 and 3.2.2.</p>	<p>Please refer to pages 21-27 of this CEO Endorsement document.</p> <p>Refer to Fig. 4 on Page 18 and paragraph 3 of page 17.</p>

S. No.	Comments	Response	Reference in CEO document
6	<p>The project will only be successful if the ethanol stove designs are preferred by the women folk. Based on those who have used it in UNIDO's recent pilot study, there appears to be a positive response. Lessons have been learned from other improved solid fuel, cook-stove programmes. This study forms the baseline. The engineering department of the University of Dar-es-Salaam will become the centre for capacity development programmes after staffs have been provided with suitable training and a research and teaching centre established. Policy makers, sugar mill staff, bankers, financiers, and entrepreneurs will be offered training in both fuels and stoves. Technical standards will also be formulated. However, since ethanol stoves have been commercially available for a decade or more, much information exists elsewhere and this should be reviewed (e.g., http://www.climatetechwiki.org/technology/cook_ethanol) On sustainability issues for the biomass, this may provide a useful guide even though it targets transport fuels (STAP, 2014): http://www.stagef.org/stap/wp-content/uploads/2015/04/Biofuels_March13_final.pdf</p>	<p>Noted. SUA will be the centre for all training and capacity building activities of the proposed project now. The technical standards will be developed for cook stoves and fuel grade ethanol by TBS. TBS will take into consideration all the existing standards available in international and regional level before formulation of the standards.</p> <p>The existing knowledge base on ethanol cook stoves was reviewed and taken into consideration. Project Gaia which is mentioned in the referred link (http://www.climatetechwiki.org/technology/cook_ethanol) is one of the partners in the pilot study and stakeholder in this project. The sustainability issues such as fuel security, technology selection, etc., (as stated in http://www.stagef.org/stap/wp-content/uploads/2015/04/Biofuels_March13_final.pdf) have been carefully studied and considered in design of the market enabling framework of the proposed project.</p>	<p>Please refer to pages 15-17 of this CEO Endorsement document.</p> <p>Refer to Fig. 5 on page 22.</p>
7.	<p>Although the projected stove price is given, there is no comparison of overall annual costs for a household between the options (charcoal, kerosene, fuel wood etc.). Surely this is a basic piece of information needed in order to produce policies. Also with mass production, will the present stove cost decline?</p>	<p>The cost comparison of various cooking fuels is provided in Table 3: Tanzania cooking cost scenario in page 12 of this CEO document. The analysis of cost aspects is also provided in Chapter 3 of “Tanzania bio ethanol cooking programme design & GEF proposal inputs” (Annex J). As per these comparisons, ethanol based cook stove is the best alternative when compared to LPG and kerosene. In addition, the price of cook stoves and fuel grade ethanol under this project are fixed competitively based on this analysis only.</p> <p>The proposed project also provides an incentive of USD 9 per stove as detailed under output 3.1.1. This will help to keep the price of ethanol cook stoves competitive when compared with LPG and kerosene stoves.</p> <p>It is expected that the mass production and local manufacturing of stoves will result in the decline of stove cost during actual implementation.</p>	<p>Please refer to pages 19-24 of this CEO Endorsement document.</p>

S. No.	Comments	Response	Reference in CEO document
8.	<p>Overall GHG emission reduction of 2.4 MtCO₂-eq is sound based on assumptions given. Ethanol stove efficiency used of 43% is not referenced; it seems low. Also, not included is the CO₂ emitted during the production of charcoal. As for all biomass, C emissions depend on whether the source of wood is replanted/replaced (in which case it can be assumed to be near C-neutral) or whether it arises from deforestation activities (which can result in double counting is include LULUCF assessment). Some clarification would be useful.</p>	<p>The emission reduction from the project has been revised based on the number of cook stoves replaced. Each household is estimated to use around 1.6 kg of charcoal per day. Calorific value of charcoal is 31.8 MJ/kg (Ref: The analysis of sustainable charcoal production systems in Tanzania, FAO) and the emission factor is 112,000 kg/TJ (Ref: 2006 IPCC Guidelines for National Greenhouse Gas Inventories).</p> <p>As discussed in section ‘A.1. Project Description’, most of the wood for charcoal production in Tanzania is obtained from deforestation of forests and woodlands. Hence, the charcoal replaced is considered non-renewable and is not carbon-neutral.</p> <p>The charcoal consumption reduction from 500,000 ethanol cook stove replacement is estimated to be 292,000 tons per year and the equivalent emission reduction is estimated to be 1,039,987 tCO_{2e} per year.</p>	<p>Please refer to Annex N (GHG emission reduction estimate).</p>
9.	<p>One risk included is from floods due to climate change. Possibly a greater risk is lack of biomass feed stocks due to future droughts –and hence a shortage of ethanol fuel. Will users be encouraged to keep their old wood burning stoves as an insurance against such an eventuality of insecure fuel supply?</p>	<p>The supply chain distributors will be responsible to ensure the ethanol supply to their consumers under the project contract agreement. They must ensure this through local procurement or import. Thus, the end users are protected against any ethanol supply shortage due floods or loss of feedstock production. In this proposed project, the end users are not required to exchange or throw out their old wood based cook stoves. They may use it in case of any extreme conditions as backup cook stove.</p>	<p>Please refer to Section A.5 on page 33 of this CEO Endorsement document.</p>
10.	<p>Efforts to promote clean cook stoves have been going on for decades. There is a wealth of information in the scientific literature as well as through currently active, global networks such as the Global Alliance for Clean Cook stoves (see http://cleancookstoves.org/). Before embarking on this project, a thorough review should be made of past and current projects similar to the one proposed here in order to glean lessons learned, enhance South – South cooperation, and ensure that information arising from this effort will be shared broadly throughout the global community in order to maximize efficiencies and avoid duplicating mistakes.</p>	<p>A thorough review of the existing literature, on-going projects and similar implemented cook stove projects was done. The lessons learnt and barriers faced by such projects were also analysed. Only after careful study and analysis of all these projects and also based on the validation workshop conducted in July 2016 in which the experiences of various stakeholders were shared, the market enabling framework for this project has been designed.</p> <p>All these are explained in chapter 2 of “Programme design & GEF proposal inputs” report which is provided as Annex J to this document.</p>	<p>Please refer to Annex H validation workshop report.</p>
<p>Comments from U.S.A. Council</p>			

S. No.	Comments	Response	Reference in CEO document
1.	<p>Given the limited supply of molasses for the production of bio-ethanol in Tanzania, the existing demands for molasses by livestock keepers, and demand for molasses as a source for power generation, we encourage UNIDO to continue to explore the feasibility of using other raw materials for bio-ethanol production (including waste from cashew apples, sisal and coffee pulp) in the event that supply of locally produced molasses is unsustainable or becomes cost prohibitive.</p>	<p>The proposed project has already taken into account the existing sugarcane production levels and molasses availability for ethanol production. In order to avoid dependence of single feedstock for ethanol production, apart from molasses, cashew apple can also be used as potential source for ethanol production. Tanzania is one of the top cashew nut exporting countries and the annual cashew apple generation in the county is around 1,000,000 tons per year. Sisal is a major crop in Tanzania and there are pilot initiatives going on to produce ethanol from sisal wastes. Various other feed stocks such as coffee pulp, seasonal fruits, etc. are also identified as potential sources for ethanol production. This has been discussed on page 13 and 14 under subsection “<i>Private sector situation</i>” of this CEO Endorsement document.</p> <p>Output 1.1.3 also discusses on the trainings related to ethanol production projects in cashew and other potential feedstock.</p>	<p>Refer to subsection “Private sector situation” on pages 13 and 14 of this CEO Endorsement document.</p>
2.	<p>While the proposal explores the barriers for uptake of improved cook stoves, it is unclear how this proposal will overcome them, particularly once the project is no longer in implementation and funds have run out. We appreciate that, based on positive results from the Zanzibar pilot study, UNIDO will collaborate with key stakeholders and partners to improve capacity for market on fuel grade bio-ethanol; improve the policy environment; promote partnerships and investments for local production of fuel grade ethanol and cook stoves; and establish market networks for bio-ethanol and bio-ethanol cook stoves. However, as the full project proposal is developed we would like to see a greater discussion of specific actions that will be taken to overcome barriers to uptake and lead to a greater success rate than other similar investments in Tanzania and elsewhere.</p>	<p>Based on the consultations with all the stakeholders, the proposed project has designed a market enabling framework to stimulate market demand, partnerships and investments into the ethanol based cooking sector in the country. A large scale roll out strategy has been designed to address and overcome most of the barriers identified. Retailing of 500,000 cook stove will create a solid partnership of supply chain industries such as suppliers, dealers, ethanol distilleries, cook stove manufacturers, etc. This will ensure sustainability of the project. Success of project will encourage other financial institutions similar to TIB to provide loans to the investors in ethanol based cooking system in the market, which would include fuel ethanol production, bottling units, fuel distributors, retailers, stove and components manufacture, etc.</p> <p>Thus, when the project is over and the funding has been utilized, there will be an established strong ethanol based cooking market with 500,000 consumers and 75,000 lpd of local ethanol production. This will drive the market for investment in fuel ethanol production, more replication and investment making more and more consumers switching to ethanol based cooking.</p>	

S. No.	Comments	Response	Reference in CEO document
3.	<p>The baseline analysis does not provide a great deal of background as to the choice of this policy outcome (“Formulation of quality standards for ethanol fuel and cook stoves was discussed as an important aspect” is the only thing I could find ...) and its relationship with existing policy reform initiatives of GoT is not that evident.</p>	<p>The statement “In most of developing countries, improved cook stove production remains a non-standardized and fragmented activity. Consumers rarely have access to information on quality, performance or safety. The absence of common stove performance protocols and standards are one of the main constraints to quality control and regulation in this informal market⁷³. The absence of high-quality cook stove testing centres is another constraint. Technical capacity to manage the centres is limited and stove-testing costs are frequently prohibitive for the small industrial manufacturers and artisans that currently produce the majority of improved stoves⁷⁴.” has been included on page 9 under section A.1 on “Global Environmental Problems, Root Causes and Barriers”, regarding the conditions, standards and performance of improved cook stoves across the countries.</p> <p>Thus, the consideration of formulation of quality standards for ethanol fuel and cook stove in the project design is justified.</p> <p>Moreover, currently, the GoT is taking initiatives under SE4ALL in which it is planning for a roll out of all clean cooking alternatives such as biogas, LPG, ethanol and natural gas (BLEN). One of the main objectives under this plan would be to ensure the quality and go for standardization of all types of cook stoves and fuels.</p>	<p>Please refer to the following sections of this CEO Endorsement document:</p> <p>Section A.1 on Page 9 subsection “Global/regional initiatives” on pages 14 and 15.</p>
Comments from Belgium Council			

⁷³<http://www.emergingmarkets.asia/consulting/news/2016/02/21/myanmar-cookstoves-market-assessment-geres/>

⁷⁴<https://openknowledge.worldbank.org/bitstream/handle/10986/21878/96499.pdf>

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S. No.	Comments	Response	Reference in CEO document
1.	<p>The proposed GEF project is certainly relevant. Cooking on wood (biomass) is a major source of CO₂ emissions in Sub-Saharan Africa, and a major cause of deforestation. In Tanzania, the use of biomass is with 85% (especially for food preparation) by far the largest source of energy consumption. The GEF project, by introducing 'bio fuel stoves' aims at reducing the use of 'charcoal stoves'. Charcoal is usually produced in Tanzania illegally and in an inefficient way (in which a large part of the energy is lost during the production). The 'deforestation rate' in Tanzania is 1.1% per year, twice the world average. Every year, Tanzania is losing 300,000 to 400,000 hectares of forest. As mentioned in the project proposal, this is 70% directly or indirectly due to logging for fuel. Increasing deforestation causes net CO₂ emissions, and has implications for soil erosion, biodiversity, etc.</p>	UNIDO appreciates comments 1-5 from Belgium Council.	
2.	<p>Tanzania currently has 45 million inhabitants (2012 census), with growth of 2.7% per year. According to UNFPA, the population will rise to 90 million in 2038 (a doubling in 25 years!). Moreover, an increasing proportion of this population migrate to the cities, where they switch from wood fires to charcoal fire, so with an increased CO₂ emission per capita as a result.</p> <p>Due to the strong population growth, Tanzania will likely cross natural limits, with dire consequences for the development of the country. An alternative to unsustainably produced charcoal is therefore urgently needed. If one wants to make the most necessary transition to a sustainable and low carbon economy, then the transition from (unsustainably harvested) biomass to more sustainable energy sources for food preparation is one of the best ways to do this.</p>		

S. No.	Comments	Response	Reference in CEO document
3.	If this project succeeds in its intent, then this does not only have positive effects for the environment, but also in terms of gender. "Indoor air pollution is an important source of respiratory diseases, primarily for women. The 'bio fuel stoves' offer in this respect a great improvement. As far as the 'bio fuel stoves' replace classic wood stoves, women and girls will not have to be searching for firewood.		
4.	The proposal describes in a credible way the opportunities in Tanzania to produce bio fuel from residual products from other economic activities (mainly sugar cane and sisal). It is very positive that no new land will be used for organic crops.		
5.	The proposal pays attention on the economic incentives in the whole 'bio fuel value chain'. The proposal makes a thorough analysis of fuel consumption by rural and urban population, and the economic aspects. The proposal also shows that the use of 'bio fuel stoves' can enter into direct competition with 'charcoal stoves', since the fuel cost is approximately equal.		
6.	However, in the economic analysis an important element, namely, the increasing share of natural gas in the Tanzanian economy and its impact on the price of domestic fuel, is missing. Tanzania is working to develop the gas fields in its coastal waters, and the chances are that this natural gas will be increasingly used for household applications. It remains to be seen what the price of natural gas for consumers will be, but if it were to come close to the price of 'bio fuels' then this may jeopardize the success of the project.	<p>A preliminary feasibility study was conducted by Tanzania Petroleum Development Corporation (TPDC) to install pipelines from Lindi and Mtwara region to Dar es Salaam for supplying natural gas for cooking purpose to 30,000 households. But the investment required for laying the natural gas pipeline network to Dar es Salaam works out to be very high. The project may not be materialized in near future as TPSC is looking for international investments for the project.</p> <p>This proposed project has been developed based on the positive outcome of the pilot study on bio ethanol as an alternative clean cooking fuel in Zanzibar Island and the recommendation to scale –up the project to other regions of Tanzania.</p>	Refer to subsection “National initiatives” on page 14
7.	A thorough analysis of the socio-cultural factors relevant for the switch to 'bio fuel stoves' is	The revised program design has taken into consideration the socio-cultural factors for switch to bio-fuels. In the revised design, the ethanol cook stoves	Refer to output 3.2.1 on page 25.

