ACCELERATING ACCESS TO ENERGY

Global Alliance for Clean Cookstoves

Tanzania Market Assessment

Sector Mapping

GVEP International

GLOBAL ALLIANCE FOR CLEAN COOKSTOVES

Introduction

- This Market Assessment was conducted by Global Village Energy Partnerships (GVEP) International, a non-profit organization that works to increase access to modern energy and reduce poverty in developing countries, and Accenture Development Partnerships (ADP), the NGO-arm of the global business consultancy, on behalf of the Global Alliance for Clean Cookstoves (the Alliance).

- It is intended to provide a high level snapshot of the sector that can then be used in conjunction with a number of research papers, consumer surveys and other sources (most published on the Alliance's website) to enhance sector market understanding and help the Alliance decide which countries and regions to prioritize.

- It is one of sixteen such assessments completed by the Alliance to:

    - Enhance sector market intelligence and knowledge.; and
    - Contribute to a process leading to the Alliance deciding which regions/countries it will prioritize.

- Four assessments were conducted across East Africa in Kenya, Uganda, Tanzania and Rwanda as part of a broader effort by the Alliance to enhance the sector market intelligence and knowledge.

- Each assessment has two parts:

    - Sector Mapping – an objective mapping of the sector.
    - Intervention Options – suggestions for removing the many barriers that currently prevent the creation of a thriving market for clean cooking solutions.

- In each Alliance study a combination of GVEP, ADP, and local consultants spent 4-6 weeks in country conducting a combination of primary (in-depth interviews) and secondary research. They used the same Market Assessment 'Toolkit' for each country so that comparisons can be made. The Toolkit is available free of charge to all organizations wishing to use it in other countries.

- **The Alliance wishes to acknowledge the generous support of the following donors for the market assessments: *Barr Foundation, Dow Corning Corporation, Shell Corporation, Shell Foundation,* and the governments of *Canada, Finland,* and *Spain*.**

This market assessment was produced by Global Village Energy Partnerships (GVEP) International and Accenture Development Partnerships (ADP) on behalf of the Alliance. The findings, interpretations, and conclusions expressed in this work do not necessarily reflect the views of the Global Alliance for Clean Cookstoves or its partners. The Alliance does not guarantee the accuracy of the data.

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Sector Mapping

- Tanzania is a Less Developed Country which has made some progress in reducing poverty, though large inequalities exist. The country is politically stable and has gas reserves in the south.
- In 2007 3.8 million households cook on open fires in an enclosed space and nearly 1m additional households are exposed to carbon monoxide from traditional charcoal stoves.
- Awareness of IAP amongst the general population is virtually non-existent, though government officials and NGOs have recently become aware of the health implications of existing cooking practices.
- There is increasing pressure on natural resources and significant increase in the price of domestic fuel which could open up new markets for energy efficient stoves.
- Cookstove production is done mainly in the informal sector around urban centers and products are often substandard. Pockets of production exist around the country and sales tend to be localised.
- A few producers of quality stoves exist in the market but sales have been limited due to lack of demand and reluctance by consumers to pay a higher price. Where demand does exist, mechanisms to link the market are missing.
- Several NGO and parastatal organisations with experience in the cookstove sector exist, but previous initiatives have lacked commercial success.
- Distributors of imported stoves have entered the market with mixed results. Many distributors find it a resource intensive activity with low margins made.
- Several carbon projects are in the pipeline but registration is a slow and bureaucratic process.

Implications for Intervention Options

- The government is aware of the issues around biomass use. The EU is funding an updated biomass strategy (led by Camco). Opportunities for coordinated action at a national level exist.
- There is some technical knowledge and experience in the country and institutions exist which could be part of a coordinated programme of support to the sector.
- Stakeholders such as the government and communities may not view Indoor Air Pollution (IAP) as a priority issue, given the urgency of other priorities. IAP is not a strong case for change - there are many other adverse effects of inadequate cookstove technology. Nevertheless stove designs need to be improved to take account of health issues.
- The potential target market for improved biomass cookstoves probably comprises a population of less than 1 million households. This leaves a large number of households unlikely to be influenced through market mechanisms – mainly in rural areas.
- Supply side constraints, such as lack of working capital, need to be addressed to increase the supply of competitively priced, high quality stoves in the market.
- Carbon finance needs to be unblocked as a way of subsidising costs to the consumer.
- More research is needed into consumer behaviour within key market segments and more testing of innovative marketing approaches. Stoves could potentially be bundled with efficient cooking utensils and booklets giving 'fuel saving tips'.
- The kerosene and LPG sectors should be studied and strategies developed for expanding use of these fuels.

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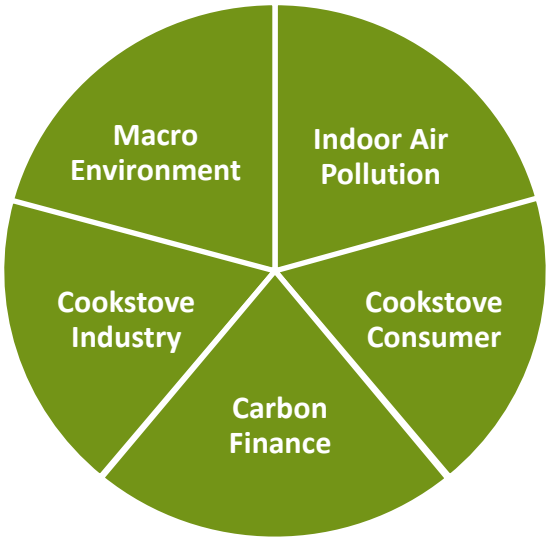
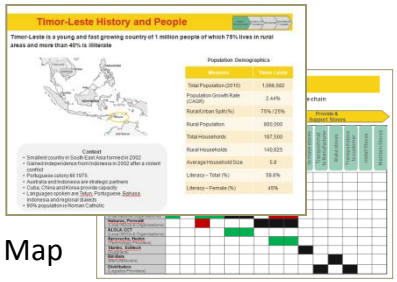
Project Approach

A structured approach first assessed the market for a cookstove industry and then used the sector mapping output to develop the intervention options and operational plan.

Sector Mapping





Sector Map

Strategy Development

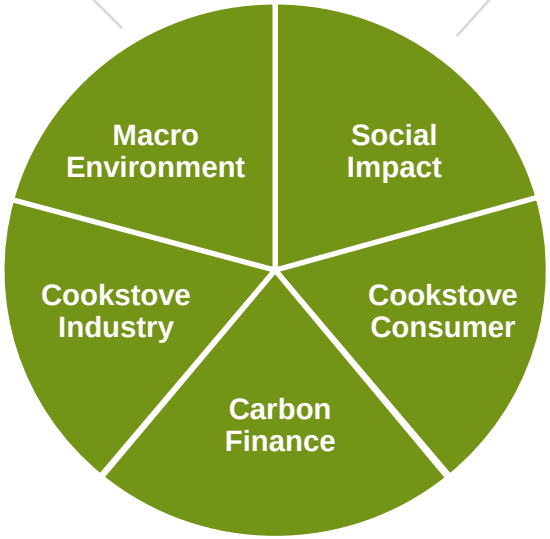
Identify Intervention Themes → **Develop Recommendations** → **Develop Operational Plan**

Intervention Options
And
Operational Plan

Sector Mapping Approach

Sector Mapping of the cookstove sector was conducted across five dimensions:

- *Social:* What is the country demographics & population distribution across regions?
- *Political:* How stable is government & what political risks will any program face?
- *Economic*: How much money do our potential customers have & what is the economic cycle?
- *Technological*: How sophisticated is the infrastructure & what is the plan for progress?
- *Environmental*: How do ecological conditions impact the success of cookstove programmes?



- How do people cook and what fuels are used in the region?
- What is the current IAP exposure profile of our target market? (Primary cause of IAP and size of problem)
- What are the other impacts caused by the use of poor cooking stoves?
- How does the impact of cookstoves stack up against other health & social priorities?

- What cooking devices are currently used within the region?
- Who are the main players active in the cookstove sector?
- What are the opportunities / threats for current & future cookstove programmes?
- How commercially attractive is the sector & what are likely to be some of the industry challenges?

- What carbon financing options exist for the country?
- What structures exist which can be leveraged for future carbon financing components?
- Which entities are likely to fill the required roles in the carbon finance operating model?

- What is the profile of the target population?
- How can the customer population be segmented / categorised?
- How big is each customer segment and what are its characteristics?
- What are the specific needs of each customer segment?

Intervention Options Approach

Strategy Development was conducted by using sector mapping as input to identify intervention areas, develop recommendations and develop operational plan.

- Favorable and unfavorable factors contributing to development of a cookstove industry on following dimensions:
  - Macro Environment
  - Indoor Air Pollution
  - Consumer
  - Current Cookstove Industry
  - Carbon Finance

- Identify possible interventions to promote a clean cookstove industry by:
  - Addressing the unfavorable factors
  - Aligning with the favorable factors

- Customer Segment Strategy:
  - Identify appropriate technology to serve each customer segment
  - Develop holistic customer strategy including marketing, financing
- Overall Strategy
  - Develop strategy for stakeholder engagement across segments
  - Develop strategy for awareness raising across segments
  - Identify possible NGOs and programs to partner with

- Develop operational plan that includes:
  - Detailed immediate next steps
  - Short term (3-6 months) activities and milestones
  - Long term (6 months – 2 years) high level directional plan

Acknowledgements

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- All those people and organisations who generously gave of their time to share their knowledge and insights. A complete list of organisations is available at the end of the report – and a selection of contributing organisations is included below.

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Social Environment

The United Republic of Tanzania is bordered by Kenya and Uganda to the north, Rwanda, Burundi, and the Democratic Republic of the Congo to the west, and Zambia, Malawi, and Mozambique to the south. The country's eastern border lies on the Indian Ocean.