S. No.	Comments	Response	Reference in CEO document
	<p>lacking. As the project itself indicates there have already been many projects in the past (in Tanzania and throughout Africa) trying to promote 'improved cook stoves'. Despite the economic rationale behind these projects, these have never been successful as one might expect. This is partly due to a different view of the population at the expense of fuel, specific requirements for the preparation of local food, and social aspects. A wood stove also provides heat and light, which a bio fuel stove does a lot less. A bio fuel stove might heat up fast, but might be less suitable to keep food warm for a long time. It would be good if the project proposal could analyse this more thoroughly, especially since it was precisely this socio-cultural aspects that jeopardized the success of previous projects. The project should provide enough opportunity for monitoring and adjustment if necessary. In the current proposal, it is assumed that this problem is merely a matter of training and awareness to convince the population of the economic benefits of the new stoves while previous projects have proven repeatedly that it is often much more complex than that. Focus on 'lessons learned' would be good.</p>	<p>will be promoted by different supply chain distributors who will work closely with the end users. They will be offering products as per requirements of end users in their region. They will also conduct regular capacity building activities such as road shows, exhibitions, door step demonstrations to end users. Such initiatives will help in overcoming the socio-cultural factors relevant for the switch to ethanol fuel stoves.</p>	
8.	<p>The proposal indicates that previous projects in Tanzania had introduced 'improved cook stoves', but it does not mention initiatives in which one follows the approach of this GEF project, namely encouraging production and use of 'bio fuels'. Have similar projects (bio fuel stoves) been implemented in Tanzania or elsewhere in Africa and were they successful? Or is this a pilot project?</p>	<p>A pilot study for fuel-switch initiative on bio-ethanol for cooking in approximately 150 households has been implemented in Zanzibar. The response to the pilot study has been overwhelmingly positive. Also, similar pilot studies have been carried out in Ethiopia, South Africa, Nigeria, and Madagascar.</p>	<p>Refer to subsection "UNIDO pilot study" on pages 15 - 16.</p>
9.	<p>The project apparently has no geographical focus. The project aims to introduce 28.000 ethanol 'cook stoves' in urban, peri-urban and rural areas. This should be specified better. As the economic analysis indicates, bio fuel stoves can compete with charcoal</p>	<p>The project targets the households in Dar es Salaam. Nearly 75% of the households in Dar es Salaam use charcoal for cooking. Also, as an initial step, the middle income households will be ideal target end users for promotion of ethanol cooking solutions. Therefore, Dar es Salaam has been selected as the geographical focus region as per discussions at the validation workshop</p>	<p>Refer to subsection "The project" on page 17 and Annex H of this CEO Endorsement</p>

S. No.	Comments	Response	Reference in CEO document
	stoves (about the same cost). However, bio fuel stoves remain more than twice as expensive as firewood, so the chance that this catches on in rural areas seems to be a lot less. 28,000 cook stoves cannot cover the entire country, especially because the continued availability of the bio fuel (a part of the project) plays an important role in the purchase of a stove. It seems therefore advisable to refer to a number of 'hotspots' where this value chain will be introduced.	conducted in July 2016.	submission package
10.	On P.13 it is proposed that the GEF project may subsidize the bio fuel price until the government has a "comprehensive policy" for the promotion of bio-ethanol. The Tanzanian government will probably have no problem to add yet another 'policy' to the long list of 'policies' and 'strategies' which they already have, but implementation on the ground is often late in coming. Initial subsidizing bio fuel risks that the project at the end collapses , and might bring people in another similar project to even more hesitate to invest in an (expensive) bio fuel cook stove.	<p>The point is well considered. That is the reason the project strongly follows the PPP model with a holistic approach of establishing a balanced supply and demand for the ethanol fuel for household cooking by bringing in the availability of ethanol based cook stoves as well. The market for the fuel and the stove would go hand-in-hand for the sustainability of the project. Ensuring the availability of the fuel is the lookout of the stove suppliers. Meanwhile, local production of fuel ethanol is also encouraged in this project by creating an enabling environment. This will reduce the price of the fuel as well as the stove in due course of time and will reduce the burden of the government in subsidising the prices in the future.</p> <p>FYI, roll out of alternative clean cooking solutions is also one of the major objectives of Tanzania under SE4ALL programme initiative.</p>	Refer to subsection "Global/regional initiatives" on pages 14 and 15 of this CEO ER document
11.	The proposal states that the project will result in a reduction of CO₂ emissions of 582,340 tonnes of CO₂ (p.15). This is a rather theoretical best-case scenario. In the calculation, it is assumed that all 28,000 cook stoves actually be put into use, and there is no failure in the next 10 years. The GEF project lasts five years. It may be optimistic to say that the entire value chain 5 year after the end of the project will still be intact, especially if you plan subsidize bio fuels in the first five years. Moreover, this calculation is based on the assumption that the 'bio fuel stoves' will replace 100% of the 'charcoal stoves', while the project is assumed that even in rural areas bio fuel stoves will be sold, and thus replaced the less	The project mainly focusses in Dar-es-Salaam where the charcoal use is high. The emission reduction estimations are estimated as per the revised target of 500,000 cook stoves. The cook stove failure rates are also applied for conservativeness. This project would result in the reduction of 8,839,891tCO ₂ e directly for lifetime of 10 years.	Refer to section Global environmental benefits on page 28 of this CEO ER document

S. No.	Comments	Response	Reference in CEO document
	polluting wood stoves.		
12.	On p.16 and 17 it is stated that the project also has benefits for the 'indigenous People'. Who is meant by this? A big part of what we mean in Tanzania with 'indigenous people' are pastoralists such as the Maasai. It is not clear how they will benefit from this project. This should be better explained.	The project design is mainly oriented towards replacing charcoal with bio ethanol in Dar es Salaam. Hence, not much indigenous people like 'Maasai' are directly benefitted.	
13.	The ' executing partners ' are the Ministry of Energy and Minerals (MEM), and the 'Vice Presidents Office (Zanzibar and Mainland). How come the "Ministry of Natural Resources and Tourism (MNRT)" is not mentioned here? It is indeed primarily an energy project (MEM), with an impact on Climate Change (VPO), but it would be best checked with MNRT because the latter is responsible for protecting forest resources, and ensure sustainable charcoal production, if only to avoid having two similar projects competing each other.	The stakeholders have been identified and their roles are given in 'Section A.3. Stakeholders' page 30 of the revised CEO. The stakeholders will work in coordination with other departments and ministries as per project requirement.	Refer to section A.3 on page 30 of this CEO document
14.	This project will emphasize the gender aspect. By reducing 'indoor air pollution' and potential time savings because no wood must be gathered (though the latter will be limited), there is indeed a major positive impact on the lives of women. The project aims to go further than that and also involves women as entrepreneurs in the production of 'bio fuels', and clearly wants to make an effort to increase the participation of women. If it fits in the local context, this is certainly to be encouraged, but this is not demonstrated in the proposal. Probably women can and must be involved in some aspects of the value chain, but given the local culture, chances of success may be low. Consequently, some training might not address the right target group. The risk analysis cites that there may be lack of interest of women, or a lack of good candidates. This should be solved by 'gender	During the PPG phase an in-depth analysis has been conducted to address the following comments: <ul style="list-style-type: none"> • Detailed risk assessment of the project; • Gender analysis. 	Refer to section A.5. Risks on page 33 For Gender analysis: page 32 and Annex I of this CEO ER document

S. No.	Comments	Response	Reference in CEO document
	responsive communication' and 'ensure stakeholder involvement.		
15.	<p>The risk analysis is not always well developed. For example, the 'Proposed mitigation measures' (e.g. 'technical risks') are rather an observation than a measure. With 'climate change risk' is 'flooding of the project sites' listed as a risk. Some risks seem far-fetched, while other obvious elements are missing. An important missing element is the above-mentioned socio-cultural aspect. What about local customs, are the bio fuel stoves fit for the preparation of local food? How about safety? Has the new 'stove' an impact on the way of cooking? Can local customs or traditions be in the way for women to invest in a bio fuel cook stove? The answer to this last question is undoubtedly yes, so the proposal should indicate how these risks can be mitigated. Maybe a "charcoal stove" can offer other benefits that a "bio fuel stove" cannot? Maybe the investment cost for a bio fuel stove is too high, especially in rural areas? Maybe there's opposition from actors from the charcoal industry? There are so many previous projects with 'improved cook stoves' or 'solar cooking' which despite a solid economic foundation stranded on these socio-cultural factors. The value chain for bio fuels is even longer, newer and more complex than the "improved cook stoves", so may be even more likely to fail. Why are these factors not mentioned in the risk analysis?</p>		
Comments from U.S.A. Council			
1.	Regarding the countries energy plan, has it been updated since 2003? Could you please confirm that this project reflects the priorities of the most recent national energy plan?	Yes, there is a new strategic plan 2011/12-2015/16 prepared by the Ministry of Energy and Minerals (MEM). The plan identifies five strategic objectives which will be implemented to achieve MEM's vision; the proposed GEF project reflects one of the objectives (Objective C) of the plan. Objective -C "Sustainable development and management of energy resources for national	Refer to subsection "Global/regional initiatives" on pages 14 and 15

S. No.	Comments	Response	Reference in CEO document
		<p>development enhanced” aims at ensuring adequate supply of energy to increase social and economic welfare. This will be achieved by: supply of adequate and reliable energy to the Nation, particularly to the rural community; facilitating and promoting the development of energy mix (coal, natural gas, wind, solar, biomass); and promoting energy efficiency and demand side management.</p> <p>Moreover, currently, the GoT is taking initiatives under SE4ALL in which it is planning for a roll out of all clean cooking alternatives such as biogas, LPG, ethanol and natural gas. One of the main objectives under this initiative would be to ensure the quality and standard of all types of cook stoves and fuels.</p>	
2.	<p>We understand that the project plans to produce Bio-Ethanol by using molasses (a byproduct of sugar production). We have three significant questions regarding the sustainability of this investment:</p> <p>a. In Tanzania, there are four sugar mill companies that are operating fully and all of them are using the Molasses for Electric Power generation and selling to the National Electric Grid. What companies or countries will provide the molasses this project?</p> <p>b. Have you considered other raw materials as sources for the bio-ethanol?</p> <p>We believe that a person living below the poverty line in Tanzania will not be able to afford the market price of bio-ethanol. Since you are targeting low-income communities (who are currently using fire wood and charcoal), how will these communities afford to buy bio-ethanol (which costs significantly more than wood and charcoal)?</p>	<p>Two of the sugar factories (Kilombero Sugar Company and Tanganyika Planting Company) produce ethanol from their molasses. Zanzibar Sugar Factory has a distillery that produces ethanol, the factory and distillery unit is being rehabilitated to increase its production capacity. The sugar factories in Tanzania use bagasse for electricity generation.</p> <p>Yes, the proposed project is considering waste from cashew, sisal, coffee pulp, etc. as other raw materials for bio-ethanol production. Please refer to paragraph 3 and 4 of page 9 of PIF document for more clarification.</p> <p>A comparison of cooking cost using various fuels was carried out during the scoping study in Zanzibar. Ethanol fuel with the CC stove (the Clean Cook stove) is the second cheapest option. According to the data gathered through the scoping study and pilot study, ethanol has the potential to be very competitive on the fuel market. Once a market is demonstrated through incentive, local ethanol producers may be inclined to increase production and sell fuel for a more competitive price. UNIDO shared the details of the pilot study with government officials about a possible commercial scale-up, and the government is in support of it. Please find attached the Scoping and Pilot study reports.</p>	<p>The project is targeting the Dar es Salaam where the charcoal usage is highest in the country. Hence, it would be mostly the middle income group who can afford to use ethanol cooking system and the cooking systems will be at a comparative price with LPG and kerosene.</p> <p>Refer to page 17 of this CEO ER document and Annex H of the submission package.</p>
3.	<p>The PIF includes a discussion of the reasons why it has been hard to get households to use new cook stoves in the past. Could you please elaborate on how</p>	<p>Based on the positive results and uptake of bio-ethanol from the pilot study conducted in Zanzibar, the project intends to collaborate with all key stakeholders and partners to address the identified barriers. The project will</p>	<p>All the discussed points have been taken care in the revised design and</p>

S. No.	Comments	Response	Reference in CEO document
	this project will address those barriers, especially once the project financing is used up?	address the identified barriers through the following: i) Improving capacity for market development on fuel grade bio-ethanol production and usage; ii) Improving policy environment for promoting bio-ethanol; iii) Promoting partnerships and investments for local production of fuel grade ethanol and ethanol cook stoves and iv) Establishing market network for bio-ethanol and bio-ethanol cook stoves. In addition, the project will also build on the lesson learned and seek synergies from other activities related to the area of clean cooking in the country to ensure sustainability of the project.	the project would focus in the major charcoal consuming area of Dar es Salaam, where the affordability and min-set will be better for fuel switching. Refer to page 17 of this CEO ER document.
Comment from Germany Council			
1.	Germany welcomes the PIF no 9281 “Promotion of Bio-Ethanol as Alternative Clean Fuel for Cooking” in the United Republic of Tanzania. The planned intervention in the cooking energy sector is fully in line with the support of Germany to the goals of SE4All to provide access to modern cooking energy for all by 2030. Germany supports the Republic of Tanzania in the market introduction of improved solid biomass burning stoves via the global Energising Development Programme (EnDEV). The planned GEF project to support production and marketing of ethanol fuel and stoves complements the existing activities. Germany would like to emphasize the importance of coordinating with existing projects and hence requests that the proponents coordinate and harmonize the envisaged activities with the Energising Development Programme.	The aim of the project is to promote bio-ethanol as an alternative clean cooking fuel and the project will therefore focus on local production of ethanol using locally available feedstock and building a market network for bio-ethanol fuel and ethanol cook stoves. As such, this project will collaborate with all other activities related to the area of clean cooking in the country, specifically, Tanzania Improved Cook Stove (TICS) programme being implemented by Energising Development Programme (EnDev). The TICS support the development of a viable production, marketing chain and supply for ceramic stoves with the aim to diversify the production of ceramic stoves to include multi-spot charcoal ICS. During the PPG stage, UNIDO will seek synergies with EnDev and explore how ethanol cook stoves could be integrated into the diversification of stoves production in the country. In addition, the GEF project will also build on the lesson learned from the TICS and activities of EnDev to ensure sustainability of the project	Refer to section A.6. Institutional Arrangement and Coordination on page 35 and 36 of this CEO ER document.

ANNEX C: STATUS OF IMPLEMENTATION OF PROJECT PREPARATION ACTIVITIES AND THE USE OF FUNDS⁷⁵

A. Provide detailed funding amount of the PPG activities financing status in the table below:

PPG Grant Approved at PIF: 100,000 USD			
<i>Project Preparation Activities Implemented</i>	<i>GEF/LDCF/SCCF Amount (\$)</i>		
	<i>Budgeted Amount</i>	<i>Amount Spent To date</i>	<i>Amount Committed</i>
Supplemental data collection on relevant sectors/technologies (incl. of identification of policy gaps and capacity building)	10,000	8,500	1,500
Organized focus group meeting	10,000	10,000	-
Identification of implementation sites and preparation of project design, market enabling framework, feasibility study inclusive of gender assessments and environment and social management plan	50,000	41,650	8,350
Organized validation workshop	5,000	5,000	-
Preparation and finalization of CEO endorsement document (incl. of project implementation /execution modalities with relevant agencies)	25,000	21,153	3,847
Total	100,000	86,303	13,697

⁷⁵If at CEO Endorsement, the PPG activities have not been completed and there is a balance of unspent fund, Agencies can continue to undertake the activities up to one year of project start. No later than one year from start of project implementation, Agencies should report this table to the GEF Secretariat on the completion of PPG activities and the amount spent for the activities. Agencies should also report closing of PPG to Trustee in its Quarterly Report.

ANNEX D: CALENDAR OF EXPECTED REFLOWS (if non-grant instrument is used)

Provide a calendar of expected reflows to the GEF/LDCF/SCCF Trust Funds or to your Agency (and/or revolving fund that will be set up)

Not applicable

ANNEX E: PROJECT IMPLEMENTATION SCHEDULE

Activity	Year 1				Year 2				Year 3				Year 4				Year 5			
	I	II	III	IV	I	II	III	IV	I	II	III	IV	I	II	III	IV	I	II	III	IV
PC1 - Capacity development																				
1.1.1 Capacity developed on implementation of large scale roll out program																				
a) Creation of technology centre																				
b) Training provided to all stakeholders																				
c) Data collection and establishing information database																				
1.1.2. Technical capacity established on local ethanol stove manufacturing																				
a) Preparation of guidebooks, manuals and study materials																				
b) Training to entrepreneurs, renewable energy (RE)/technical institutions, banks/financial institutions, NGOs/CSOs, etc.																				
1.1.3. Technology transfer achieved for ethanol production through micro distilleries																				
a) Adaptation of available guidebooks, manuals and study materials on micro distilleries to Tanzanian conditions																				
b) Training to sugar mills, entrepreneurs, engineering service companies, banks/financial institutions, NGOs/CSOs, etc.																				
PC2 - Policy framework development for promoting ethanol based cooking																				
2.1.1. National safety & quality standards formulated for fuel grade ethanol and ethanol cook stoves																				

Activity	Year 1				Year 2				Year 3				Year 4				Year 5			
	I	II	III	IV	I	II	III	IV	I	II	III	IV	I	II	III	IV	I	II	III	IV
a) Preparation of standards for fuel grade ethanol																				
b) Preparation of standards for ethanol cook stoves																				
2.1.2. Compliance testing facilities strengthened																				
Establishing compliance testing facilities																				
2.1.3 Ethanol supply scheduling system developed																				
Work plan preparation to ensure ethanol supply to end users																				
2.1.4. Maximum retail price regulation designed for fuel grade ethanol																				
Formulation of maximum retail price regulation																				
PC3 - Rollout of ethanol based clean cook stove program																				
3.1.1 Incentive scheme designed for ethanol cook stove retailing																				
Preparation of incentive scheme																				
3.1.2 Technical specifications, bidding documents, etc. prepared and participating distributors and stove suppliers selected																				
a) Preparation of technical specifications, tender document and announcement of tender																				
b) Review of bids and selection of qualified bidders																				
3.2.1. Establishment of ethanol fuel/cook stove supply chain network facilitated contractually to cover 500,000 households																				

Activity	Year 1				Year 2				Year 3				Year 4				Year 5			
	I	II	III	IV	I	II	III	IV	I	II	III	IV	I	II	III	IV	I	II	III	IV
a) Signing agreement with selected contractors																				
b) Setting of market networks																				
c) Sale of ethanol cook stoves and ethanol fuel																				
d) Issuance of incentive for the cook stoves retailed																				
3.2.2. Supply of 500,000 ethanol cook stoves established contractually																				
a) Signing agreement with selected contractors																				
b) Quality check of cook stoves manufactured																				
c) Establishment of local cook stove units																				
3.2.3. Local investments stimulated in ethanol distilleries (micro/medium/large scale) through market demand of 90 million litres per year																				
a) Establishment of local ethanol distilleries																				
b) Quality check of ethanol produced																				
PC 4 - Monitoring and Evaluation (M & E)																				
4.1 Mid-term-M&E report prepared																				
a) Preparation of TORs and recruitment of evaluation consultant																				
b) Conduct of midterm evaluation and preparation of M & E report																				
4.2 End of project M & E report prepared																				

Activity	Year 1				Year 2				Year 3				Year 4				Year 5			
	I	II	III	IV	I	II	III	IV	I	II	III	IV	I	II	III	IV	I	II	III	IV
a) Preparation of TORs and recruitment of evaluation consultant																				
b) Conduct of final evaluation and preparation of the M & E report																				
c) Dissemination workshop, publications and websites																				
Project Management																				
a) Establishment of Project Management Unit																				
b) Development of a detailed activity plan and schedule																				
c) Establishment of Project Steering Committee																				
d) Periodic convening of PSC meeting																				
e) Monitoring and reporting																				
f) Day-to-day coordination, management and monitoring of all project activities																				

ANNEX F: REVISIONS FROM THE APPROVED PIF

Changes in Project's Framework between the approved PIF and CEO ER							
Project Component		Expected Outcome		Expected Output		GEF Fund (USD)	
In the approved PIF	CEO Document	In the approved PIF	CEO Document	In the approved PIF	CEO Document	In the approved PIF	CEO Document
1. Capacity development	Not changed	1.1. Improved capacity for market development on fuel grade bio-ethanol production and usage	Not changed	1.1.1. Institutional capacity building strengthened 1.1.2. Key policy makers, regional officials (at least 100 cumulatively) and other target groups ⁷⁶ (30 in each group) trained	1.1.1. Capacity developed on implementation of large scale roll out program 1.1.2. Technical capacity established on local ethanol stove manufacturing 1.1.3. Technology transfer achieved for ethanol production through micro distilleries	110,000	198,000
2. Policy framework development for promoting bio-ethanol production and financial incentives	Policy framework development for promoting ethanol based cooking	2.1. Improved policy environment	Conducive policy and regulatory environment in place	2.1.1. National policy on bio-ethanol production and its use for cooking as well as financial incentive developed for	2.1.1. National safety & quality standards formulated for fuel grade ethanol and ethanol cook stoves	100,000	150,074

⁷⁶Sugar mill owners, interested entrepreneurs on micro-distilleries, national experts, renewable energy (RE)/technical institutions, banks/financial institutions, engineering companies, NGOs/CSOs, etc.
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Changes in Project's Framework between the approved PIF and CEO ER							
Project Component		Expected Outcome		Expected Output		GEF Fund (USD)	
In the approved PIF	CEO Document	In the approved PIF	CEO Document	In the approved PIF	CEO Document	In the approved PIF	CEO Document
				<p>the consideration of Government</p> <p>2.1.2. National standards for fuel grade bio-ethanol and ethanol cook stoves formulated</p>	<p>2.1.2. Compliance testing facilities strengthened</p> <p>2.1.3. Ethanol supply scheduling system developed</p> <p>2.1.4. Maximum retail price regulation designed for fuel grade ethanol</p>		
3. Promoting production and market network for bio-ethanol fuel and ethanol cook stoves	Roll out of ethanol based clean cook stove program	3.1. Partnerships and investments promoted for local production of fuel grade ethanol and ethanol cook stoves	Design of market intervention and strategy for implementation in Dar es Salaam	<p>3.1.1. Local manufacturing of ethanol cook stoves facilitated</p> <p>3.1.2. Ethanol plants (large, medium and micro-distilleries) for a cumulative capacity of 120,000 litres per day (lpd) facilitated</p> <p>3.1.3. Ethanol cook stoves retailed (around 28,000 nos.)</p>	<p>3.1.1. Incentive scheme designed for ethanol cook stove retailing</p> <p>3.1.2. Technical specifications, bidding documents, etc. prepared and participating distributors and stove suppliers selected</p>	1,900,074	112,000

Changes in Project's Framework between the approved PIF and CEO ER

Project Component		Expected Outcome		Expected Output		GEF Fund (USD)	
In the approved PIF	CEO Document	In the approved PIF	CEO Document	In the approved PIF	CEO Document	In the approved PIF	CEO Document
		3.2. Market network available for bio-ethanol and bio-ethanol cook stoves	3.2. Large scale rollout of 500,000 ethanol cook stoves and market for 90 million litres/year of ethanol fuel supply created	3.2.1. Bio-ethanol fuel and ethanol cook stove retailing network designed and established	3.2.1. Establishment of ethanol fuel/cook stove supply chain network facilitated contractually to cover 500,000 households 3.2.2. Supply of 500,000 ethanol cook stoves established contractually 3.2.3. Local investments stimulated in ethanol distilleries (micro/medium/large scale) through market demand of 90 million litres per year	150,000	1,800,000
4. Monitoring and evaluation (M&E)	Not changed	4.1. Effectiveness of the outputs assessed, corrective actions taken and experience	Not changed	4.1.1. Mid-term M&E report prepared 4.1.2. End of project	Not changed	80,000	Not changed

Changes in Project's Framework between the approved PIF and CEO ER							
Project Component		Expected Outcome		Expected Output		GEF Fund (USD)	
In the approved PIF	CEO Document	In the approved PIF	CEO Document	In the approved PIF	CEO Document	In the approved PIF	CEO Document
		documented		M&E report prepared			

The list of changes in PPG activities proposed during PIF stage and their current status or requirement is provided in table below:

No.	Activity	Comments
1	Resource assessment study for potential feedstock's in Tanzania for ethanol production	Ethanol supply for the project is the look out of the supply chain distributors as per rollout strategy. They will be responsible to ensure supply of ethanol from market sources. Hence, separate PPG activity is not necessary now.
2	Detailed feasibility study report for ethanol distillation units (large/medium/micro)	As per rollout strategy, ethanol fuel supply is responsibility of selected distributor/contractor. Hence, this activity may not be necessary.
3	Gender analysis report	Gender analysis carried out by UNIDO.
4	Gap analysis of existing government policies on ethanol market	Country already has adequate policies for liquid bio-fuel promotion. Hence, this activity may not be necessary.
5	Design of modalities for financial plans and identification of financial institutions	As per rollout strategy, no credit schemes are proposed for ethanol distilleries or cook stove manufacturers. Hence this activity may not be necessary.
6	Design of modalities for financial plans for end users for purchase of ethanol stoves	As per rollout strategy, micro-credit schemes for end users are under the scope of selected distributor/contractor. Hence this activity may not be necessary.

LIST OF ATTACHMENTS:

Annex G- Focus Group Meeting Summary Report

Annex H - Validation Workshop Report

Annex I - Gender Analysis Report

Annex J -Tanzania Bio ethanol Cooking programme design& GEF proposal inputs

Annex K- Environmental and Social Management Plan

Annex L- Co-financing Letters

Annex M-Itemized Budget

Annex N - GHG Emission Reduction Estimation

Annex O - GEF Tracking Tool



TANZANIA BIOETHANOL COOKING PROGRAMME PROGRAMME DESIGN & GEF PROPOSAL INPUTS

A stove and fuel delivery facilitation project

Draft – Final Draft

**CONFIDENTIAL COMMERCIALY SENSITIVE DOCUMENT
Project Number120568**



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Executive summary

Following the bioethanol cooking workshop attended by Government officials, experts and stakeholders in Dar es Salaam in January 2016, the current GEF approved project entitled “Promotion of Bio-Ethanol as Alternative Clean Fuel for Cooking in the United Republic of Tanzania” has been reviewed. The review and associated recommended changes to the original project have arisen because the conference unanimously concluded that the original project should be broadened from primarily capacity building to focussing fully on a larger scale targeted delivery of bioethanol stoves and fuel supply. This report documents the project review and redesign for a more ambitious target driven bio-ethanol project delivering a substantially greater range of benefits to the stakeholder’s involved.

Reflection on the current lack of bioethanol fuelled cooking stove take up in East African countries raised at the workshop can be attributed to the lack or limited size of any programmes, no focus or intent to shift to bioethanol cooking on a large scale and thereby the lack of clear country mandates. Yet there are numerous examples of large scale rollout type cooking switch projects that have been successfully completed in other countries and with other fuels. These vary from electric to LPG cooking in South Africa and kerosene to LPG cooking in Indonesia.

Further global experience clearly indicates that without a systematic and orchestrated set of prescribed activities, financial incentives and other regulated inducements all integrated and consistently monitored to achieve the establishment of a new and ultimately self-sustaining local supply industry for fuel and stoves and the building of a market and supply infrastructure, little will happen or be achieved. The private sector alone will not solve the pressing negative health, deforestation and environmental problems facing Tanzania. They are however part of the solution if correctly marshalled and enabled. Government (or the mandating of a publicly recognised and accountable ‘delivery body’) ownership of the country’s challenges, clear leadership plus continuing accountability for results and achieving program aims will be the single most important factors for success or failure. Role clarity among all stakeholders and disciplined performance management over the full life of any enabling program are also critical for success. Lastly, there will be a need for fuel and appliance offers for customers that are affordable, acceptable and readily accessible.

Situationally the extensive yet completely unsustainable reliance on charcoal, particularly in Dar es Salaam needs to be recognised. Charcoal prices are escalating as the distances to production areas increase and the pressures on natural forest resources grow. Charcoal stoves are purchased every 6-8 months as they wear out. Fuel prices in Dar es Salaam were reviewed and a relative cooking cost exercise was undertaken. This showed that at a price of around TSh1,600/litre bioethanol is cheaper than all other fuels used by households. This translates for a typical monthly household usage the relative costs between bioethanol and charcoal to be around one third TSh80,000 for charcoal and TSh24,000 for Bioethanol.

Based on information from a range of sources typical build up in the bioethanol price has been estimated. This is needed to ensure the prices of bioethanol to compete against other fuels can be achieved and that there is sufficient return for the distributors. Importantly, regulation will be needed to get these levels as low as possible whilst ensuring fair return for the producers and distributors.

Bioethanol price make up TSh	
Factory gate price	800
Geographic distribution	170
Bottling & margin	300
Dealer commission	150
Total cost /litre	1,420

The cost of the Bioethanol stoves is another important enabling factor and a review showed with full local production and scale through national supply contracts for sub sets of 500,000 units the price for a single and double plate stove of correct quality, design and acceptability is expected to be \$20 and \$35 respectively.

At a macro visionary level there is also a pressing need for the Tanzanian Government to embrace the switching of cooking from current practices to clean burning environmentally friendly fuels on a massive scale to prevent the probability of an ecological disaster within just a few decades from now. Current levels of deforestation unless they are stopped will inevitably lead to huge areas of deforested land within just two or three decades from now. In view of these imperatives it is visionary to speak of numbers switched away from charcoal and wood of around 50% or 5-6 million households perhaps in 10 years to realistically alter the current very negative trajectory of traditional fuel use soon enough in the country. Such programmes translate to an average of 2,000 households switched per day.




To initiate such a radical shift into the Tanzanian cooking space as the first step towards such an overall country vision this UNIDO led GEF project now proposes the switching of 500,000 urban households in Dar es Salaam from predominantly charcoal cooking to bioethanol stoves within 5 years, which is 10% of such a national Tanzanian environmental vision. Yet this still equates to an average switch rate of 400 stoves per working day over the five years. As in all programmes of this nature there would be a gradual build in the rate of delivery with a realistic annual switch rate of 10,000/50,000/100,000/150,000 and 190,000 per year to reach the target. Based on an estimated usage of 15litres/month of bioethanol the fuel supply industry would need to develop to the level where it can supply 90million litres/year or 7.5millionlitres/month after 5 years.