Demographic Information	Tanzania
Total Population	44,841,226
Population Growth rate	3%
Rural/Urban split	74%/26%
Rural Population	33,182,507
Average Household size	5.7
Literacy-total (%)	68% (M;79%, F:59%)
Life Expectancy	52.4 years
Population below poverty line	36%

Context

- Former British colony which gained independence in 1964
- Long period of 'African Socialism' under Nyerere followed.
- Muslim 35.0%, Christian 63.0%, other (traditional, Sikh, Hindu, Baha'i) 2.0%
- Languages: Kiswahili and English; There are 120 ethnic communities in the country representing several of Africa's main socio-linguistic groups

Sources: World Bank, UNBS, CIA World fact book

-Implications-

High population growth rates and increasing urbanisation are driving up fuel prices.

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Political Environment

Tanzania has been one of the most stable countries in sub-Saharan Africa and enjoys good relations with its neighbours.

Sources: CIA World fact book

Political Structure

- Tanzania is a democratic republic.
- The President of Tanzania is both head of state and head of government.
- Executive power is exercised by the government. Legislative power is vested in both the government and parliament. The Judiciary is independent of the executive and the legislature.

Current Government

- President Jakaya Mrisho Kikwete, assumed office Dec 2005.
- Vice President - Mohamed Gharib Bilal, Prime Minister - Mizengo Pinda.

Working with the Government

- Several government policies address issues related to biomass use and a national strategy is being developed.
- Tanzania is a less easy place to do business in than its neighbours, though not bad by sub-Saharan African standards.

Administrative Map

- Dodoma is the national capital but Dar es Salaam is the commercial capital and largest city.
- Tanzania is divided into 30 regions - 25 on the mainland, 3 on Unguja (Zanzibar), and 2 on Pemba

-Implication-

Cookstove programs should seek support from the government and try to link into current policies. Private sector involvement is officially encouraged.

Economic Environment

Tanzania has sustained high rates of growth in recent years though the recent economic downturn has hit export earnings. Eighty percent of the population rely on agriculture. Other key sectors are mining, construction, communications, financial services and tourism.

Key Economic Indicators	
GDP (2010)	$23.2 billion
GDP Per Capita (PPP) (2010)	$1,500
GDP Growth Rate (2010)	6.1%
Inflation Rate (2011 est.)	11.1%
Unemployment	8.8%
Household income by percentage share – Lowest 10%	2.8%
Household income by percentage share – Highest 10%	29.6%

Key Economic Indicators	
Exports	$5.659 billion (2011 est.); gold, coffee, cashew nuts, manufactures, cotton Main Markets: China, India Japan, UAE.
Imports	$8.65 billion (2011 est.); consumer goods, machinery and transportation equipment, industrial raw materials, crude oil. Main Suppliers; China, India, South Africa, Kenya
GDP composition	Agriculture: 27.8%, Industry: 24.2% and Services: 48% (2011 est.)

Sources: World Bank, CIA World fact book

-Implications-

Rising incomes for some plus rising fuel prices mean more households are potentially in the market for improved stoves.

Gender

Tanzania is traditionally a patriarchal society. Discrimination and violence against women is common although the government has made progress in reducing equality disparities particularly on the issues of education and legal rights.

Policy & Employment

- The Ministry of Community Development, Gender and Children deals with Gender Mainstreaming and Women's Development.. A number of policies are in place relating to gender including the National Strategy for Gender Development (2008).
- Women are more active in agriculture than men, specifically in food crop production and processing agricultural products. Women make up 43% of the total MSME sector.
- Men dominate in manufacturing, construction, transport, and finance and account for 71% of workers in formal sector employment.

Cultural Background

- Women are responsible for domestic tasks that are often time-intensive, and energy consuming. These include processing food crops, providing water and firewood, and caring for the elderly and the sick.
- Customary laws and practices discriminate against women on issues of property inheritance particularly on land, as well as violence against women.

Gender Equality Statistics		
	Male	Female
Primary school attendance	79%	82%
Secondary school attendance	26%	24%
Youth Literacy (15-24 yrs)	78%	76%
Labour participation rate	91%	86%
Seats held in national government (2011)	64%	36%

Sources: UNICEF, World Bank, government websites

- Implications -

Cookstove programs must be sensitive to the cultural factors around gender in order to effectively involve and empower women.

Technological & Infrastructure Environment

Macro Environment

Tanzania faces challenges in access to energy and improving maternal healthcare. The improvement of infrastructure in transport & energy and private sector development are government priorities.

Current Situation

Healthcare

- Infant mortality rate is 50 deaths / 1000 live births
- Only 24% of the population has access to water and sanitation (2008)
- HIV/AIDS prevalence in the country among adults is 5.6% (2009)

Infrastructure

- 47 mobile subscribers per 100 people
- 11 people per 100 are internet users
- Radio is the most common form of media
- Dar is the major port, road networks improving

Education

- 73% literacy rate
- Net enrollment in primary education is 92%
- Primary education completion rate is 90%

Energy

- Around 12% of the population have access to grid electricity (HBS,2007)
- 90% of the total energy used in the country is derived from biomass.
- No government subsidy on LPG

Sources: World Bank Indicators, CIA fact book, government website

Government Priorities

- Improving access, quality and efficiency of primary health services
- Promoting private sector involvement in the delivery of health services
- Developing human resource to ensure adequate supply of qualified health staff

- Improving roads, ports, railways, and air transport
- Developing the national fibre-optic backbone network

- Achieving universal primary education
- Ensuring quality, access and equity at all levels of education
- Promoting science and technology

- Increasing rural electrification and electricity generation
- Encouraging commercialisation and private sector participation
- Finding alternative sources of generating electricity

-Implications-

Government priorities in energy focus on increasing generation and reliability of supply which may reduce the focus on biomass.

Ecological Environment

Tanzania has an abundance of natural resources but over exploitation, population pressure and poor policy have led to environmental problems.

Photo Source: National Geographic

Emissions

- Tanzania is a low emitter of carbon with CO2 emission at 0.2 metric tons per capita.
- Tanzania has low emissions from fossil fuel use, whilst the forest and land use sectors have relatively higher emissions.

Climate

- Tanzania's climate varies from tropical along the coast to temperate in the highlands.
- Temperatures vary across the different topographical regions from 15-32°C.
- Elevation ranges from 0 – 5895m.

Natural Resources

- Natural resources include hydropower, tin, phosphates, iron ore, coal, diamonds, gemstones, gold, natural gas, nickel
- Electricity is largely generated by hydropower (60%), but this is being increasingly interrupted by droughts. Alternative indigenous sources of energy include coal and natural gas.
- Wind and solar energy is another source of energy but very little attempt has been made to utilise them.

Environmental Problems

- Soil degradation; deforestation; desertification; destruction of coral reefs; recent droughts affected marginal agriculture; wildlife threatened by illegal hunting and trade.
- Flooding on the central plateau during the rainy season; drought

Sources: FAO, CIA World fact book, climatetemp, government websites

-Implications-

Cookstove programs have the potential to contribute to wider environmental issues.

Contents

Indoor Air Pollution in Tanzania

The use of biomass with basic cooking devices combined with unsuitable cooking spaces is the main cause of IAP in Tanzania.

	Scenes	Comments
Cooking Fuel		• Low grade biomass and agricultural residue used as cooking fuel increases the exposure to IAP
Cooking Device		• Open wood fires and traditional cook stoves at both the residential and institutional level are the primary cause of indoor air pollution in rural homes • Traditional charcoal stoves burning poor quality charcoal cause exposure to carbon monoxide
Housing Structure		• Women keep small children near them during the preparation of meals • 2/3 of kitchens are in a separate hut or makeshift shelter • Use of poor quality kerosene “candles” that generate a lot of soot is widespread in the rural areas

-Implication-

Improving cooking practices as well as encouraging cleaner technologies would have a major health benefit.

Health Impacts of IAP

Female cooks and children are the main groups exposed to IAP which is linked to acute respiratory infections responsible for 65.74 deaths per 1,000 live births.

Who is Exposed to IAP

Group	Numbers Exposed
Households using traditional open fires in built kitchens	10.6 million
Female cooks	3.8 million
Institutional cooks and kitchen helpers	265,000
Secondary students age 13-19 who study with the Kerosene "candle"	2.8 million
Urban women & children exposed to carbon monoxide by using charcoal stoves	1.9 million

IAP Effects

- ARI caused by wood smoke and other substances is responsible for 65.74 deaths per 1,000 live births.
- In addition, harmful gases in wood smoke (e.g. sulphur dioxide and carbon monoxide) cause conditions such as mental impairment and cardiovascular disease.
- WHO estimates 18,900 deaths per year as a result of indoor air pollution.
- Awareness of ARI is low. Only 46% of children with ARI symptoms are taken to a health centre, yet they are the second biggest cause of death.
- 21% of deaths among children under five are attributed to respiratory infections.
- IAP exposure is closely tied to population growth and is projected to continue in line with Tanzania's predicted population growth (approx. 2 % p.a.)

-Implications-

Cookstove programs need to educate users on the dangers of IAP and ensure improved stoves really do reduce exposure.

IAP Programmes

Although often not the primary objective, many cookstove programs aim to reduce indoor air pollution through their activities. In addition programs in other sectors have aimed to tackle this problem. Below are some of the main programs that have focused on IAP in Tanzania.