Achievement of this target will require the implementation of a Market Enabling Framework that brings commercial players on board in a way that a new market for bioethanol and bioethanol stoves is developed for the least subsidies or stimulus. Central to this approach is an offer that customers cannot afford to miss that will ensure the market growth and development. A breakdown of costs by stove type and the subsidies thought to be needed for the offer is shown adjacent:

Line item	Single \$	Double \$
Stove cost	20.00	35.00
Stove delivery	2.00	2.00
Total cost	22.00	37.00
Customer payment	13.00	28.00
Subsidy	9.00	9.00
Total income	22.00	37.00

In order for the Market Enabling Framework to work a subsidy of \$9 per stove delivered is needed or a total of cash funding of US\$4.5 million is needed. Cash not in kind co-funding of at least \$3million will now be needed as part of the project. Co- funding will still be forthcoming in the areas of government support plus importantly the necessary investment by all three new industry supply chain elements of: new bioethanol distribution chains, new bioethanol stove manufacturers and the bioethanol fuel production industry.

Next a detailed summary of the Market Enabling Framework is provided.

<p style="text-align: center;">UNIDO/GEF Tanzania Bioethanol Programme Market enabling Framework Summary</p>			
<p><i>A facilitated Market intervention</i></p>		 <p>A switch in cooking from Charcoal to Bioethanol</p>	
<p><i>Target 500,000 households in 5 years</i></p>			
Strategic Action	Programme role	Target organisation or entity	Outcome
Offer low priced high quality ethanol stoves for rapid take up in Dar es Salaam & fuel	<ul style="list-style-type: none"> Suitable stoves Subsidise price Promotion Training 	<p style="text-align: center;">Residential households</p> <ul style="list-style-type: none"> Middle income household in Dar es Salaam Currently using charcoal in open stoves Need to respond to a once off offer in their area Commit to use bioethanol for minimum 5 years Enjoy cheaper, clean cooking 	Householders switch to ethanol stoves to cook & purchase refills locally
Creation of a new bioethanol fuel distribution industry to service the new market	<ul style="list-style-type: none"> Tender for 3/4 suppliers Bottling plant Distribution Local agents Contracted 	<p style="text-align: center;">Distribution Businesses</p> <ul style="list-style-type: none"> Open tender for prospective distributors Exclusive geographical supply territory will have a required sales and household penetration target 150-180,000 each Invest in the distribution of bioethanol Procure and sell stoves, less a subsidy 	Delivered stoves & outlets close to uses selling fuel at or below a regulated maximum price
Establish a residential ethanol market demand, planned rise to 90 million litres/year	<ul style="list-style-type: none"> Notify producers Publish progress One on one engagement 	<p style="text-align: center;">Fuel suppliers</p> <ul style="list-style-type: none"> Producers only react to a market demand Distributors will be procuring ever increasing volumes of bioethanol in a planned way Gate price to account for maxi retail price Minister of Energy Controlled production, to limit imports, yet strategically stocked 	Industry responds naturally to a market growth & ensuring continuity of supply
Use the subsidised price to create a guaranteed purchase of 500,000 stoves in 5 years	<ul style="list-style-type: none"> Tender for 2/3 suppliers Minimum standards Plant investment 	<p style="text-align: center;">Stove suppliers</p> <ul style="list-style-type: none"> Open tender for national supply contracts Minimum standards set and adhere to, either local or foreign designs Fabrication plants will need to be built Sell to the Distributors against fixed price agreements 	New fabrication industry developed and quality stoves supplied at correct rate
Minimal involvement through only controlling orders, payments and regulatory matters	<ul style="list-style-type: none"> Small project office Regulation of stoves /fuel Customer Limited price gauging Bioethanol fuel supply continuity 	<p style="text-align: center;">Programme support activities</p> <ul style="list-style-type: none"> Apart from funding only four organisations needed to facilitate the programme VP office to house a fully mandated & effective project office – tenders, contracts, payments MoM&E to manage/encourage local production and imports as needed – holding strategic stock Energy regulator to introduce residential ethanol maximum retail price cap Standards authority to publish and enforce stove regulation and fuel supply regulation 	A fully facilitated programme though market enablement

The Market Enabling Framework can be locally implemented by setting up a unit in the Vice President's office to provide the necessary patronage and authority for a project that will become visible across Dar es Salaam. The authority will also ensure enabling standards and regulations will be forthcoming.

Lastly, it was found when the proposed project revisions were presented to all the stakeholders in May 2016 there is full support. The Vice President's office has agreed to sign any project changes that may be needed, plus co-financing letters are now being prepared for signature.

Acknowledgements

This technical report has been produced by the United Nations Industrial Development Organization (UNIDO) under the general guidance of Jossy Thomas, Industrial Development Officer, Energy and Climate Change Branch, UNIDO.

During the completion of the study, the support and assistance of the locally based UNIDO personnel must be fully acknowledged. Invaluable assistance was provided specifically by Mr Victor Akim and the team at the UNIDO office in Tanzania. Victor provided inputs to the work and facilitated the critical country mission and his contribution is fully acknowledged.

Lastly, the consultants responsible for undertaking this project are acknowledged, they were from Integrated Energy Solutions (Pty) Ltd, based in Cape Town, South Africa. The following staffs are specifically mentioned; Paul Harris (Professional Engineer), the principal consultant and project leader and Chris Hazard the project independent quality controller...

Abbreviations

GEF - Global Environment Facility

IAP - indoor air pollution

kg - kilogram

lt – litre

LPG – Liquid petroleum gas

MEF - Market Enabling Framework

\$ - United States Dollars

TSh represents Tanzania shillings

UNIDO - United Nations Industrial Development Organization

VPO - Vice President's Office

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1 Introduction

General project and report background

UNIDO is developing a project for approval under the Global Environment Facility (GEF) 6th funding cycle in collaboration with the Government of the Republic of Tanzania with the Division of Environment in the Vice President's Office and the Ministry of Energy and Minerals. The proposed project intends to promote the use of bio-ethanol as an alternative clean cooking fuel.

The original proposal to GEF has recently undergone a review and modification following a workshop with Government Officials, experts and stakeholders on 28 January 2016 in Dar es Salaam. At the workshop there was a strong shift in programme focus from a modest prototyping/capacity building type of development project to a more ambitious programme designed to make a substantial and necessary shift in the household cooking practices in Tanzania away from charcoal and wood to bioethanol. The revised thinking has shifted to the preparation of a programme that will target and facilitate the roll out of 500,000 bioethanol stoves over 5 years and the creation of new bioethanol fuel and stove manufacturing local supply industries together with the necessary supply channels and market support commercial infrastructure.

This report provides the revised programme design for inclusion as a GEF project revision.

Problem statement and deliverables

Preparatory work was required whereby a roll-out strategy was devised for the conversion of 500,000 households to ethanol stoves in 5 years in the greater Dar es Salaam area. These strategies and associated supporting material are intended to be used in the revised GEF proposal. These inputs required the following broad work outputs to be completed:

- a. Overall project concept – harnessing Government and private industry to deliver.
- b. Target areas in terms of immediate opportunity to convert away from charcoal and wood burning for household cooking needs.
- c. Mapping demand side needs, switching matters/barriers/price of fuels and supply side ability of industries to supply, plus broader stakeholder matters (taxes etc.).
- d. Mapping Tanzanian bioethanol supply side essentials such as major producers, volumes, costs, risks and current usage.
- e. Factoring solutions to barriers to delivery.
- f. Review of competition and existing household cooking fuels.
- g. Address these barriers through a series of activities.
- h. Stakeholder engagement to validate information before submission.

This document captures all of the above completed work to form the technical basis of the GEF revised submission. What has been important is capturing the correct underlying facts, assumptions, analysis, plus formulating the relevant logic as a coherent basis on which to present the recommended revised approach. The recommendations are then followed with information about what will need to be done and what it will cost.

Report structure

This report has been structured as a working document around these points, to provide a base from which to extract any format or summary required for the revised GEF proposal.

2 Literature and other background research

Lessons from other cooking programmes and particularly efforts to encourage the take up of bioethanol stoves are important for the development of a coherent Tanzania bioethanol strategy. Much of this background was obtained from the workshop held in Dar es Salaam on 28 January 2016.

2.1 Project Gaia

Project Gaia¹ has promoted bioethanol fuel and stoves for several years. They work in both humanitarian and commercial settings to increase energy access and transform communities. When questioned during the conference they admitted that less than 50,000 bioethanol stoves have been placed into the market collectively over the years. Their stove models differentiate between fully imported stoves through to local production and from their experience the following price ranges can be noted:

Model 1: Imported fancy stove and ethanol

- Programme size only 15,000 in 5 years
- Stove imported cost \$55, retailing at \$65
- Ethanol imported cost 0.55/lt and \$0.8/lt retail price

Model 2: Imported economy stove and locally produced ethanol

- Programme size only 15,000 in 5 years
- Stove imported cost \$15, retailing at \$25
- Ethanol locally produced cost 0.35/lt and \$0.55/lt retail price

Model 3: Bifurcated approach of importing and local manufacturing

- Programme size only 149,000 in 5 years
- Stove imported for first three years \$55/\$65 and then locally manufactured \$20/\$30 (supply & retail)
- Ethanol imported first three years \$0.55/\$0.8/lt and then locally sourced 0.35/\$55 (supply & retail)

2.2 SAFI INTERNATIONAL

Safi International² is a Norwegian initiative and to quote their marketing material: “We develop, manufacture, sell and distribute a brand new clean cook stove, the Safi e-cooker, for the African market. Our projects are in East Africa. Safi International is a leading Norwegian bioethanol stove- and fuel company, designing, developing and manufacturing affordable, modern bioethanol stoves for African families.”

Initiated operations in Tanzania in 2014, with the following programme information:

- Stove manufacture costs – around \$50
- Subsidised price for the market - \$22 or TSh50,000
- Total number sold ~ 4,000
- Current bioethanol selling price – TSh2,350/litre

¹ From the Project Gaia presentation at the 28 January 2016 workshop.

² From the SAFI International presentation at the 28 January 2016 workshop

2.3 NDZiLO and Mozambique programme

ZOE Enterprises³, Lda. (ZOE) is a Mozambican company based in Maputo. ZOE started operation in February 2007 promoting and selling ethanol gel (gelfuel) and respective stove under the Brand of CHAMAZUL (Blue Flame). In 2012 ZOE became the Department of Marketing and Sales of CleanStar Mozambique Lts. (CSM). A new stove and a liquid ethanol fuel were introduced under the Brand of NDZiLO (Flame/Fire in Maputo local language). CSM declared insolvency in June 2014 and ZOE bought the Brand and all the assets of the Production and Distribution of NDZiLO

Currently they are servicing around 36,000 stoves in the Maputo area and lessons extracted include the following:

Stoves:

- Two stove brands have been identified as being very good: Domestic and Safi Stoves
- Both have prices far above our client's affordability.
- In Mozambique the minimum salary is about \$100
- Average price for 2 burner stove – \$70
- Average price for a 1 burner stove - \$40
- Includes transportation, insurance, clearing agent, VAT, etc.)

Culture/educational matters:

- Change of cooking with charcoal and firewood to ethanol based fuels is a change of habit. This requires a lot of investment in Civic Education.
- The potential for growth is enormous. Women like NDZiLO.
- During the joint project CSM – ZOE had reached sales of NDZiLO fuel of 140,000 litres per month. They could have done better but there was often a shortage of stoves.

Bioethanol is sold in 1 litre and 5 litre plastic bottles to the end users. NDZiLO have their own bottling plant that fills the bottles before distribution to sales agents. Currently imported bioethanol is utilised to supply the operation.

At the workshop in January 2016, some comments were made about the reasons for the CleanStar project commercial failure. No clear conclusion can be drawn. What is important though is the pilot was taken over by a local entrepreneur and still operates today with around 35,000 customers being served. Other points related to this matter include:

- Excessive project managerial overheads.
- Difficulties with small scale biomass producers reimbursement and management
- Lack of apparent accountability among local project sponsors and managers

2.4 UNIDO Zanzibar pilot lessons – base line project

UNIDO ⁴has 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:

³From the NDZiLO presentation at the 28 January 2016 workshop

⁴ From the first GEP project proposal document

- a) Baseline survey of household cooking energy and supply;
- b) Feasibility assessment on ethanol usage as household cooking fuel;
- c) Acceptability assessment for ethanol usage as household fuel.
- d) 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_2 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 facilities are key to lifting 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 also 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.

Currently bioethanol supply issues are evident following the pilot. Zanzibar Sugar Factory as intermittent supply plus they have significantly increased the cost of bioethanol to over TSh2,000/litre in bulk. Efforts are underway to try and rectify the situation.

Another point noted, is the additional efforts needed to gain acceptance by citizens who are practising Moslems. Part of this belief system includes serious prohibitions concerning the handling of alcohol (effectively bioethanol). However, positive Moslem customer response during the Zanzibar trail, following correction communication on the matter, showed that this challenge is readily solved.

2.5 Other efforts and other fuel programmes

2.5.1 GVEP and DEEP initiative inputs⁵

The Developing Energy Enterprises Program in East Africa (DEEP) is a five year initiative established in 2008 to provide the crucial support necessary to enable the development of a sustainable and widespread industry of micro and small energy enterprises in countries including Tanzania with particular focus on improved cook stoves.

A variety of locally made stoves are available in the market, most are made by small informal businesses whose focus is on quantity and lowering costs rather than quality and design. Such stoves are designed to burn charcoal, wood or biomass with lower emissions than a simple crude open fire. Efforts have been made by NGOs to train artisans on quality stove production most notable by TaTEDO who have started a stove company in Dar es Salaam producing quality charcoal stoves, to try and promote commercial sustainability. However the company has struggled to find the market for these stoves and production remains at a modest scale of around 700 stoves per month. Efforts have also been made to promote rocket stove technology which aims to burn solid fuels without smoke both fixed stoves and portable. Many local producers were trained through a GIZ led program, but many producers failed to sustain production when the program ended. Imported stoves have been introduced in the past few years with the most notable distribution efforts being made in Arusha.

Quality clay that is used to line the interior of the stoves is available in particular regions of the country and may be transported significant distances to producers, whilst most sheet metal is sourced in Dar es Salaam. Stove producers sell through retailers on a local scale and country wide distribution is rare due to the large distance to be covered and poor infrastructure.

The GVEP programme is designed to assist local manufactures produce higher quality stoves and operate more sustainable businesses. However, whilst they are achieving some success, the crux is charcoal is still used as the fuel and no chimneys are added to deal with particulate emissions.

It should also be noted that during recent discussions with householders in Dar es Salaam that many of these cook stoves have a relatively short life before wear and tear damages the lining and other features of the stoves. Six to eight months appears the anticipated average life of such stoves. This is notable from the viewpoint of whether any Bioethanol Market Enabling Framework (MEF) should remove such stoves from the market place as part of a bioethanol switch over. In view of the short life of these cook stoves it does not appear to be necessary.

2.5.2 Integrated Energy Solutions (Pty) Ltd case studies

South Africa residential electrification

A utility driven programme, that achieved >7million homes in 10 years, up to 2,000 connections/day. It is noted for its standard offerings 20 amp & 40 amp supplies with ready boards and prepaid metering to help with immediate usage. The programme was driven by clear targets and critical performance indicators with monitoring / performance management.

A rolling process was followed in each community:, that included; *before delivery*: preparation, community liaison, management of expectations, 'buy in', demonstration of benefits with demonstrations, *during*: exchange, training, switch, users hands on, payment and revenue collection and *after* agents established, after care activities in place, check deliverables and if all met move on to next community.

Overall a major success, yet non-payment and political issues remain.

⁵The Improved Cookstove Sector in East Africa: Experience from the Developing Energy Enterprise Programme (DEEP) By GVEP/Laura Clough, 2012

LPG switch out programme'

Due to electricity generating plant failure near Cape Town and a supply emergency, in three months 4,000 large stoves & 88,000 two plate stoves and cylinders were rapidly exchanged for electric cooking equivalents.

The larger stoves were swapped out via retailers who had signed up to offer the programme subsidy to participants. The stoves were then returned with paper work to a central crushing facility and the audited numbers were then used to reimburse the suppliers.

The large double plate programme was structured with the major LPG companies being offered fixed quotas of stoves to procure and deliver into the low income communities. Again when stoves had been returned with the paperwork the subsidy was paid.

National LPG programme – designed but not implemented

This programme was based on a vision to convert 3 million homes to LPG cooking across South Africa. The programme originated in the World LPG challenge, was spoken of in Minister of Energy Speeches to parliament and endeavoured to bring all players around the table through extensive deliberations. The programme goals were to remove paraffin and lower electrical & CO₂ usage. A full market enabling framework prepared, but there was failure to progress due to: Government & LPG Industry trust issues, lack of funding to pay for the household switch, competition issues led to LPG industry pulling back; and, lack of Government capacity and leadership.

Government then tried to go it alone and their pilots failed, relative price problems emerged with subsidised electricity now overshadowing LPG in poor households.

2.5.3 Malawi UNDP programme⁶

This extensive UNDP report identified ethanol as a viable alternate cooking fuel for use in Malawi. Some of the key points from the report include:

- Unsustainability of the current biomass based cooking country wide, with wood and charcoal making up 85% of the usage.
- Indoor air pollution is reported as one of the ten most important threats of public health.
- Bioethanol price wise expected to be below paraffin and LPG.
- At the correct price it is expected that around 4% of the households or 14,000 can be persuaded to switch to ethanol cooking.

2.6 Literature section summary and conclusions

Bioethanol specific conclusions

- Minimal numbers in the market despite years of activity, with less than 50,000 stoves supplied. Something significant is needed if bioethanol fuel stoves are to be taken up in any significant measure.
- All programmes are small in scale and stove costs are too high becoming a barrier to entry for householders wanting to shift.
- Large scale programme such as UNDP programme for Malawi have not produced significant results.
- More radical and urgent approach required if meaningful solutions are to be achieved on the necessary large scale to confront escalating deforestation with associated negative environmental impacts: and, widespread poor health and premature deaths

⁶Feasibility study for the use of ethanol as a household cooking fuel in Malawi, UNDP , November 2007

caused by low level smoke and particulate pollution in homes, particularly among young children and women.

- The Government of the Republic of Tanzania must take a strong leadership and enabling role in order to achieve the bioethanol production and household usage results that are necessary.

Key general principles for success / lessons to date

This section summarizes the main conclusions delivered at the Dar es Salaam Workshop in January 2016.

Global experience clearly indicates that without a systematic and orchestrated set of prescribed activities, financial incentives and other regulated inducements all integrated and consistently monitored to achieve the establishment of a new and ultimately self-sustaining local supply industry for fuel and stoves and the building of a market and supply infrastructure, little will happen or be achieved.

The private sector alone will not solve the pressing negative health, deforestation and environmental problems facing Tanzania. They are however part of the solution if correctly marshalled and enabled.

Government (or the mandating of a publicly recognised and accountable 'delivery body') ownership of the country's challenges, clear leadership plus continuing accountability for results and achieving program aims will be the single most important factor for success or failure.

Role clarity among all stakeholders and disciplined performance management over the full life of any enabling program are critical for success.

Fuel and appliances offers for customers that are affordable, acceptable and readily accessible are also necessary.

Standardised, customer accepting offers:

- Basic choice e.g. two different cookers – one plate, two plate
- Needs market research and testing

Government and supply industry agreements

- Remove risk and build trust
- Long term commitment

Continuity of energy supply

- Failure of LPG companies to supply! Need strategic stock
- Results in immediate loss of faith in the product

Safety training for users

- Liability will rest with the supplier unless clearly laid off on customer

Safety of the appliances delivered

- Paraffin stoves have a dreadful legacy of being unsafe
- Programme approved appliance & pipe and regulator – one failure!
- Rigorous safety standards and enforcement

Area by area, street by street, house by house – roll out

- Significantly lowers costs and allows business model to work
- Requires high levels of buy in before entering an area

Concessionary start migrating to commercial competition

- Tender based involvement, based on capabilities, with support/subsidies
- Ensuring a level playing field in the future (neutral connections, customer stove ownership etc.)

Rigorous performance management and inculcation of accountability among all role players

- A matter of not just what needs to be done, but also how it must be achieved.

- Competition among stove and fuel suppliers even though they have prescribed territories initially to enhance on prescribed capped price and specified minimal customer service levels

Reaching critical mass as promptly as possible

- High volume and sales at low prices versus low sales and high prices both for fuel and stoves
- Rapidly attaining widespread customer acceptance and market demand pull to continue market and supply growth of bioethanol.

3 Contextual Tanzanian project information

Development of the programme must be based on Tanzanian specific information and situation. This information has been gathered from various sources including a country mission from 14-22 April 2016.

3.1 Baseline scenario – existing initiatives

3.1.1 Historical programmes

Improved cook stoves have been promoted in the country since early 1980's. However, the adoption rate is still low. Although often not the primary objective, many cook stove programs aimed to reduce indoor air pollution (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;
- 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;
- e) Air Quality Monitoring Capacity Building Project (AQMCBP) implemented by USEPA and UNEP³¹.

Inferences and lessons learnt from these programmes include the following:

- 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.
- e) 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 of forests for wood collection, it is essential to introduce alternative cooking fuel that do not deplete Tanzania's forests, and is non-polluting, less GHG emitting and cheaper for the Tanzanian population at the same time. A practical alternative is the usage of bio-ethanol cook stoves.

Apart from SAFI, there have been no notable efforts in the area of bio-ethanol production or its use in the residential cooking sector in Tanzania.

3.1.2 Government focus / mandate⁷

Environmentally the Vice President's Office (VPO) has responsibility for all the countries programmes and activities. To fulfil this mandate, the VPO has A Division of Environment (DoE) and National Environment Management Council (NEMC).

Environment being a crosscutting sector, it needs dedicated attention because its wellbeing has a significant contribution to the economic and social development of the country. Currently, the environmental sector is faced with a number of environmental challenges such as increasing environmental degradation, climate change, land degradation and deforestation (at the rate of 372,000 ha per year). All these challenges have adverse impacts on the environment, the economy and social wellbeing and if not addressed the future of the national economy and social wellbeing will be at stake.

The latest focus areas of the Division of Environment include:

- 1) Capacity Building for Environmental, Management and Climate Change Issues in Tanzania;
- 2) Operationalization of the National Environmental Trust Fund (NETF);
- 3) National Tree Planting and Management;
- 4) Implementation of the Environmental Management Act; and,
- 5) Promoting Alternative Energy Sources to Reduce Charcoal Consumption in Tanzania.

Thus component 5, promoting Alternative Energy Sources to Reduce Charcoal Consumption in Tanzania, is where this GEF project will provide direct benefits. Expected outputs include:

- a) Raising awareness on the use of alternative sources of energy and associated technologies.
- b) Environmental assessments, feasibility studies and guidelines for utilization of the non-traditional energy sources conducted.
- c) Promotion of energy efficient technologies.
- d) Market based incentive mechanisms to encourage investments in energy production sector in place.
- e) Research and Development activities related to energy production, reduction of health hazards related to production and use of energy sources.
- f) Mechanisms to waive or reduce taxes associated with facilities used in production and use of energy in place.
- g) Institutions involved in the development and dissemination of energy technologies strengthened.
- h) Public Private Partnership in development of alternative energy technologies encouraged.

⁷Effective management of environment and climate change, March 2016

3.2 Country level energy and household type data

According to the Household Budget Survey (2007), 75% of the population lives in rural areas and 25% in urban areas.

Charcoal is the major cooking fuel in urban areas, whereas in rural areas firewood is more commonly used. 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.

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.

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

In 2009, the 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 consumption.

3.3 Cooking practices

Interviews were conducted with seven Dar es Salaam household ladies, to understand their cooking practices.

Meals cooked were found to be similar throughout the houses:

- Morning – tea and reheating of some food or cooking light food.
- Lunch time – full meal if there are folk eating.
- Supper – full meal; rice or ugali (maize porridge) plus side dishes of meat/vegetables.

Important points noted from the interviews:

1. The programme target market is the middle income households, who earn TSh200,000-700,000/month, with number estimated to be least 60% of Dar es Salaam households or 800,00-1,000,000 households.
2. A very high percentage of these households will be using charcoal as their primary source of fuel for cooking. At the top end some LPG is used, but only for a limited number of cooking processes and at the bottom end this is some fire wood usage.
3. Again virtually all households use a simple charcoal stove made with a porcelain lining that is used outside or in a dedicated cooking room given the smoke, photos with captions next:



4. All cooking is on the floor and either outside or in dedicated rooms, separating the person from the family. Significant advantages to the bioethanol stove would be cooking inside with sufficient fresh air ventilation, without health impacting emissions, carbon particulate, at an ergonomically better height and cleaner kitchen areas.
5. Current stove costs vary from TSh5,000-12,000/unit dependent on size and quality, however they only last less than a year. This repeated capital cost can be demonstrated against the long lasting bioethanol stove investment. Thus a selling price of TSh25,000-30,000 acceptable to the market.
6. Monthly charcoal running costs are T50,000-90,000/month dependent on usage which gives an indication of the expenditure already on energy needs!
7. Most of these homes have electricity connections, not all have connected water suppliers. Of course the high cost of electricity precludes most households from cooking on electricity.

3.4 Fuel and appliance matters

From a survey and enquires in the city the following prices were obtained, at the time the exchange rate was US\$1 ~ TSh2,200.

Charcoal prices:

- Charcoal large; TSh80-85,000 big bag – 55-60kg
- Charcoal small; TSh1600 - 1kg
- Charcoal stove TSh6-10,000 dependent on type and size

Paraffin prices:

- Paraffin price for small household quantities - TSh1,578/litre

LPG prices:

- 15kg – TSh43,500-45,000 for a refill, TSh45,000 for the cylinder deposit
- 5kg – TSh18,000 for a refill
- Double plate stove – standard type TSh110,000

SAFI project bioethanol prices:

- Stove cost - TSh54,000 (a sponsored price)
- Fuel price – TSh 2,300/litre (high!)

3.5 Programme parameters

To assist with the programme development a number of fuel and appliance cost parameters have been determined.

Relative cooking costs

A theoretical calculation of the relative fuel costs for different bioethanol fuel costs is provided below⁸:

Fuel	Price per unit	Calorific value	Theoretical Price/MJ	Efficiency	Price/MJ
Paraffin	1,578 TS/litre	35.3 MJ/litre	44.70 TS/MJ	40%	111.76
LPG	3,600 TS/kg	44.7 MJ/kg	80.54 TS/MJ	62%	129.90
Charcoal	1,600 TS/kg	28.2 MJ/kg	56.74 TS/MJ	25%	226.95
Bioethanol @1,600	1,600 TS/litre	24.8 MJ/litre	64.52 TS/MJ	59%	109.35
Bioethanol @2,000	2,000 TS/litre	24.8 MJ/litre	80.65 TS/MJ	59%	136.69
Bioethanol @1,200	1,200 TS/litre	24.8 MJ/litre	48.39 TS/MJ	59%	82.01

At a price of around TSh1,600/litre bioethanol is cheaper than all other fuels used by households.

For typical monthly household usage the relative costs between bioethanol and charcoal would be:⁹

Fuel	Monthly usage	Monthly cost
Charcoal	50 kg	80,000 TSh
Bioethanol 15 litres	15 litres	24,000 TSh

Bioethanol will be significantly cheaper than charcoal.

Bioethanol supply chain costs

Based on information from a range of sources¹⁰ a typical build up in the bioethanol price has been estimated. This is needed to ensure the prices of bioethanol to compete against other fuels can be achieved and that there is sufficient return for the distributors.

Bioethanol price make up TSh	
Factory gate price	800
Geographic distribution	170
Bottling & margin	300
Dealer commission	150
Total cost /litre	1,420

Importantly regulation will be needed to get these levels as low as possible whilst ensuring a fair return for the producers and distributors.

⁸ Paraffin, LPG and Charcoal prices were gathered in Dar es Salaam from typical vendors. Bioethanol prices were estimated based on expected local production costs and chain mark up from meetings with prospective suppliers.

⁹ Based on Feasibility study for the use of ethanol as a household cooking fuel in Malawi, UNDP, November 2007, plus experience with LPG cooking in South Africa.

¹⁰ Interviews with prospective suppliers and Project Gaia information.

Stove costs

The existing double plate stoves supplied by SAFI could be termed “fancy” as shown in the adjacent picture and cost around \$50.



Project Gaia stoves are called CLEANCOOK and estimated to cost \$55.



Another stove is the single plate Protostar, shown adjacent that has been seen for sale for around \$15.



There are numerous designs as shown in the following pictures:



With full local production and scale through national contract for sub sets of 500,000 units the price for a single and double plate stove of correct quality and design acceptability is expected to be \$20 and \$35 respectively¹¹.

¹¹ These values are based on inputs by Operation Gaia, surveys of prices and reasonable estimates of what local and scale production will provide.

4 Market Enabling Framework

This programme makes a radical departure from the usual development project approach to achieve a goal that involves a major shift in cooking fuels and appliance use in Tanzanian homes. The norm is for development programmes to provide regulatory improvements, capacity building and demonstration pilots while also setting modest delivery targets. With UNIDO and GEF joining hands with the government of Tanzania however, greater delivery targets are attainable thereby bringing improved health sooner for many more Tanzanian citizens. At the same time with deforestation, greenhouse gas emissions and environmental degradation, that are ever more problematical for the country, can all be seriously challenged.

Only a more radical approach will provide solutions on the necessary scale and timeously enough. By focusing on the *implementation of a major target driven and prescribed market creation programme* a significant shift in household cooking practices in Tanzania can be achieved.

4.1 Market Enabling Framework overview

Taking lessons from other countries where the physical roll out of modern energy services to multitudes of households¹² have been achieved, demonstrates that a programme with clear targets and prescribed delivery methods can achieve success. They kick start and enable new markets and activate supply resources that reach sufficient critical mass within defined time periods to then stand on their own and reach permanent competitive and commercial sustainability.

Such a programme may be referred to as deploying a Market Enabling Framework (MEF) in that it shifts a targeted household cooking market in terms of fuels used, has measurable and achievable targets, and then enables their achievement through an integrated framework of prescribed enabling initiatives and activities. Once the necessary commercial critical mass is established the market then reverts to free competition and many of the special market enabling prescriptions including subsidies and exclusive supply territories are no longer necessary.