Current

- Tanzania Domestic Biogas Programme (SNV/CAMARTEC)
- Developing Energy Enterprises Project DEEP (GVEP Int'l)
- Up-scaling access to Integrated Modern Energy Services for Poverty Reduction (HIVOS/TaTEDO)
- Tanzania Energy Development and Access Project (World Bank,GEF)

Past

- Air Quality Monitoring Capacity Building Project AQMCBP (USEPA,UNEP)
- Program for Biomass Energy Conservation ProBEC (GTZ/DGIS/MEM)
- Households Efficient Stoves in Rombo & Hai District, Kilimanjaro, Tanzania (HIVOS/TaTEDO)
- Enabling Access to Sustainable Energy EASE (DGIS)
- Smoke, Health and Household Energy in Tanzania (DFID)

Other Outreach Programmes

- Renewable Energy Project Development Programme East Africa (BMWi)
- Natural Resources Management Programme (NORAD, Tz Government)
- Integrated Sustainable Energy Services for Poverty Reduction and Environment Conversation Programme (HIVOS/NORAD/TaTEDO)
- Tanzania-German Programme to Support Health (BMZ, KFW,GIZ)

-Implications-

Cookstove programs should build on existing experience and link in with other initiatives related to IAP.

IAP Programmes

Several lessons can be learnt from past initiatives that have contributed to a reduction of IAP.

Lesson Learned

- Engagement of existing local financing institutions in rural areas is key to success especially for the expensive technologies such as biogas digesters.
- There is need to build capacity at all levels of the financial institutions - to overcome overcautious lending, overstatement of risks and a market expansion limiting group financing model.
- There is great disparity in accessing credit as more men than women are able to access financing.
- There is a need to strengthen air quality monitoring & data required to enable development of trends & identify sources of pollution; IAP needs to be monitored to establish the link with increasing respiratory diseases.
- Programmes with many components have achieved less than those focused solely on cookstoves.
- There is very low awareness amongst the rural population on new sustainable clean energy products in the market.

Risks and Opportunities

- There is greater chance for success of IAP programmes/projects through integration with poverty reduction and environment conservation and other programmes.
- There are limited organisations active in reducing Indoor Air Pollution and it is often not a policy and programme priority.

-Implications-

Cookstove programs need to integrate with other development activities, especially in rural areas.

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The Role of Gender

The majority of stove businesses are male headed, although women are involved in areas of the business, mainly liner production, assemble and retail.

Role of Gender in the Household

- Women are far more likely to be exposed to IAP in their role as primary cook.
- Although women are involved in household purchasing decisions, men have more purchasing power and ability to pay upfront.
- 23% of households in rural areas are female headed, compared to 30% in urban areas (HBS, 2007).

Role of Women in the Cookstove Sector

- Women's involvement in micro enterprises and access to local networks has extended into the cookstove sector.
- Women are mainly involve in liner production and stove assembly whereas metal work is dominated by men.
- Women are integral to any consumer awareness and education campaign as the primary users of cookstoves.

Barriers to further involvement

- Women often have less access to finance and own less collateral, hence finding it difficult to secure a loan for business expansion.
- Women's role looking after the home often restricts their ability to travel long distances and limits them to local activities.

Sources:Interviews, field visits

-Implications-

By improving the ability of women to participate in the sector, cookstove programs can take advantage of existing skills and networking capability.

Deforestation

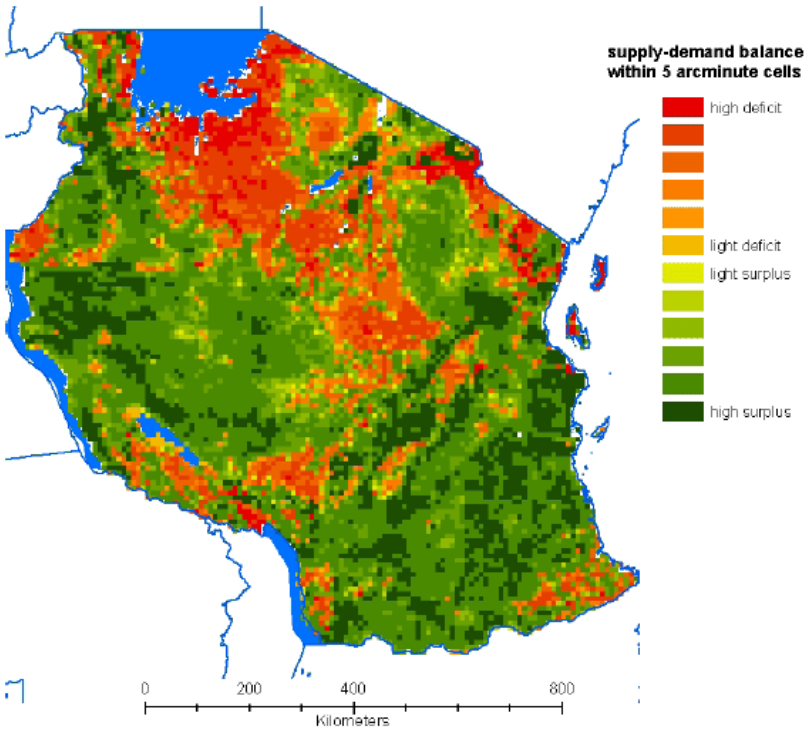
Tanzania's forests cover nearly 40% of the land area. Much of the forest has high levels of biodiversity and many endemic species, which are threatened by a deforestation rate of over 1% per year.

Deforestation

- It is estimated that about 70% of the deforestation in Tanzania is due to fuel wood harvests, directly or indirectly, with about 30% of the deforestation being the result of agricultural land clearing.
- In total, between 1990 and 2010, Tanzania lost 19.4% of its forest cover, or around 8,067,000 hectares.
- Tanzanians consume more than 2650 metric tons of charcoal each day equivalent to a wood requirement of 342.5 hectares of forest (World Bank, 2009).
- The total annual revenue generated by the charcoal sector for Dar es Salaam alone is estimated at 350 million USD.
- Scientists have linked the lose of snow on Mt Kilimanjaro to deforestation on the mountains foothills.

Sources: Mongabay.com, UNEP, World Bank, FAO

Map of wood fuel supply-consumption balance (FAO 2006)



-Implications-

Rapid depletion of biomass resources is having economical, social and environmental impacts.

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Customer Segmentation

Research conducted in 2007 by the Shell Foundation Breathing Space Programme.

The market for improved stoves comprises mainly urban and peri-urban households living above the poverty line.

The Shell Foundation Breathing Space project conducted research amongst consumers in 2007 when the population of Tanzania was 38.3M (current 44.8M.) The population was divided according to income level and area:

	Rural (HH)			Urban (HH)		
	Poor (<$1)	Middle ($1-$3)	Upper (>$3)	Poor (<$1)	Middle ($1-$3)	Upper (>$3)
HHs	2,500,000	2,600,000	1,000,000	310,000	860,000	550,000
Tot HHs	7,820,000					
% of Tot	32%	33%	13%	4%	11%	7%
		4,000,000			700,000	

Subgroups of the total population were identified for detailed research. Households with income levels lower than $1/day were excluded on grounds of insufficient purchasing power. This left a total of approximately 4M households in rural areas predominately using firewood and 0.7M households in urban areas the majority presumed to use charcoal as their main fuel. These were the segments considered most likely to include potential customers for stoves.

-Implications-

A market approach needs to be based on an understanding of the existing and potential customers for stoves.

Customer Segmentation

Research conducted in 2007 by the Shell Foundation Breathing Space Programme.

	$1-3/d				$>3/d *
Firewood	Segment 1	Segment 2			
Charcoal			Segment 3	Segment 4	Segment 5
	Rural	Peri-urban		Urban	

The two overall groups of firewood and charcoal users were divided in five segments as illustrated in the table on the left.

Sampling of these groups was carried out using a detailed questionnaire survey. 250 households were interviewed, representative of 5 consumer categories (i.e. 50 households per segment). Locations were picked randomly to cut across areas identified as viable from Stage 1, and geographically spread to ensure social, cultural and economic representation.

Consumer group no.	Geography	Main cooking fuel	Household income	Locations sampled	Sampling incidence*
1.	Rural	Firewood	$1-3/day	Mbeya rural (south), Arusha rural (Kilimanjaro) & Morogoro rural (Central)	57
2.	Peri-urban	Firewood	$1-3/day	Moshi (Kilimanjaro) & Korogwe (Central)	66
3.	Peri-urban	Charcoal	$1-3/day		57
4.	Urban	Charcoal	$1-3/day	Dar es Salaam & Mwanza	56
5.	Urban	Charcoal	>$3/day		54

NB. *Although the survey conducted by Shell Foundation is five years old and excluded the rural segment with income over $3/day it contains valuable information about consumers attitudes and aspirations. The following slides summarise the findings of the research.*

Consumer Cooking Habits

Firewood users mostly cook on 3-stone fires. Jiko stoves are widely used among charcoal users but just the $>3/d segment is most likely to own ceramic-lined stoves. Most meals are prepared using heat-wasting aluminium saucepans. Some use of clay pots for boiling roots that typically accompany breakfast is not as diffused but present. People generally cook seated on a high stool and do not prepare more than one dish at a time.

Typical meals

• Tea and wheat porridge with roots are the two main hot foods taken for breakfast. Across the segment both require intense heat for boiling water.

• Maize meal with vegetables, legumes and some meat is most often consumed for supper and lunch in the rural group while the others tend to use rice rather than maize.

• A relatively high percentage of other foods is reported, indicating huge variety in tastes.

Cookstove requirements

• Ability to generate both high intensity heat and low intensity simmering.

• Need to function in the morning and evening when there is no sun.

• Connected water heating system.

• Improved cooking tools.

• The degree of variety requires a versatile cooking appliance or different specialised ones.

-Implications-

Cooking needs are similar across segments. An integrated cooking system would best address Tanzanian consumer needs, along with more efficient cooking pots and water heating systems.

Consumer View of Cooking Systems

Firewood peri-urban consumers almost exclusively buy firewood, spending as much as the urban charcoal group. Richer urban charcoal users spend up to $20/month which is considerable given that their income ($3.5/day) is very close to that of other segments.

	Fuel availability	Issues	Benefits	Other uses	Switching fuels
Rural firewood	22% buy for $4.1/month	Smoke (eyes itching, cough, dirtying utensils)	Affordability	Heating water for bathing and roasting foods	7% want to switch to charcoal
Peri-urban firewood	94% buy for $11.4/month		Easiness of lighting		34% want to switch to charcoal
Peri-urban charcoal	$7.3/month	Cost, availability and difficulty in lighting	Availability and taste		25% want to switch to electricity, paraffin, sawdust, back to firewood
Urban charcoal	$13.5/month				Approx 20% want to switch to paraffin, gas, electricity
Urban charcoal >$3/day	$20.7/month				

-Implications-

Barriers to switching to efficient appliances are high. Cost a significant issue for most consumers.

Consumer Purchasing Preferences

Purchases are rare and strictly based on household needs such as furniture and house repairs. However, kitchen utensils figure among the purchases. Also, radio is largely diffused, about one third of families own a bicycle outside urban areas while more than half of all urban dwellers have a TV.

Future purchases are likely to be on furniture/deco/repairs and the vast majority has no plans to spend at all.

% / Segments	Rural firewood	Peri-urban firewood	Peri-urban charcoal	Urban charcoal	Urban charcoal >$3/day
Bought item $15-30 in the past year / bought expensive item $30+	24 / 13	26 / 6	19 / 6	29 / 5	27 / 27
Bought stove $15-30 / plans to buy	0 / 0	0 / 6	0 / 0	6 / 2	8 / 0
Bought kitchen utensils $15-30 / plans to buy	18 / 7	23 / 2	11 / 4	19 / 4	15 / 0
No plans to buy at all	78	48	52	59	65
Ever bought on credit	11	20	13	29	33

-Implications-

New stoves would need to offer demonstrably superior performance and cost savings. Fuel efficient utensils capable of speeding the cooking time and making the cooking more fuel efficient could be appealing to some customers.

Consumer Segments (1/2)

The rural segment mostly relies on collected solid fuels and has very low willingness to pay. Peri-urban respondents buy their fuel but have very low purchasing power. Problems with smoke are mentioned in terms of eyes itching, coughing and making utensils dirty.

	Segment 1 Rural Firewood	Segment 2 Peri-urban Firewood
No of HH	Not available from source data	Not available from source data
Income	$1-3day	$1-3day
Rural / Urban	Rural	Peri-urban
Willingness to pay	Minimal (mostly collects)	Moderate (mostly buys)
Stove ownership	No improved firewood stove	15% improved firewood stove (mostly self made)
IAP awareness	Low	Low
IAP exposure	High	High
Fuel choice	Firewood Few wish to switch, mainly to charcoal	Firewood One third wishes to switch, mainly to charcoal but paraffin and saw dust are also mentioned

-Implications-

Stoves that offer the opportunity to save fuel could appeal to the peri-urban group. However, subsidies or microfinance schemes would need to be combined with most programs to increase affordability. Woodstoves would need to offer excellent value for money to replace open fires or existing self made appliances.

Consumer Segments (2/2)

All fuel is purchased and cost is indicated as the major issue. Many already own clay lined charcoal stoves and some few also gas cookers. Others complain about smoke and aspire to upgrade to gas.

	Segment 3 Peri-urban Charcoal	Segment 4 Urban Charcoal	Segment 5 Urban Charcoal $>3/d
No of HH	Not available from source data	Not available from source data	Not available from source data
Income	$1-3day	$1-3day	$>3day (av $5/day)
Rural / Urban	Peri-urban	Urban	Urban
Willingness to pay	Moderate to high (already pays for charcoal)	Moderate to high (already pays for charcoal)	Moderate to high (already pays for charcoal)
Stove ownership	Jiko, approx 20% clay lined	Jiko, approx half clay lined	Jiko, approx 70% clay lined
IAP awareness	Low	Low	Low
IAP exposure	High	High	High
Fuel choice	Charcoal Many wish to switch to gas	Charcoal Many wish to switch to gas	Charcoal Many wish to switch to gas

-Implications-

A cookstove programme could consider opportunities for LPG for the better off. An improved charcoal stove should clearly present considerable added value over the existing ones to be able to penetrate the market.

Consumer Segments Summary

Each customer segment has different characteristics and needs.

Consumer Segments	Size (N of HH)	IAP Exposure	IAP Awareness	Affordability	Willingness to pay	Access to alternative clean fuel source	Alternative Use	Distribution access
Rural	--	●	◔	◔	◔	◔	◕	◑
Peri-urban firewood	--	●	◔	◔	◑	◑	◑	◕
Peri-urban charcoal	--	●	◔	◔	◕	◑	◕	◕
Urban	--	●	◔	◑	◕	◕	●	●
Urban >3$/d	--	●	◔	◕	◕	◕	◑	●

Legend:

- ◔ Minimal
- ◑ Moderate Low
- ◕ Moderate High
- ● High

IAP exposure is high as use of chimneys is not diffused

Some awareness of smoke provoking prevalently eyes itching but low on long term risks. Better quality / different fuel seen as solution

Cost is an important issue making campaigns based on fuel savings and micro-finance interesting

Electricity and gas in urban areas, possibly sawdust or pellets from other biomass elsewhere

Alternate use for heating water and roasting scores highest

Generally fair but transportation cost may increase in remote areas and in the rain season

-Implications-

Tanzania is a tough market. Many people will not be reached through commercial approaches.

How Big is the Existing Market?

The total existing market – households owning an improved stove – is around 400,000 households. According to the Tanzania Household Budget Survey 2007, 2.8 million HH own a stove – the vast majority are traditional stoves.

NGOs 400,000

•SNV in a report prepared in 2011 collated figures from a range of NGOs. They estimated 3 m domestic stoves had been 'disseminated' over the 2000-10 period. Stoves last 0.5-3 years. Assuming 1.3 years average the 3 m figure would suggest 400,000 HH could be using an improved stove. *

Palmula & Baudin 300,000?

•A study by Palmula and Baudiin in 2007 found 20% of all HH in Dar who use charcoal owned an improved stove – 50,000 HH. 80% of charcoal users had traditional metal stoves. Assuming slightly lower levels of ownership in other urban areas approximately 300,000 HH might be assumed to own an improved stove nationally.

Shell Fdn ca. 400,000

•In the Shell Foundation research no firewood users had bought an improved stove, 17% of peri-urban charcoal users had a stove, around 48% of urban charcoal users ($1-3) and 67% (>$3) had a stove. This equates to approximately 400,000 improved stoves.

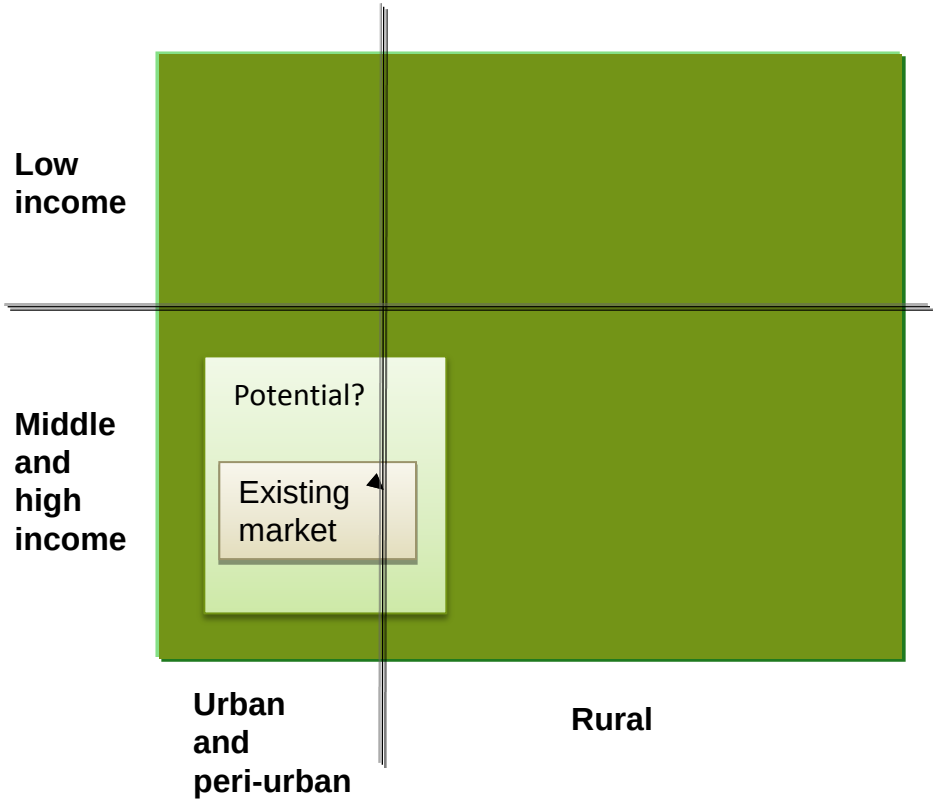
**The 3m figure is a rough estimate based on the available data. The quality of many of the stoves in use is likely to be poor as most are made by small scale artisans.*

-Implications-

The existing market is small– with urban and peri-urban areas predominating. More research is needed to establish the actual size of the market.

What is the Potential Market?

The potential market will be larger than the number of households currently owning stoves - though it is difficult to quantify given currently available data.



Evidence of demand

Increasing urbanisation and rising charcoal prices is likely to push up demand for efficient stoves, in areas where people pay for fuel.

In rural areas penetration of stoves is almost non-existent and the Shell Foundation survey suggests limited/no demand.

The ProBEC project was not sustained after it closed.

Stove producers/retailers report significant challenges trying to sell quality stoves (SECCO, L's Solutions.)

-Implications-

Even with subsidies market based approaches will only reach certain segments of the population. More research is required to identify true market segments and potential for commercial development.