These carefully designed initiatives or activities could be referred to as “levers or enablers”, which when implemented with the least resource, produce the greatest numbers of households switched to cleaner, safer and more efficient cooking fuels and practices. Examples of such levers or enablers are as follows:

- Introduction of a financial subsidy for a period for part payment for a new stove, which can help to ‘kick start’ and develop local stove manufacture and a distribution channel for new fuels.
- Regulation and provision of maximum retail price for the fuel which will help to ensure households that make the switch are protected from any major price escalation or gauging in the future.
- Import constraints, excise duties and tax incentives for investment in local bioethanol production to ensure the development of an indigenous local fuel supply industry and the avoidance of fuel importation.
- Legislation to discourage continuing use of charcoal in target households with such measures as smoke control rules and/or increasing retail taxes on charcoal sales.

¹²Eskom 6 million home Electrification, LP Gas 100,000 Stove roll out in Cape Town South Africa

- Government sponsored public information campaigns, school programs for learners and fast tracking the development of local quality standards and certification of fuels and appliances.

To be successful, such a market enabling framework in a free market environment must offer sufficient value or financial return to attract the correct mix of market players and stakeholders to actively participate, while having the support and protection of other stakeholders. It must also provide unquestionable levels of improved energy service, convenience and safety at appreciably lower costs than all current alternatives.

There are *four main market players* in this household cooking programme are; (1) the targeted households, (2) the producers and bulk suppliers of the fuel, (3) the manufactures/suppliers of the stoves and (4) the distributors of the stoves and the bioethanol fuel to serve the households. Other players such as government, regulatory authorities and academic institutions are stakeholders that need to be managed and required to support the programme.

4.2 Programme target and vision

An overriding national vision

Ethanol cooking has a minimal footprint in Tanzania even in the major urban area of Dar es Salaam, despite having greatly preferable features and benefits to wood, charcoal and paraffin being a clean, safe and modern alternative. Current cooking realities are underpinned by historical cooking practices plus the deployment of readily accessible and low cost fire wood and increasingly charcoal in urban areas. The environmental and public health impacts of these practices are widespread, extremely serious and rapidly escalating. Indoor air pollution causing a range of upper respiratory and other health impairments particularly among young children and women make this one of the leading avoidable causes of premature death among the poor¹³. Deforestation is another serious and worsening impact leading to serious soil erosion, the silting of rivers and threats to edible food production. Changes to these entrenched norms are now urgent.

However it must be recognised that to switch large numbers of households from ingrained methods of cooking is a challenging proposition. Wood and charcoal production and supply are also entrenched sub sets of the Tanzanian economy and fuel industry. To begin to meet these challenges it is essential to start with those that can readily afford alternative cleaner fuels and with households located in urban high density communities. In this way a greater probability of success will be achieved with maximum positive impacts on household health, the reduction of demand for charcoal and thereby deforestation while greatly improving air quality in densely inhabited locations. The creation of a market among higher income urban households will also create ambassadors for bioethanol cooking and a growing aspiration among the general population of the country to migrate to safer, cleaner and more modern cooking methods. These factors naturally point to higher income homes within built up urban areas being the primary target for the proposed bioethanol stove program.

At a macro visionary level there is also a pressing need for the Tanzanian Government to embrace the switching of cooking from current practices to clean burning environmentally friendly fuels on a massive scale to prevent the probability of an ecological disaster within just a few decades from now. Current levels of deforestation unless they are stopped will inevitably lead to huge areas of deforested land within just two or three decades from now. The likely impacts on the country being able to feed future populations are potentially life threatening. In view of these imperatives it is necessary to speak of numbers switched away from charcoal and wood of around 50% or 5-6 million households perhaps in 10 years to realistically alter the current very negative trajectory of traditional fuel use soon enough in

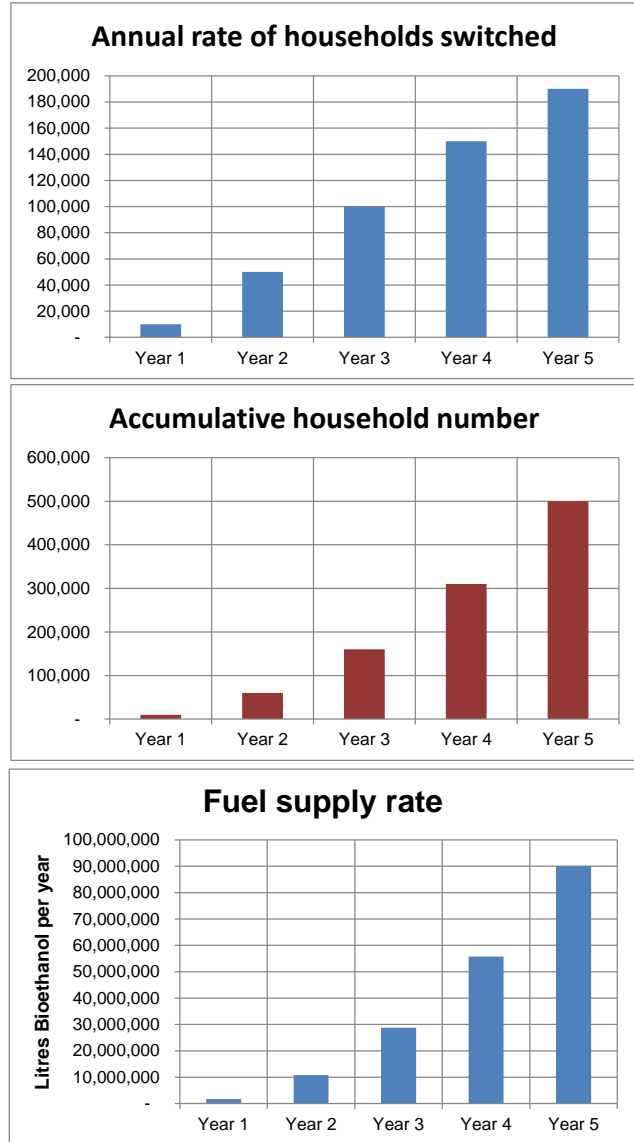
¹³ World Health Organisation

the country. Although a challenging proposition, such programs are entirely feasible and achievable with the right levels of stakeholder leadership and commitment. Such a program translates to an average of 2,000 households switched per day! Clearly pilot projects and programmes even of a “tens of thousands” scale will always be ineffective against the large scale of the urgent need. A natural process would be to move such changes from the higher income households down to lower income and from most dense urban through to peri-urban and then to rural areas.

Programme target

To create a radical shift or intervention into the Tanzanian residential cooking market as the first step towards such an overall country vision this UNIDO led GEF project proposes the switching of 500,000 urban households from predominantly charcoal cooking to bioethanol stoves within 5 years, which is 10% of a national Tanzanian clean fuel, improved health and sustainable environmental vision. This would equate to an average switch rate of 400 stoves per working day over the five years.

As in all programmes of this nature there would be a gradual build in the rate of delivery with a realistic annual switch rate of 10,000/50,000/100,000/150,000 and 190,000 per year to reach the target. Based on an estimated usage of 15litres/month of bioethanol the fuel supply industry would need to develop to the level where it can supply 90million litres/year or 7.5millionlitres/month after 5 years. Graphically these numbers are shown adjacent:



Target household market

The target of 500,000 households to be switched will be executed within the urban area of Dar es Salaam. The city has over 1.5 million households of which at least 60% fall into the target market who utilise charcoal extensively or 900,000. This is well above the programme target of 500,000.

4.3 Barriers and value analysis

Development of a MEF requires the extraction, assimilation and analysis of a range of information and data. This analysis needs to answer the question; what is needed to get the cooking market to shift from the current charcoal/wood cooking practices to realize 500,000 households using bioethanol fuel stoves in 5 years. In essence one has to pinpoint the barriers that need to be removed and what enabling value and prescriptions are needed in each of the four main market player areas.

Household market related points

The first profound barrier is that households need to be supplied with a bioethanol stove, with preferably the removal of any charcoal or wood burning stove to minimise switch back and to maximise the continuity of the program. These stoves need to be acceptable to users in terms of functional design (does the job), aspirations or life style (seen as better) and capability to cook the same food that charcoal is used for. Household sizes and income levels need to be accommodated by having a few models; single plate double plate, fancy looking and so forth.

Operational or running costs must be kept on par or below current practices, in other words the same costs before and after if there are sufficient other non-financial benefits such as aspirational value, cleanliness, health, safety and a new favourably perceived “norm”. When compared a monthly running cost of TSh80,000 for charcoal will be replaced by TSh24,000 in bioethanol if price at TSh1,600/litre.

Another barrier to be overcome is the familiarity with the current cooking practices, here strong promotional messages, support from local community groups and even the rich and famous will all assist in motivating households to switch to bioethanol.

However, to ensure project success householders will only switch if they are given an offer they almost cannot refuse, “for the same running cost and minimal conversion cost you can have a stove that functions so much better than your current one”. Plus consumers will need protection once they give up existing appliances in that they will never be left without a reliable fuel supply, that prices don't inflate rapidly or they may be left with a broken appliance.

By adopting such a systematic approach to householders three critically important enablers will be met to ensure rapid market penetration by bioethanol stoves and fuel. The appliance and fuel offer must be *acceptable* to the target potential customers, they must be readily *accessible* and they must also be *affordable* particularly in relation to competing fuels and appliances. These three evaluative criteria are invaluable benchmarks to keep uppermost throughout the various stages of the development and implementation of the program.

Bioethanol fuel supply industry requirements

In terms of accessibility bioethanol will need to become a “commodity” in the midst of the project, freely available in convenient and safe quantities at almost any hour of the day or day of the year and at widespread convenient locations. Many producers and suppliers of bioethanol will be quite used to this commercial situation as it is the same as supplying both bulk and retail sugar. In other words suppliers will respond to market demands and market certainty. The current bioethanol market in Tanzania is minimal and as such limited quantities of bioethanol are being produced. Yet increased supply will be a factor of investment in bioethanol distillery capacity and the availability of waste biomass.

The barrier to overcome will be plant investment to produce the required volumes plus the holding of strategic stock to give a year through consistent supply. A further barrier is the broadening of waste sources from sugar waste to include others (cashew cassava etc.) in order to meet the levels that will be demanded.

Here, the important enabler will be to convince and prove to local manufactures that a market will be developing for a product that they can supply, that should reach at least 90 million litres/year in 5 years just to satisfy this urban charcoal displacement program. In terms of long term market size and commercial opportunities for bioethanol as indicated earlier even this large program is only some 5% of the total long term market potential and this is just within Tanzania.

So for the 500,000 urban household programs it is a classical ‘chicken and egg’ situation whereby if consistent market demand is created systematically over five years, a corresponding growth in bioethanol distillation and production will also hopefully follow with the right inducements and orchestration. A non-negotiable condition of any tax concessions, VAT exemptions, preferential licensing and other Government inducements for bioethanol production growth needs to be that Tanzania becomes self-sufficient with this fuel within a defined time period. The ultimate aim must be that the country does not import bioethanol and that any such imports are strictly controlled and only permitted in the early stages of the program while additional production capacity is brought on stream.

It is proposed that a National Tanzanian Local Bioethanol Production Plan be established and monitored with the various players by the Department of Energy and Mines and this be co-ordinated with other Government enabling measures such as resale price regulation, incentives to producers and any production licensing arrangements. Bioethanol quality will also need to be carefully monitored by the Tanzanian Bureau of Standards via testing on a regular basis.

On the upside is the anticipated long term need to supply these fuels with an annual turnover ~\$88million a year, but any fuel price caps will need to be carefully considered so as not to undermine required rates of return.

Stove manufactures

The manufacture and supply of stoves is different from the ethanol, in that the stove is a one off item, with possibly a replacement in the future. Hence, the specific market from the programme would be for only 500,000 units at an average price of \$35 or ~\$17.5million over 5 years with no guarantee of sales beyond.

Barriers will include lack of local manufacturing capability and knowledge to manufacture the units. Again the programme strength would be the offer to potential suppliers to set up country based operations to supply firm orders arising from the GEF household switching program. Placement of orders on an ever increasing scale is also an inducement to develop a local stove manufacturing industry.

Other positives for local stove manufacture include low local labour costs to reduce cost of production, standardised designs and the envisaged Tanzanian Bureau of Standards quality and safety guidelines. A widespread ‘clean cook stove’ manufacturing base has already been established with other clean cooking initiatives and many of these manufacturers may wish to migrate to bioethanol fuel stoves. The technologies involved are simple involving fairly basic sheet metal batch production ideally suited to many small entrepreneurial manufacturers.

However further help may be needed to accelerate the development of this local manufacturing capacity particularly in skills transfer, raw materials and component supply and or production machine acquisition. However, as with bioethanol fuel, the aim must be for the rapid creation of a self- sufficient stove manufacturing base within Tanzania so no stoves have to be imported within a defined time period.

Distribution chains

Many fuel and other supply chains already exist, from petroleum products, garage forecourts, through to the informal supply of charcoal that links rural manufactures to the urban markets. There are the cellular phone service shops everywhere and a cold Coke is

accessible on every street corner. So many precedents already exist for getting bottles of bioethanol to urban households. The question is how bioethanol can be supplied to the target households plus the facilitation of an initial stove exchange.

New distributors may experience strong competitive pressures from the charcoal suppliers due to market loss. Yet using existing supply channels such as local shops or garage forecourts will denude the program the opportunity of creating new livelihoods for many dozens of women. So a range of factors will need to be considered and weighed.

For potential distributors there is an opportunity to build a whole new channel to the market, here woman’s groups and local entrepreneurs can be brought into the supply chain. Existing chains such as petroleum distributors or charcoal vendors may expand their lines and become part of the new market. It will be about who can best meet customer needs.

One of the critical questions concerns who and where bottling takes place in the distribution chain. From the bulk supply of bioethanol from the producers quantities will need to be broken down into smaller bottled units. Where and how such bottling is done will prove to be a major determinant of economies of scale and distribution efficiencies (or inefficiencies). Will the local distributors handle the bottling or will the bioethanol producers do so? Generally, it is more cost effective to locate bottling facilities near centres of demand. Similarly the final bottled bioethanol quality will need to be carefully monitored by the Tanzanian Bureau of Standards via testing on a regular basis.

Once bottled, branded with the name of the distributor it then becomes a matter of distributing the bottles to sales points and local sales agents. There are various supply channel options that may be selected and promoted within the program such as:

- Dedicated local franchised agents preferably women who sell stoves and fuel.
- Stoves sold through local hardware shops separately from the bioethanol fuel.
- Mobile bioethanol sales vehicles visiting published locations at prescribed times to sell fuel and obtain returned empty bottles.
- Marketing personnel, preferably local ladies who handle neither the stoves nor the fuel but act as demonstrators, sales persons and service providers.
- Automatic dispensing units that are replenished regularly by a distribution vehicle that also collects empty bottles. Such dispensing machines could be similar to soft drink vending machines. Another agency could collect the money deposited in the machines somewhat similar to Bank ATM’s.
- Collaborating with another complementary business and supply chain such as a supermarket chain that handles hardware items, or local shops or a soft drinks distribution company. In the latter case they will probably have all the necessary delivery vehicles and other resources necessary to handle bottled bioethanol.