Contents

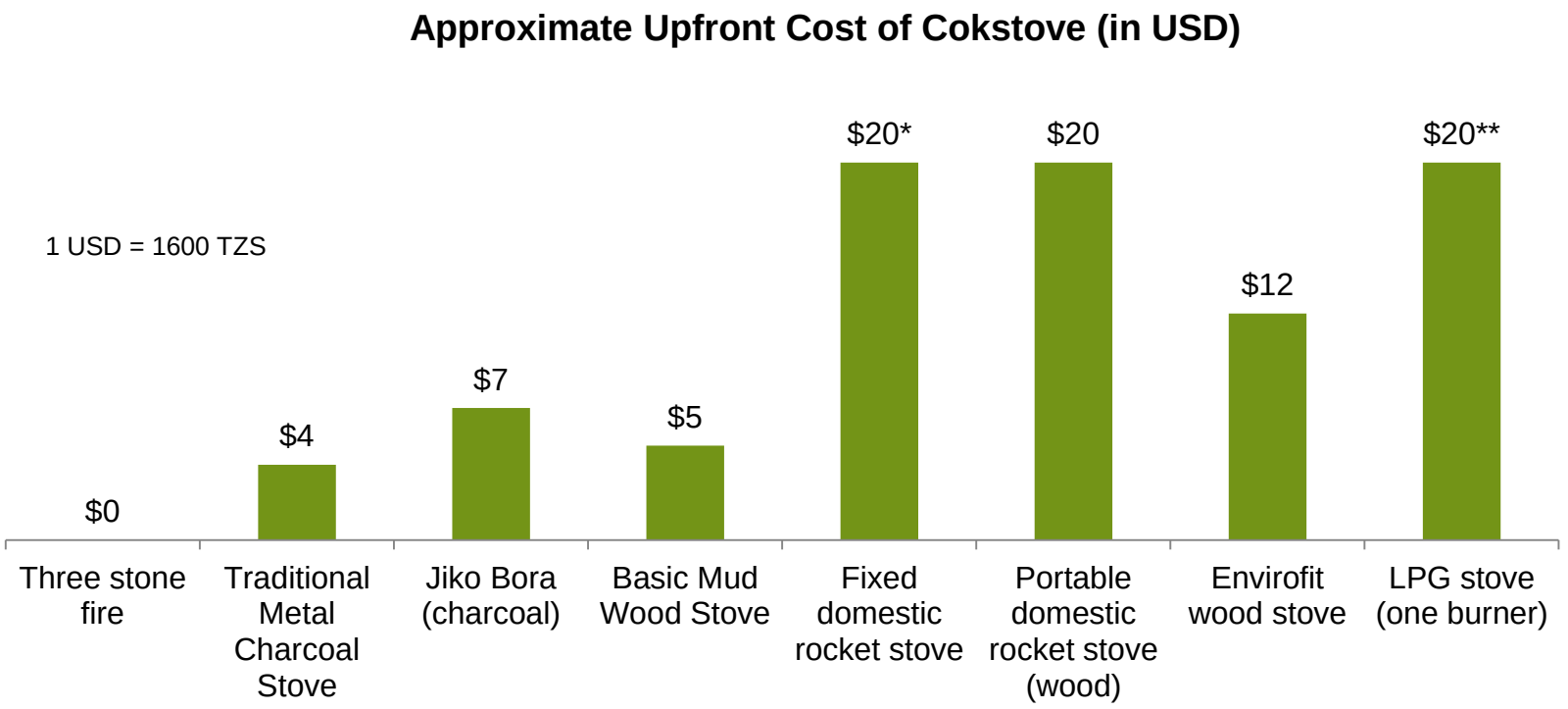
Available Cookstove Usage and Cost (1/2)

96% of the population in Tanzania use biomass for cooking. Within rural areas wood is the main cooking fuel, whilst in urban areas both wood and charcoal are used. Traditional cooking methods such as the three stone fire and traditional metal charcoal stove are prevalent. Improved cookstoves have been promoted in the country since the early 80's but uptake is still low.

Cookstove Usage

- Improved cookstoves are more available around urban centers particularly Dar-es-Salaam, Morogoro, Arusha, Mwanza, Dodoma and Tanga.
- Many of the stoves on the market are cheap and of low quality. Many consumers are not willing to pay a higher price for quality improved stoves.
- Wood stoves have been promoted by several NGO's but have failed to achieve commercial success.
- Innovation has occurred in the improved cookstove sector introducing new stove types such as the KUUTE and Sazawa stove, however commercialisation has been slow.
- Imported stoves such as the Envirofit wood stove have also been introduced to the market but the number of distributors is low since it is a resource intensive activity. Other imported stoves from Stovetech and Phillips have also been tested in the market, but are yet to be introduced.
- Cooking with Biogas is being promoted under the Tanzania Domestic Biogas Program with the aim to install 12,000 biogas digesters in 5 years.
- Uptake of LPG is low due to the high up front cost of the stove and gas cylinder and availability outside urban centers.
- Stoves are paid for upfront in cash.

Available Cookstove Usage and Cost (2/2)



* Most fixed domestic rocket stove sold at prices ranging from 20 – 70 USD (ProBEC 2010)
** Initial cylinder cost around 77000 TZS / 48 USD for 13kg

-Implications-

Improved stoves need to demonstrate high performance while being competitively priced to succeed in this market.

Available Fuel Cost (1/2)

Whilst cost is a significant factor, availability and purchasing quantity are also important along with social and cultural factors.

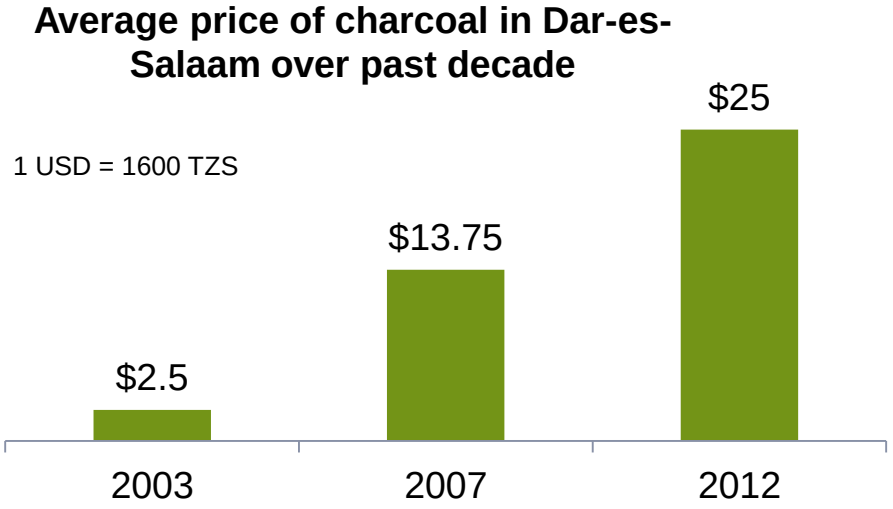
Fuel Usage

- Wood is used primarily in rural areas whereas in urban areas people use mostly charcoal and in some cases firewood.
- Significant increases in the price of fuel have been experienced in the past five years.
- Many households in rural areas can collect firewood for free although it is becoming increasingly unavailable.
- The price of fuel is higher in urban centers and increases during the rainy season.
- LPG use has increased in urban areas over the past 5 years but uptake is still low. It is often perceived as a dangerous fuel and availability outside urban centers is low.
- Kerosene is used by a small percentage of the population for tasks requiring rapid heating.
- Alternative fuels such as biomass pellets and briquettes are being introduced into the market but uptake is still low.

-Implication-

Increases in fuel prices may open up new markets for energy saving cookstove and alternative fuel sources.

Available Fuel Cost (2/2)



Fuel cost per week (in USD) (using traditional cooking methods*)

*based on interviews and authors derivations, will vary depending on family size, location, stove and fuel mix.

Fuel	Purchase Unit	Usage	Cost	Cost per week / USD
Firewood	3 pieces	1 day	500 TZS / $0.31	2.19
Charcoal	40kg sack	25 days	30,000 TZS / $19	5.25
LPG	13kg cylinder	30 days	56000 TZS / $35	8.12
Kerosene	1 litre	2 days	2500 TZS / $1.6	5.46

Fuel Switch Initiatives

Initiatives promoting alternative fuels such as biomass pellets and briquettes exist in Tanzania.

Alternative fuel sources

- Biomass pellets made from agri-waste such as rice husks and Jathropha press are being trialled in Tanzania with complimentary clean cookstoves.
- There are also several manufacturers of biomass briquettes made from recycled char and other agri-waste such as coconut shells.
- Uptake so far has been limited and restricted to commercial and industrial markets.

Challenges

- Alternative fuels must be as available and convenient to buy as charcoal and firewood to make them competitive.
- Sensitising the market on new technologies can be time and resource intensive.
- Significant investment in pressing and extruding machinery is required to produce on a large scale.
- Availability of feedstock may be a limiting factor.

-Implications-

Fuel switch initiatives can reduce pressure on traditional biomass but require intensive sensitisation and good availability.

Production of Improved Cookstoves (1/2)

Components of a charcoal stove (KUUTE/Jiko Bora)

 **Liner**	Ceramic liner made from clay Clay costs from 6-25 USD per ton depending on quality and transport distance Sometimes freely available to producers
 **Cladding**	Made from sheet metal Costs around 10 USD per sheet (depending on gauge) which will make around 16 clads Sourced from suppliers in Dar-es-Salaam Cladding is painted after complete assemble
 **Insulation**	For the KUUTE stove the liner fits into the cladding and is held in place by the pot rest For the Jiko Bora insulative materials are used including cement, ash, char and lime Char left from the liner firing process is often used

- A lot of stove production is done through informal businesses and artisans.
- Many producers will source out the making of liners and complete the cladding and assemble of the stove.
- Small artisans often work closely together especially within the 'jua kali' sector.
- Quality clay is available in particular locations and may be transported significant distances to producers.
- Most sheet metal is sourced from Dar-es-Salaam.

-Implications-

Small scale production prevents economies of scale and restricts cash flow leading to increased costs and driving down quality.

Production of Improved Cookstoves (2/2)

Fixed wood stoves have been promoted by organisations such as TaTEDO and ProBEC targeting rural wood user. Several types exist including basic mud stoves (known locally as Ukombozi) and Okoa rocket type stoves that can be made from local materials. Programs in the past have trained local artisans to install the stoves, however many of the producers stopped after the end of the program when program subsidies were removed.

Basic Mud Stoves

Raw Materials	Constructed using clay soil. Other materials include ash, stones, Okra leaves, water and fresh dung. All materials are locally available and can be obtained freely in rural areas.
Features	The earth wall is made from a mixture of soil and ashes. The fire is surrounded by a wall of clay to protect it from wind. The shape of the combustion chamber and chimney help reduce heat loss.

Source: TaTEDO

-Implications-

Quality production at scale is a challenge. A cookstove program may need to look at alternatives to market mechanisms if rural communities are to be engaged.

Current Cookstove Market (1/4)

A lot of stove production is done in the informal artisan sector and quality is often substandard. SECCO are the largest formal producer of quality household stoves in Dar-es-Salaam. Quality stove designs are also being promote by CAMARTEC, SIDO, COSTECH and varies NGOs but commercialisation has so far been limited. The following slides give a selection of stoves available in the Tanzanian market.

	Improved Charcoal Stove		**Improved Charcoal Stove**	
Manufacturer	SECCO, Dar-es-Salaam		CAMARTEC, Arusha	
Cost Range	$6.25 - $7.5(subsidised)		~$40 medium	
Thermal Efficiency	35%		25%	
Key Features	Ceramic liner with metal cladding. SECCO make complete stove. Subsidised by about $3, will generate carbon revenue through VCM.		Ceramic liner made from bricks with outer metal cladding and metal charcoal grate. Metallic parts sourced elsewhere.	
Production Capacity	Currently around 700 stoves a month. Sold over 6000 stoves so far.		Sold over 500 so far but capacity to make more	
Distribution Channels	Sell through network of 48 agents around Dar-es-Salaam		Sell through agricultural fairs and contacts	
Availability and Use	Use ◔ Availability ◔		Use ○ Availability ○	

Key | ○ Minimal ◔ Low ◑ Medium ◕ Medium-High ● High

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Current Cookstove Market (2/4)

	 **Envirofit Imported Stove**	 **Portable rocket wood stoves**
Manufacturer	Envirofit (Distributor L's Solution)	M&R Appropriate Technology Engineering
Cost Range	$12 (subsidised)	$20
Thermal Efficiency	33%	30-35%
Key Features	Highly engineered wood stove manufactured in China.	Liner made from clay and sawdust, with metal cladding and insulation material
Production Capacity	Demand Driven. 16,000 sold to date through L's Solution	M&R sell 500 – 800 annually. Currently seeking investment for expansion.
Distribution Channels	Through roadshows and network of distributors	Mainly direct sales and exhibitions
	Use ◔ Availability ◔	Use ◔ Availability ◔

Key | ○ Minimal ◔ Low ◑ Medium ◕ Medium-High ● High

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Current Cookstove Market (3/4)

	 **Fixed rocket wood stoves**	 **Fixed Maasai Wood Stove**
Manufacturer	Various (Many ProBEC trained)	ICSEE (manufactured locally)
Cost Range	$20 -$70 (depending on size/material)	$45 (subsidised)
Thermal Efficiency	Around 25%	24%
Key Features	Made by fabricating mild steel sheets, galvanised sheets and inserting insulative bricks inside the combustion chamber.	Stove brings hot gases around the pot before escaping through chimney.
Production Capacity	Demand driven. On average producers make 20-30 per month.	300 installed so far by ICSEE. Factory capacity currently 150 / month
Distribution Channels	Mainly direct sales and exhibitions	Sold within Maasai community, installed through local women
	Use ◔ Availability ◔	Use ○ Availability ○

Key | ○ Minimal ◔ Low ◑ Medium ◕ Medium-High ● High

Current Cookstove Market (4/4)

Double lined jiko (Sazawa)

Metal charcoal stove

Oven for baking and roasting

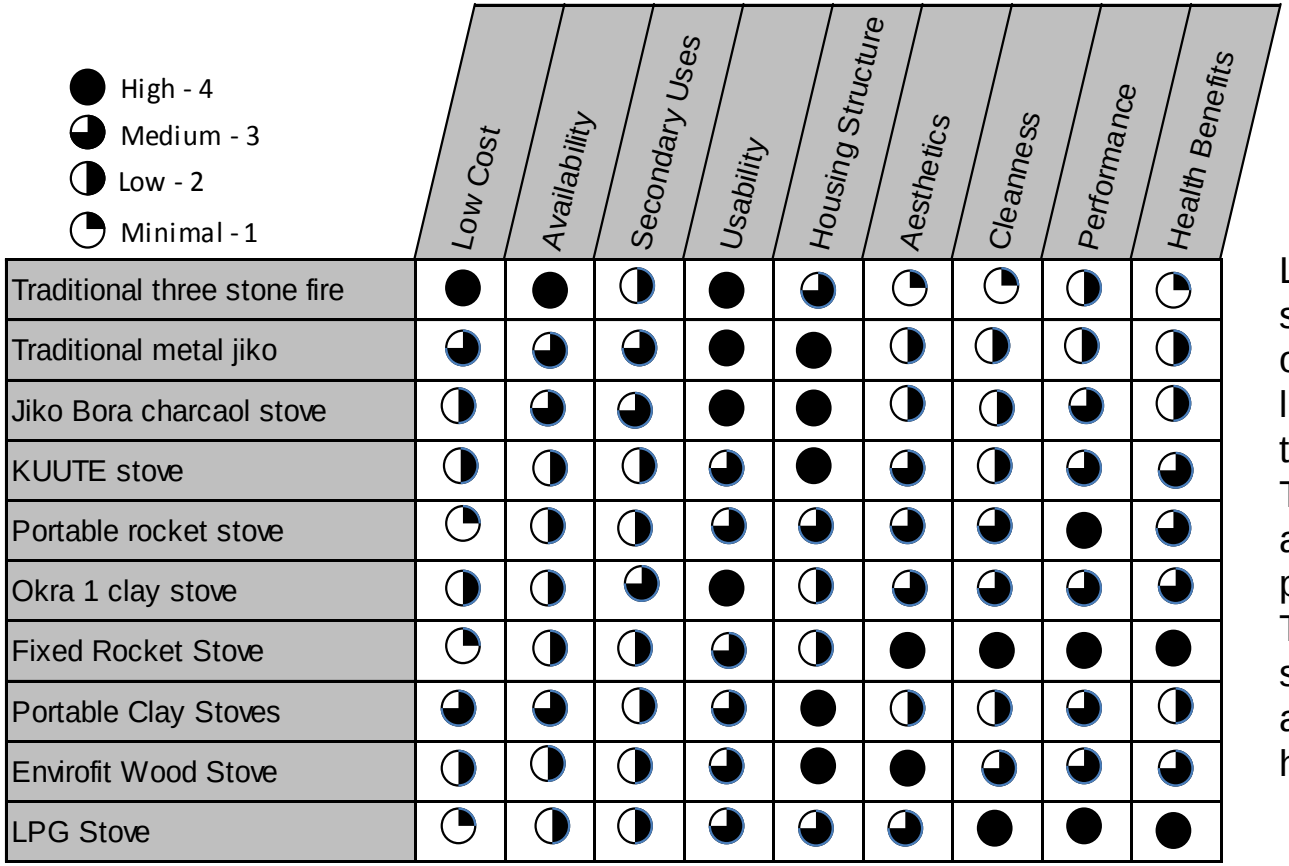
Clay wood stoves

Implications-

A cookstove program should seek to build on existing stove designs to improve their performance and health benefits. Quality designs should be supported to commercialisation.

Current Technology Landscape

A variety of stoves are available in the market to suit differing end user requirements.



Locally manufactured improved stoves have similar scores offering performance and limited health benefits over traditional cooking methods. The rocket stoves both portable and fixed scored highly on performance but low on price. The Envirofit and LPG stove scored high mainly due to aesthetics, performance and health benefits.

-Implications-

Availability and affordability are important factors that need to be addressed to make high performing stoves appeal to the end user.

Institutional Cookstoves

Most institutions in Tanzania use firewood as their primary cooking fuel. Improved institutional stoves in Tanzania have targeted schools, food vendors and restaurants, but uptake has been low mainly due to lack of awareness and financial mechanisms to make them more affordable.

Institutional Stoves

- Improved Institutional stoves can have efficiencies over 40% and save up to two thirds on fuel consumption.
- Improved institutional stoves can cost between1200 – 1900 USD depending on cooking capacity.
- Most vary in size from 20 liters up to 250 liters.

Challenges

- Lack of end user financing makes the stoves unaffordable to many institutions.
- Lack of government policy to encourage the transition to energy efficient cooking practices in institutions.
- There is a lack of awareness around the technologies.
- End user training is needed so that cooks get maximum performance from the stoves.