Subsidies and costs

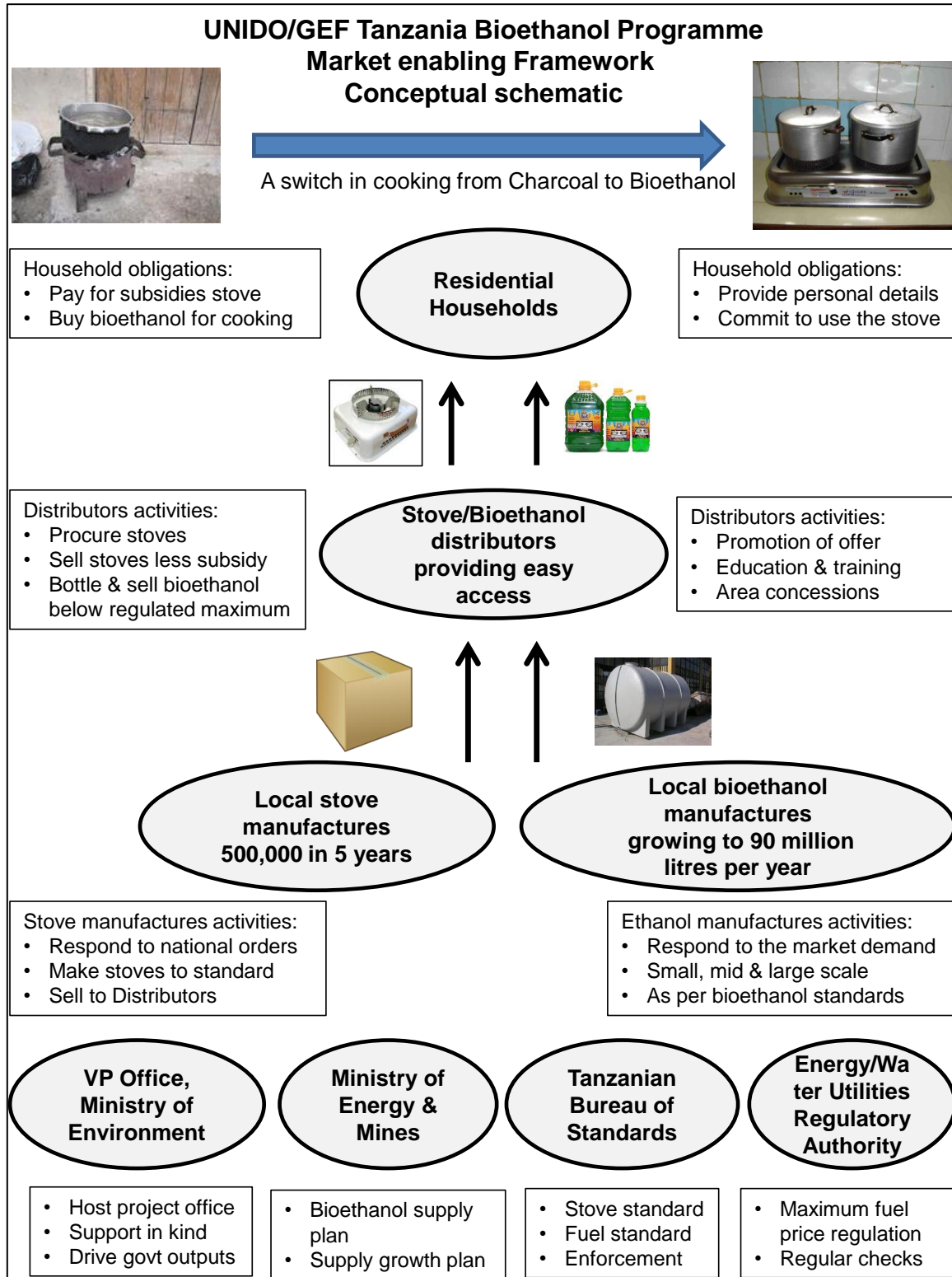
A breakdown of costs ¹⁴by stove type and the subsidies are shown adjacent for use for the detailed MEF.

Line item	Single \$	Double \$
Stove cost	20.00	35.00
Stove delivery	2.00	2.00
Total cost	22.00	37.00
Customer payment	13.00	28.00
Subsidy	9.00	9.00
Total income	22.00	37.00

¹⁴ Customer payment amounts have been set following customer research in Dar es Salaam and positioning between charcoal and LPG stoves. Stove delivery payment coupled with the concessionaire area benefits are sufficient value to potential distributors to ensure a positive tender response. Based on learning from other programmes and interactions with potential Distributors.

4.4 Market Enabling Framework development

Despite years of activity around the introduction and promotion of bioethanol cooking little progress is evident. In other words normal economic (supply/demand) activity has not led to a switch from charcoal/wood cooking to bioethanol. Hence a major facilitated market intervention is needed to shift households to more desirable fuel use. Based on the earlier analysis the required interventions are now proposed. These are summarised in the following Market Enabling Framework:



4.4.1 A customer offer that cannot be refused

To create a systematic switch of 500,000 households over 5 years to bioethanol a customer offer that almost “cannot be refused” is needed to ensure the market is established according to plan. The following customer offer elements are required:

1. Household suitable/acceptable stoves to be supplied with a few options to provide an element of customer choice. Recommend one or two plate stoves to be made available that have been proven acceptable via market research. Of note the existing charcoal stoves have minimal value as most will have limited life remaining.
2. Stoves priced to ensure high levels of attractiveness to householders in each geographic area targeted – a subsidised price of \$13(TSh29,000) is recommended for a single plate, with the same subsidy per stove level on a double plate meaning prices around \$28 (TSh62,000), when a stove is received and personal details provided plus a signed commitment to use the stove for 5 years. In other words this commitment stove is being “bought” for this amount. Customers must always pay towards the new stove as it creates a “value” in their minds, implies “ownership” and shows commitment to the new fuel. By allowing customers to own the stove, in the longer term a competitive fuel supply market can be established as customers can choose fuel suppliers.
3. Customers will be required to purchase the first bioethanol supply at the time of the stove supply, 10 litres at a cost of ~\$7 (TSh1600).
4. Be trained on the new appliance, to ensure all customer will be able to handle the fuel safely and be able to operate the appliance easily and economically.
5. An important element of the programme is to ensuring customers interested are protected in terms of on-going running costs. Relative costs will need to be explained as part of the sign up process and a maximum retail price cap will be applied.
6. Participation in the scheme requires the provision of basic customer information (name, address etc.) and a signed commitment to use bioethanol for a period plus be willing to be surveyed in the future. In turn there needs to be clear communication of the programme terms to the customer.
7. Participation in the programme will be limited to customers households within specified geographic areas. As part of the sign up proof of address will be needed as well as a commitment to use the stove in that house.
8. The product offer will be made for limited periods on” a take it or leave it” basis within each defined geographic area in line with a project plan.
9. As well as creating a compelling customer product offer, the manner in which it is presented and marketed to potential householders will also be very important. It is envisaged that focused ‘area by area’ sales promotion or energy days will be a major feature of the initial marketing drive that moves systematically across supply territories. Such energy days will demonstrate the bioethanol stoves, provide cookery demonstrations, sell stoves and bioethanol fuel and exchange the new stove for existing charcoal and wood burning stoves.

4.4.2 New bioethanol distribution chain developed

The opportunity exists for the establishment of an entirely new distribution chain that will be needed to complete the stoves switch during the programme roll out and then the regular supply of the bioethanol cooking fuel thereafter. The following commercial offer will be made to prospective participants:

1. Contracts will be advertised and offered as a “Distributor Request for Proposal” to prospective distributors for the exchange of a fixed number of stoves, set up of a fuel supply network within a fixed geographic area over 5 years. After the 5 year period and achievement of bioethanol fuel usage household targets the exclusive territorial contracts will lapse and normal trading and competition will apply. Around 3 or 4 contracts each for separate areas or territories are expected with around 150,000 households in each. Each exclusive geographical supply territory will have a required sales and household penetration target to be achieved over the five year period. Once all the contracted territory suppliers have achieved their targets the 500,000 households switched to bioethanol will have been achieved.
2. Participation benefits include:
 - a. By fixing the geographic area an initial monopoly on supply is allowed to support distribution chain development, however with time supply will become open market as customers will be free to change to other fuel suppliers.
 - b. A subsidy will be paid for each household switched to the value of \$9 to cover part of the cost for a new stove, plus the delivery of the stove to the customer.
3. Participation terms/requirements include:
 - a. Development of an effective bioethanol distribution dealer network such as for example a local supplier per 100 households. Methods of sale, bottle sizes, bottling plant, delivery etc. all left to the contracted supplier. It is at the interface with household customers that local female sales agents can play a pivotal role in demonstrating the stove and bioethanol fuel cooking safety and benefits. Such agents may be franchised, branded and act as sales, training and local service providers for the stoves and the bioethanol fuel. These local agents could also be responsible for the focused area by area energy days and sales campaigns during the initial launch marketing for the program. However, as described earlier there are several supply channel options. Distributors submitting proposals will be expected to fully describe their chosen supply channel option.
 - b. Procure stoves from preselected stove suppliers; deliver the stoves to customers in the target geographic area as per the customer offer specified above. All aspects of the offer to be completed, from promotion, energy days through to concluding customer training. Provide a copy of signed customer receipt forms for audit purposes. Payment of the \$9 subsidy for each stove successfully delivered following an audit of the records.
 - c. Provide a written undertaking that 3 months of bioethanol strategic stock will be held at all times, based on the number of households contracted x 20 litres per month.

- d. Maximum retail price regulation will apply to all sales outlets; failure to abide by the rules will invoke a fine and/or revoking exclusive territory supply contract. In these circumstances or any other major break or failure with contract terms and the withdrawal of a contract, it will be passed to one of the existing other suppliers who may wish to complete the contract.
 - e. Use of local entrepreneurs and local woman's groups is required with full disclosure and description of related agent hiring and operational plans, number of women to be hired, trained and accredited as sales agents and other employees together with employment/remuneration terms and conditions.
 - f. Agreement not to supply fuel to the car market.
4. The "Request for Proposal" will be adjudicated on the following basis:
- a. Technical correctness to requirements. (Yes/No)
 - b. Demonstration of business, financial and managerial capability in the proposal and quality and sustainability of business model. (60%)
 - c. Level of local ownership, use of local entrepreneurs and woman's groups, training provisions and marketing proposals. (40%)

Notes; Stove estimated to cost around \$20 for a single plate and \$35 for a double plate, less customer payment of \$13 or 28 respectively, with the remainder from the Distribution subsidy, leaving \$2/customer for the stove delivery, promotional and all set up activities.

4.4.3 A new stove industry incubated

An order book for 500,000 single and double plate ethanol stoves over 5 years will be sufficient to develop in country manufacturing. The following commercial offer will be made prospective participants:

1. Contracts will be advertised and offered as a "Stove Request for Proposal" to prospective stove suppliers for fixed and guaranteed quotas of stove numbers. Around 2-3 contracts are expected with 160-250,000 stoves in each. The purchase of the stoves will be in accordance with defined terms and conditions and an overall project plan in terms of supply timing.
2. Participation benefits include:
 - a. By guaranteeing a contract size the development of a new industry will be incubated and provide for surety in any business cases. Market opportunity beyond the contract will be for the supplier's risk. Should the programme be halted for any reason, these contracts will still be honoured.
 - b. A fixed price will be paid for each stove supplied up to a maximum value of \$20 for a single stove and \$35 for a double plate stove.
3. Participation terms/requirements include:
 - a. Stove designs and examples will need to be submitted for approval by the Tanzanian Bureau of Standards. A new Tanzanian minimum stove safety, quality and longevity standard will be issued and all stoves will need to meet the minimum standard. Regular checks of produced stoves to confirm adherence to standards will be required.

- b. Stoves must be manufactured or assembled in Tanzania thereby reducing production costs while also creating local employment and livelihood opportunities.
 - c. Use of local entrepreneurs and local woman's groups for manufacture is preferential.
4. The "Requests for Proposal" will be adjudicated on the following basis:
- a. Technical correctness to requirements, including test authority approval. (Yes/No)
 - b. Demonstration of local production capability and sustainable business model in the proposal (60%)
 - c. Level of local ownership, use of local entrepreneurs and woman, skills transfer and training provisions. (40%)

Notes; through the UNIDO/GEF a number of support offers will be made to assist this new industry, including; programme participation guidance, obtaining technical support from other industry players like Project Ghia, University and the Ministry of Trade and Investment. In addition the opportunity to assist these new industries will be offered to other support organisations.

4.4.4 Sustainable supply of fuel

The market shift to bioethanol from charcoal will produce a demand for the fuel, which will increase to 90 million litres a year in 5 years. This market opportunity is deemed to be sufficient to motivate the potential local bioethanol Producers, such as the sugar industry, to respond. Their response needs to be in the form of capital plant investment, storage for the off season and the wholesale supply to the main distributors. Should they so wish the producers may become one of the downstream Distributor's. What will be important will be to communicate effectively with this industry as follows:

1. Make the industry part of the solution by including them in all development steps and showing them the MEF approach to development of the new market.
2. Embracing and encouraging of local small scale bioethanol production needs to be enacted as much as possible. Support organisations from the agricultural universities to other development agencies need to be mobilised to support the opportunity.
3. Creation of a Tanzanian National Bioethanol Production Plan to be monitored and facilitated with the various local producers by MEM. It will be absolutely critical to the success of the program that consistent and growing supplies of bioethanol are available to meet the increasing demand from the urban charcoal replacement stove exercise. Any failure in supplies will seriously jeopardise the reputation of the whole program in the minds of existing and prospective household users. All large producers will be requested to procure up to 5% of their production from small producers to foster a micro production industry.
4. Regular reports on how the stove delivery is going and if it is on track etc.
5. Any supply deals with the distributors will be a straight commercial arrangement between the Producers and the Distributors. However, in all cases Distributors will be contracting for 12 months of supply, hence storage and full season production will become a Producer responsibility.

6. Producers will need to be aware of the maximum retail price regulation and the need for the distributors to make a fair margin in the chain. Currently around TS1,500/litre.
7. Issue of importation will be managed, whereby local production will be encouraged/protected through importation licences only being allowed if there is a failure to supply or during set up phases if needed.
8. To assist the Producers and in return for the maximum price regulation importation of capital equipment to have zero import duties.]
9. Product quality will be strictly enforced through checks by the testing authorities and the new standards to be adopted in Tanzania.
10. Regulation to ensure the fuel is not used for blending and lost into the car market.
11. In addition the opportunity to assist these new industries will be offered to other support organisations.

4.4.5 Stakeholders and specific programme support initiatives

As part of the MEF, a number of stakeholders will need to provide programme support and specific support outputs.

Vice Presidents office – Environment

- As the GEF programme is hosted in the VP office their support for the revised MEF based programme is critical. In addition co-financing needs to be raised to the value of \$3million for direct cash funding the \$9/stove Distributor subsidies.
- Media and promotional support for the project to raise awareness and drive through acceptance of the bioethanol stoves as a viable charcoal/wood replacement with a longer term vision of 5 million.
- Drive the three government required outputs; stove and fuel regulations, plus maximum celling price for bioethanol.
- Information dissemination in charcoal industry to enable some re-training and reorientation of livelihoods.