Sources: Probec

Promotion of Institutional Stoves

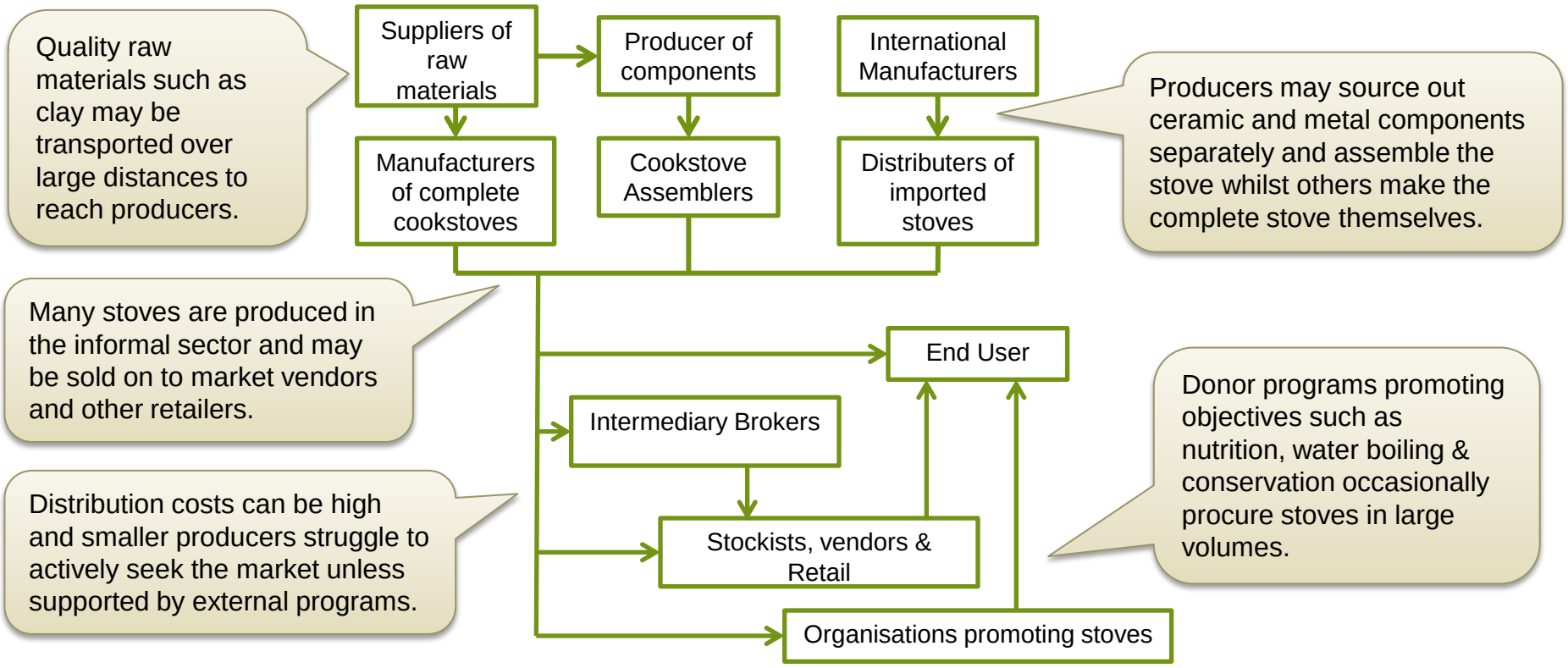
Programs and organisations that are active in promoting institutional stoves in Tanzania include CAMARTEC, Probec, SIDO, Envotech, M&R and Sunseed Tanzania, REA and UNDP, both through commercial businesses and donor funded projects offering training and building stoves for schools.

-Implications-

Awareness creation and appropriate financing mechanisms could increase the uptake of institutional stoves.

Current Industry Value Chain

Several value chain options exist for the dissemination of cookstoves in Tanzania. The majority of producers sell through retailers within the local areas and countrywide distribution is rare.



-Implications-

Interventions must consider ways to strengthen links in the value chain and create distribution channels to reach underserved markets.

Stakeholders in the ICS Sector

A variety of stakeholders exist in the cookstove sector although experience and commitment in promoting improved cookstoves may vary.

Government Departments

- Ministry of Energy and Minerals
- Ministry of Natural Resources - Division of Forestry and Beekeeping
- Ministry of Community Development, Gender and Children
- Ministry of Industry and Trade
- Vice President's Office – Division of Environment
- Prime Ministers Office – Regional Administration and Local Government

Parastatal Organisations

- Rural Energy Agency (REA)
- Small Industries Development Organisation (SIDO)
- Centre for Agricultural Mechanisation and Rural Technology (CAMARTEC)
- Tanzanian Commission for Science and Technology (COSTECH)
- Tanzanian Industrial Development and Research Organisation (TIRDO)
- Tanzanian Bureau of Standards(TBS)
- Tanzania Engineering and Manufacturing Design Organisation (TEMDO)

National & Regional NGO's

- The Family Alliance for Development and Cooperation
- Karatu Development Association
- Sunseed Tanzania Trust
- Women Development for Science and Technology (WODSTA)

Stakeholders in the ICS Sector

A variety of international and regional NGO's are involved in the cookstove sector through training cookstove artisans on technical and business skills, disseminating improved cookstoves or providing education on related issues.

International NGO's

- GIZ
- CARE International
- GVEP International
- SNV
- UNCHR
- Millennium Village Projects
- World Vision
- UNDP
- World Food Program (WFP)
- Partners for Development
- ICSEE
- TaTEDO
- ARTI Tanzania
- Canadian Physicians for Aid and Relief (CPAR)
- E+Co

Donors

- European Union (EU)
- DGIS
- World Bank
- DFID
- Southern African Development Community (SADC)
- HIVOS
- German Government
- Global Environment Facility (GEF)
- NORAD
- USEPA
- Shell Foundation

Stakeholders in the ICS Sector

There are several private sector individuals and businesses involved in the cookstove sector. Carbon developers are also trying to enter the Tanzanian ICS sector.

Private Sector

- Envirofit
- Ecozoom
- L's Solution
- Zara Solar
- Alternative Energy Tanzania Ltd
- Kiwia & Lausten
- SECCO
- Envotech
- Greenstar
- Morogore metal clusters
- M&R Appropriate Technology Engineering

Carbon Developers

- CO2Balance
- Uganda Carbon Bureau
- E+Carbon

Others

- Tanzania Renewable Energy Association (TAREA)
- Camco
- Round Table Africa

Research

- University of Dar es Sallam
- Berkeley Air Monitoring Group

Cookstoves Initiative in Tanzania

Manufacturers and Distributors*

The following tables list examples of cookstove initiatives in Tanzania. Although many stove producers exist in the market many of them are small scale and informal and recent efforts have been made to introduce quality stoves into the market on a commercial basis.

	Sustainable Energy Enterprise Company	Introduction of Envirofit Stove
Who	TaTEDO is an NGO with over 20 years experience in the ICS sector. In 2000 it started SECCO a private company based in Dar-es-Salaam	E+Co is an NGO that invests services and capital in small and growing clean energy businesses in developing countries.
What	TaTEDO set up SECCO to promote the commercial dissemination of quality improved stoves, SECCO make a range of cookstoves and improved ovens. Their best selling product is the charcoal domestic stove and they are currently working with E+Co to link the project with carbon finance. So far they have sold over 6000 charcoal stoves under the project.	In 2010 E+Co started coordinating the introduction of the Envirofit stove through local distributors Zara Solar, L's Solutions and Alternative Energy Tanzania. L's Solutions have continue the distribution in large numbers distribution 16,000 stoves in the past year, targeting rural areas through road shows and retailers.
Challenges	Creating awareness and demand for the stoves particularly outside of Dar-es-Salaam	Marketing is very resource intensive with several visits to an areas required to realize sales potential.
Partners	TaTEDO, SECCO, E+Co	E+Co, Envirofit, L's Solution.

*List not exhaustive

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Cookstoves Initiative in Tanzania

NGO (1/2)*

Several NGO led programs are currently active in Tanzania targeting specific regions. However past programs have failed to sustain stove promotion and new projects are looking at entrepreneurial aspects and financial access.

	Program for Basic Energy and Conservation (ProBEC) (2005-2010)	Developing Energy Enterprises Program (DEEP) – (2008-2013)	Improved Cookstove for East Africa
Who	A SADC program implemented by GIZ. Since the program ended activities have been taken over by the Rural Energy Agency.	Implemented by GVEP International with technical support from IT Power.	Collaboration between Uganda Carbon Bureau, Care International and the Nordic Climate Facility.
What	Aim to assist low income groups in access to sustainable and affordable energy. Promote improved cookstoves through training on stove construction (rocket, clay & charcoal stoves), and assisting in marketing activities. Offered indirect subsidies through raw materials, kiln access and transport.	The program provides business and technical support to existing micro energy enterprises through training, mentoring, and market linkages. It also links entrepreneurs to financing through its loan guarantee program to enable them to expand their businesses. The program has trained over 300 entrepreneurs in the Mwanza region.	The project aims to provide sustainable access to affordable and efficient cook stoves. Improving affordability of these cookstoves is achieved by the setting up of a CDM Program of Activities (registered 2011) that will provide stove suppliers with access to revenue from the CDM carbon market.
Challenges	Many artisans stopped production after the project ended, although REA have taken over the marketing activities their limited resources are spread across several sectors.	Changing mindset of entrepreneurs to realise market potential of energy business.	Delays in registering project in country. Identification of suitable stove producers to work with.
Partners	Ministry of Energy and Minerals, GIZ	IT Power, EAETDN	Uganda Carbon Bureau, CARE International, Nordic Climate Facility.

*List not exhaustive

Cookstoves Initiative in Tanzania
NGO (2/2)

	Biomass Pellet Stove	Maasai Stove Project
Who	Partners for Development are a US based NGO aiming to improve the quality of life for vulnerable people in underserved communities.	ICSEE is a NGO working on projects around environmental conservation and community development
What	Working with local stove manufacturer Kiwia and Lausten they have developed an energy efficient gasifier stove that cooks using biomass pellets. PFD are also producing the biomass pellets from agricultural residues and aim to distribute them through network of vendors. Aiming to register the project under CDM.	Working with local Maasai women the project has developed a fixed wood stove that greatly reduces exposure to smoke within the household. The stove is locally manufactured and installed by trained local women. On purchasing a stove women get access to a buyers club and other home improvement items.
Partners	Partner for Development, Kiwia and Lausten	ICSEE

CO2Balance are also extending their Improve Cookstove Projects into Tanzania.