Department of Energy and Mines

- Facilitation, administration and monitoring of Tanzanian National Bioethanol Production Growth Plan.
- Revised programme design acceptance and full support for the overall vision to move 5 million households to bioethanol and direct support for the now revised MEF driven GEF/UNIDO programme.
- Administration of the bioethanol Production Growth Plan and close control of importation licences, strictly limited to set up phases and time of emergency procurement. This needs to be closely operated with the local Producers so that the Tanzanian industry is grown.
- Ensure growth of the local bioethanol Producers through tax and other incentives to ensure the full market demand can be locally produced within a defined time period.

Tanzanian Bureau of standards (TBS)

- Prepare in conjunction with other standards organisations and knowledgeable persons a suitable bioethanol stove standard for Tanzania covering; quality, safety, open market (no specific valves etc.), and longevity. Plus the means for testing and approval of supplier's stoves for use as part of the programme and public awareness labelling of approved stoves.
- Develop and approve a set of bioethanol fuel quality regulations and testing regimes. This needs to include ad hoc testing of the fuel sold by the Distributors.

Tanzanian Energy and Water Utilities Regulatory Authority (EWURA)

- Preparation and introduction of a maximum retail price regulation for bioethanol fuel. Benchmarking of the price levels against charcoal, paraffin and other possible fuels on an on-going basis is required.
- Development and implementation of resale price auditing measures.

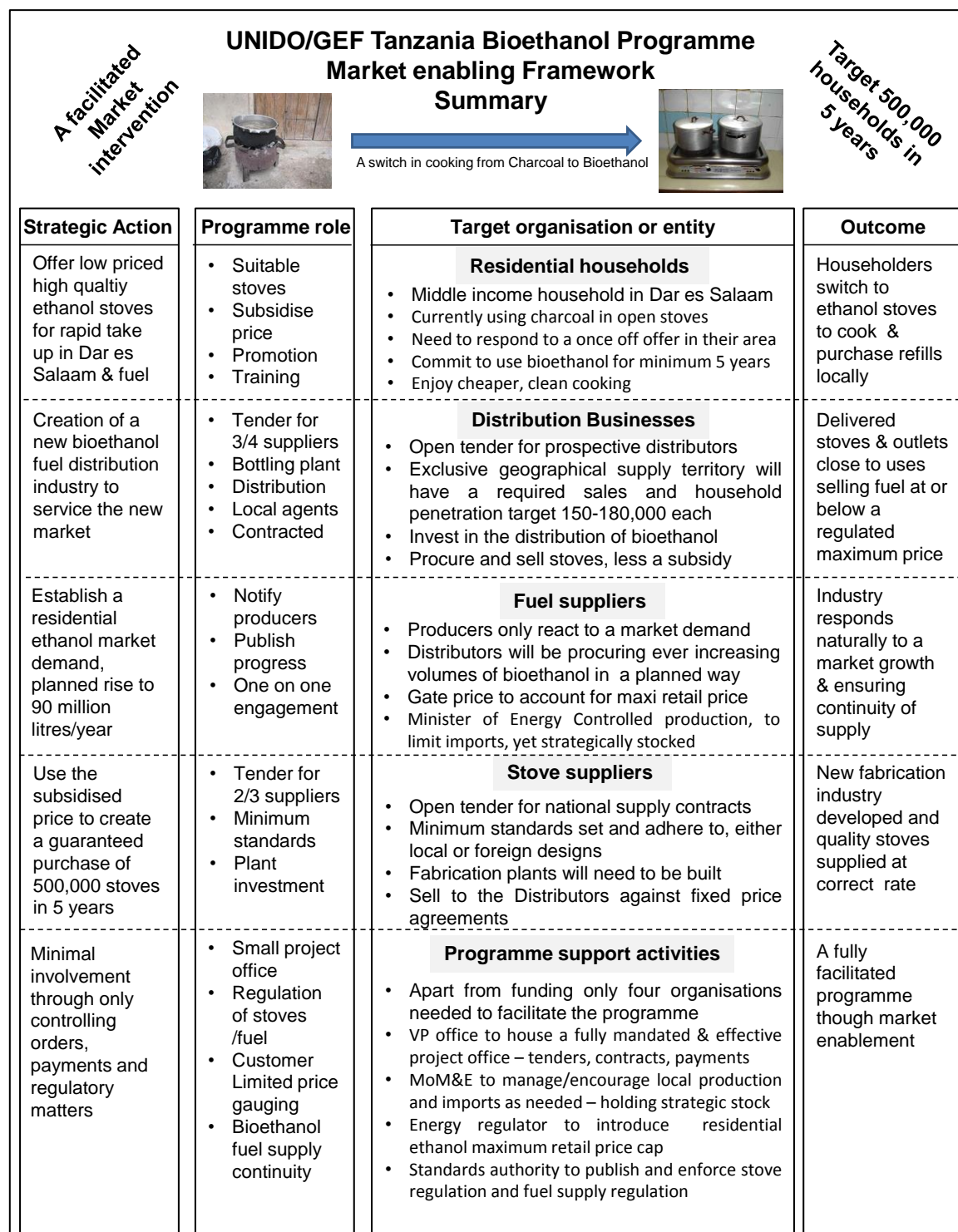
Programme facilitation, audit and payments

A joint project office between GEF/UNIDO and the MEM will be needed to administer and drive the project. These activities may be housed within REA. Outputs include:

- Programme final design and agreement of specific outputs with deadlines and scope of activities by all stakeholders. This includes the allocation of programme funds needed for disbursement of the subsidies.
- Final preparation of the various "Request for Proposals", agreement by programme principles, advertising, adjudication and the contracting of the Distributors and Stove Manufactures.
- Preparation of training material for use by the Distributors and other players.
- Administration of the \$9 subsidy payments through the verification of Distributor claims by auditing of the signed customer records by an external auditor. For governance purposes it is proposed that an independent auditing firm be engaged to complete this output.
- General project management; progress reports, remedial actions etc.

4.5 Market Enabling Framework Summary

The following diagram is a summary of the Market Enabling Framework showing the players and their action or responses:



5 Project plan

Having devised the framework, this section specifies a practical plan that when implemented will ensure the project is completed.

5.1 Project plan components and descriptions

1. Capacity development

To enact a project of this nature will require the development of capacity in a range of areas:

- Project general launch with funders, key policy makers and other stakeholders, to ensure correct sign offs and commitment.
- Communication with all stakeholders that the project is approved, what will be happening when, what their roles will be, time frames and other project matters.
- Given the key role that the Ministry of Environment, in the Vice President's office, plays, it is recommended that the project operational office be housed here. This will ensure there is sufficient authority to implement.
- Care needs to be taken that the correct level of staff are seconded to the project office, that they are sufficiently equipped and given the resources to correctly handle the contractual/payment aspects of the project. A team of 3/4 people will be needed to realistically drive the project from within this office over the 5 years. Importantly the UNIDO office also needs to play a key role in this team.
- Institutional capacity needs to be built within the Project Operational team as part of setting up the team and through specialised training of the team and other stakeholders.
- Two sets of technical support capacity need to be developed to assist with the programme development; manufacture of ethanol cooking stoves locally and small scale bioethanol production. Relevant technical organisations within Tanzania need to be helped to provide this capability.

2. Policy framework development for promoting bio-ethanol based cooking

During project development background work on policy and other aspects of the market enabling framework will need to be put in place.

- Development of ethanol cook stove safety and quality standards is needed. These would become the basis for compliance testing on all stoves to be supplied into the market.
- Development of a bioethanol fuel standard, which can be used for compliance testing. Two parts of the supply that will need testing are; firstly the bulk supply level to distributors and secondly in the final bottles or receptacles when supplied to end users. Includes national standard development for stoves and bioethanol production, together with testing/verification regimes
- Tanzanian regulatory authority will need to put the resources in place to ensure that they can administer the new regulations through test laboratory practices.
- The Tanzanian Energy Regulator will need to introduce and operate a new bioethanol fuel maximum retail price regulation. This will need to be published monthly and checks/resale audits with penalties in the areas of supply.
- The Ministry of Energy and Mines will need to develop and operate a bioethanol production/importation scheduling system to ensure continuity of supply. This will

take into account the increasing local production on one side and the need for importation on the other. Overall the correct level of strategic stocks will need to be maintained to ensure that shortages are avoided.

- Preparation of all the contractual documents for tenders, adjudication and appointment of the Distribution and Stove suppliers. This will be a major portion of the overall development work.
- Within the Project Office a system for managing all the activities of the 500,000 stove roll out will need to be set up. This includes a brief for commercial auditors to assist with the monitoring of stove deliverer process, verification of signed customer forms and then authorisation of the subsidy payments to the Distributors.

3. Promoting production and market network for bio-ethanol fuel and ethanol cook stoves

Now the project needs to move into the action stage of setting in motion the entire market enabling framework, activities include:

- Advertising of the tenders, handling clarification meetings, receiving tenders.
- Adjudication of the tenders and allocation of the Stove manufacture orders, plus appointment of the 3 Distribution organisations.
- Guiding/supporting of these organisations until they are ready to go to market.
- Set up of the market launch by each of the three Distributors. This includes promotional messages and general communication on the programme in Dar es Salaam.
- General project coordination to ensure all players are working as planned.
- Remedial action as the project progresses.
- Payment over five years of the cash subsidies.

4. Monitoring and evaluation (M&E)

Lastly monitoring and evaluation is important, here the following project outputs are planned

- Appointment of auditors to validate the stove delivery and authorisation of the subsidy payments to the Distributors. If needed the Auditors can operate an Escrow account and make the actual payments on the donor/funders behalf.
- Normal GEF/UNIDO reporting will be applied; mid-term M&E report and End of project M&E report

5.2 Comments on co-funding and time line

Co- funding is critical, particularly given the significant cash portion, as follows:

- Cash co-funding of the subsidies is critical as \$9 x 500,000 or \$4.5million is needed over the 5 years, mostly in project years 3, 4 and 5. This can be offered as an opportunity to other agencies, countries to fund as the system for delivery into the market will be fully prepared and paid for, plus the auditable delivery of a stove delivery for every \$9 is a major attraction.
- Investment by the stove and bioethanol industry will be engaged to provide co-funding letters subject to market development in the form of plant investment.
- Distribution industry will need to invest in bottling plants and distribution assets.

The time line for each of the project components are shown below:

Year	Year One				Year Two				Year Three				Year Four				Year Five			
Delivered number stoves	10,000				50,000				100,000				150,000				190,000			
Yearly quarter	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
1. Capacity development																				
2. Policy framework																				
3. Contracting & implementation																				
4. Monitoring and Evaluation																				

6 Report conclusions

A comprehensive project review and redesign has been completed on the GEF project entitled “Promotion of Bio-Ethanol as Alternative Clean Fuel for Cooking in the United Republic of Tanzania”. The concerns raised at the stakeholder workshop are fully justified as the review has shown that far more ambitious target driven project will be possible.

The current lack of bioethanol fuelled cooking stove take up in East African countries can be attributed to limited programme size, intent and lack of clear country mandates. Yet there are numerous examples of large scale rollout type cooking switch projects that have been successfully completed in other countries and with other fuels. These lessons have formed the basis of the project redesign.

Situationally the extensive yet completely unsustainable reliance on charcoal, particularly Dar es Salaam needs to be recognised. Charcoal prices are escalating as the distances to production areas increase and the pressures on natural forest resources grow. The point has now been reached where the National Tanzanian government has elevated the cross cutting focus on the environment by including a Division of Environment (DoE) and National Environment Management Council (NEMC) in the Vice President’s office. The department’s six focus areas have just been published, including “Promoting Alternative Energy Sources to Reduce Charcoal Consumption in Tanzania.”

The success of roll out type cooking projects coupled with the Tanzanian government focus on charcoal use reduction fully supports the GEF project review and proposed modification.

In line with current GEF project budget, a project modification to a target of 500,000 Dar es Salaam households switched from charcoal to bioethanol in 5 years is recommended. This is a substantive step towards reducing the over 90% reliance on charcoal or firewood by the 5 million Tanzanian households. In addition a 10% switch away from charcoal/wood to bioethanol will kick start new industries and a natural progression down the road of sustainable cooking fuels.

Achieving the 500,000 household cooking switch now needs to become the central focus of the GEF project. To this end, a Market Enabling Framework has been designed and is included. Consisting of the following five components; a customer offer that will enable a house by house street roll out of acceptable stoves at affordable prices to create a new bioethanol market in targeted geographical areas, through the placement contracts new distributors of bioethanol fuel will be established, by placing national contracts for the 500,000 stoves a whole new stove manufacturing industry will be developed in Tanzania, the growth in bioethanol fuel purchases up to 90 million litres/ year the agro processing industry in Tanzania will naturally invest and begin production.

The Market Enabling Framework can be locally implemented by housing the unit in the Vice President’s office to provide the necessary patronage and authority for a project that will become visible across Dar es Salaam. The authority will also ensure enabling standards and regulations will be forthcoming.

Lastly, it was found when the proposed project revisions were presented to all the stakeholders in May 2016 there was full support. The Vice President’s office has agreed to sign any project changes that may be needed, plus co-financing letters are now being prepared for signature.

7 Sources of information

1. Documents provided by UNIDO:
 - a. Original GEF PIF Promotion of Bio-Ethanol as Alternative Clean Fuel for Cooking in the United Republic of Tanzania.
2. Tanzanian Government document:
 - a. Effective management of environment and climate change, March 2016.
3. Presentations & inputs from a workshop held in Dar es Salaam on 28 January 2016
 - a. Project Gaia presentation.
 - b. SAFI International presentation.
 - c. NDZiLO and Mozambique programme.
4. Public domain documents:
 - a. The Improved Cook stove Sector in East Africa: Experience from the Developing Energy Enterprise Programme (DEEP) By GVEP/Laura Clough, 2012.
 - b. Feasibility study for the use of ethanol as a household cooking fuel in Malawi, UNDP, November 2007.
5. Integrated Energy Solutions (Pty) Ltd internal documents:
 - a. LPG Association of Southern African – Market enabling Framework.
 - b. Eskom LPG Stove Roll Out report.

Appendix I List of persons and their organisation interviewed during the site visit in annex

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6. UN Women – Melyabeen Alaraklina
7. Katani Ltd – Francis Nkuba
8. Zanzibar cook stoves – Hillary Njou
9. United petroleum - Mr Collins Chemngorem
10. Ministry of Energy, Renewable Energy - Mr Paul Kiwele
11. Ministry of Trade & Industry, Dir. Industrial development - Mr. Obadiah Nyagirot
12. Sugar Board, Development Planning & Liaison Manager - Mr. A. Mwankemwa
13. Mtibwa Sugar Estates, Group Chief Financial Officer - Mr. Sateesh Babu Desu
14. REA Rural Energy Agency Director-General - Dr. Lutengano
15. Vice Presidents Office, Vice Presidents Office Director of Environment - Dr. Julius Ningu
16. Tadedo – Mr Estomih Sawe
17. ETG – Zanzibar Sugar, Project Manager - Mr. Tushar Mehta, Farmers Foundation Tz Director - Nadia Paschette
18. SIDA Swedish agency Embassy Energy portfolio - Mr. Jogen Eriksson, Embassy Programme Officer Energy – Mr Stephen Mwakifwamba
19. CoET - UDSM University, represented by - Dr Hassan Rajabu, plus 5 staff