Enabling Environment

Several NGOs and research institutes with experience in the stove sector exist, but lack of continuous funding and access to finance for producers has hindered growth of the sector.

Government

- Ministry of Energy & Minerals is the lead government body. Other stakeholders include the Ministry of Natural Resources & Community Development, Gender & Children.
- Currently developing a biomass energy strategy with support from GIZ and EUIE.

International Bodies / Donors

- International bodies involved in the cookstove sector include EAC, SADC, World Bank, UN & EU.
- Many donor funded projects have taken place over the past 20 years but funding is often short lived and projects struggle to continue on a commercial basis.

Financing

- Many small producers struggle to access traditional source of finance.
- Few financial institutes have energy portfolios but village community banks (VICOBA) could provide potential sources of funding.
- Few producers have managed to access carbon revenue although several projects are in the pipeline.

Research

- There are several parastatal bodies and universities involved in research in the ICS sector.
- Stove testing facilities exist, but need further capacity building and equipment.

-Implications –

Creation of an enabling environment is important to support the scaling up of quality cookstove sales.

Cookstove Industry Stakeholders

Tanzania has a few producers of quality stoves but this is not happening on a large scale. There are also several parastatal organisations that have the capacity to support the cookstove sector.

Key: Full capability / Partial capability / Basic capability / No capability	Coordinate Program	Provide Funding	Coordinate Project (Region)	Centralize Act. (Mktg, Ops, Fin)	Educate on IAP	Raise product awareness	Run Promo Activities	Import & retail stoves	Design stoves	Test stoves	Train Stove Manufacturers	Supply Materials	Transport mat. to Manufacturer	Make stoves	Transport stove to customer	Sell and install Stoves	Maintain Stoves
Multilaterals / Donors - USAID, EU, UNDP, World Bank	Partial	Full	Partial	Partial	Partial	Partial	Basic	None	None	None	None	None	None	None	None	None	None
Government - Ministry of Energy and Minerals, Ministry of Health	Full	Partial	Partial	Partial	Basic	Basic	Partial	None	None	None	None	None	None	None	None	None	None
Parastatal Organisations - COSTECH, SIDO, Camartech	Partial	Basic	Full	Partial	Basic	Partial	Basic	Basic	Partial	None	Partial	None	None	None	None	None	Partial
Micro Finance Institutions - VICOBA, SACCOS	None	Partial	None	None	Basic	Basic	Basic	Basic	None	None	None	None	None	None	None	None	Basic
iNGOs and Local NGOs - TaTEDO, PFD, SNV	Full	Partial	Full	Partial	Partial	Partial	Basic	Basic	Basic	Partial	Full	Basic	Basic	Partial	Partial	Partial	Basic
Local Manufacturers & Suppliers of Stove Components	None	None	None	None	None	None	None	None	None	None	None	Full	Partial	Basic	Partial	Basic	Partial
Local Low Quality Manufacturers - Informal artisans, Jua Kali	None	None	None	None	None	None	None	None	None	None	None	None	None	Full	None	Basic	Basic
Local Quality Manufacturers - SECCO, M&R, Envotech	None	Basic	None	None	Basic	Basic	Basic	Basic	Basic	Basic	Partial	None	Basic	Full	Partial	Partial	Basic
International Manufacturers - Envirofit, Stovetech	None	Basic	None	None	Partial	Basic	Basic	Basic	Partial	Partial	Basic	None	None	Full	None	None	Basic
Local Entrepreneurs - L's Solutions	None	Basic	Basic	None	Basic	Basic	Basic	Full	None	None	None	None	None	None	Partial	Basic	Basic

-Implications –

There is potential to upscale the existing commercial market but further capacity is needed to increase demand in the market.

Contents

Country context on carbon finance

Given institutional constraints, much development in Tanzania has taken place in the voluntary market.

Institutions

Country Institutions

- Only 1 project is registered under the CDM but over 8 are in validation, many for some time.
- Government bodies are in place but there are tight restrictions on carbon credits.
- The World Bank are starting an ambitious renewable energy advance payment scheme with REA.
- Carbon Finance for cook stoves has only been at the pipeline level so far.

Methodology

Carbon Finance Accounting

- The Voluntary Carbon Market has been seen as more attractive than the CDM.
- Several PoAs are coming. 11 CDM Programme of Activities with a Tanzania component, however, only 2 are on cookstoves and without a Tanzanian CPA in progress.

Additionality

Tanzania is exempt as LDC

- Projects of less then an equivalent of 5MW of energy are exempt from the additionality test.

Existing Carbon Finance Projects in Tanzania

Carbon Finance project development takes longer in Tanzania and many projects are delayed at the validation stage.

CDM Projects

Single CDM projects

- 1 project has been registered in Tanzania – but none since 2007.
- 8 projects have entered the validation pipeline since 2009.
- However, no cookstove projects are amongst them.

CDM PoAs

CDM Programme of Activities

- 11 PoAs are in validation with Tanzania as a Host Country but none have been registered.
- 2 of them focused on cook stoves.

Gold Standard

GS VER Projects

- Gold Standard projects are the forefront of implementation.
- There are 3 projects by 2 carbon companies in preparation, but the latest status is unclear.

-Implications –

Potential to exploit carbon revenues exists in the country but the procedure is often slow and bureaucratic.

Existing Carbon Finance Projects in Tanzania

A range of international and local actors are working together to register their carbon finance projects.

Lead partners in Carbon Finance

Partner	Activities
CO_2 Balance	2 Gold Standard VER projects in the pipeline, estimated at almost 140,000tCO_2 per year in total, based on a rocket stove design.
E+Carbon	Worked on a Gold Standard VER project to distribute Envirofit stoves worth 40,000tCO_2 per year - latest project status is unclear.
Uganda Carbon Bureau	Multi-country PoA in validation. TaTEDO is working with Uganda Carbon Bureau to register the Efficient Woodstove Project in Kilimanjaro as a CPA.
Green Development SA	Multi-country PoA in validation but no CPA in the pipeline in Tanzania.

Implementation Partners

- Institutions such as CAMARTEC, TaTEDO and SIDO have been at the forefront of stove research in Tanzania and in supporting local artisans to improve quality and their business.
- SNV and TAREA are organising stakeholder groups in order to develop a national strategy for the sector.

Existing Carbon Finance Projects in Tanzania

Both imported and locally produced stoves are used in carbon finance projects. In Tanzania the focus has so far been on higher end more expensive stoves such as the rocket stove.

Imported stoves

Envirofit stoves are distributed under the E+Carbon project through several retailers, with L's Solution in Arusha the most active. Wood fuel stoves are being promoted with other local stoves to be added later.

Locally produced stoves

- CO2 Balance is working with the manufacturer of the CarbonZero Stove, a rocket stove, to be installed in the Arusha and Tanga region.
- TaTEDO are working in the Kilimanjaro area with a rocket type stove that shall be soon registered as a CDM project.
- Other projects in the pipeline are working with locally manufactured fixed wood stoves as well as portable domestic charcoal stoves in urban areas and gasifier stove technology.

The rocket stoves cost around from 20- 40 USD, whilst the Envirofit stove around $12 (when subsidised). The carbon finance projects therefore have hence concentrated on the higher end market segment.

-Implications-

There is potential for partnerships between international players and local manufacturers, but quality and production issues may need to be overcome.

Financial Considerations

tCO_2

Emissions Reductions

If all projects are registered and successful 180,000tCO_2 can be reduced per year.

So far Gold Standard VER projects have been dominating the market.

*Total Emission Reductions of projects over 7 years is **1.3 million tCO_2.***

Funding

Funding from carbon finance

Uncertainty in the voluntary market (e.g. aviation) is suppressing demand. Advance payments are estimated at EUR 2 per VER.

*Together the Tanzanian projects would mobilise EUR 360,000 per year or **EUR 2.5 million** over their 7 year lifetime.*

If prices increase again to EUR 10 in the following years the total value of the assets is over ***EUR 12.7 million** over the next 7 years.*

Subsidy

Benefit sharing and free stoves

Projects aim to retroactively claim carbon credits but it is unclear what the subsidy to the end user will be since no carbon payments have yet arrived for any distributor.

CO2 Balance aims to distribute the rocket stoves for free to the user despite an estimated retail cost of 40 USD per stove.

-Implications-

Significant carbon revenue can be generated from cookstove programs but market prices are subject to fluctuations.

Operational Considerations

Several Carbon Finance projects are in the pipeline but no distributor has yet received revenue.

Manufacturing

Manufacturing capacity

Carbon finance relies on a significant scale-up of production which for some producers is hard to achieve at their current location.

Carbon financing makes outsourcing of production more difficult as the quality needs to be maintained and monitored.

Distribution

Central manufacturing leaves distribution to be solved

To comply with monitoring and allow easy tracking of sales the distribution chains need to be controllable and a scale-up through middlemen is more difficult to achieve.

In some cases the carbon finance requirements seem to run counter or not in line with conventional expansion strategy.

Monitoring

User monitoring

In some cases stoves have been sold to consumers as “subsidised” but no carbon finance revenues have reached the business yet to allow this.

-Implications-

Cookstove carbon projects must consider the challenges in distribution and monitoring to reach their maximum target market.

Cookstove Industry Summary

There are a range of products and implementation partners in the cookstove sector. However there is a lack of quality producers at scale due to low demand for products.

Macro

- \+ Increasing fuel prices could expand market further
- \+ Government developing biomass strategy
- \+ Tanzania is politically stable and has made economic progress over past years
- − Government focus on electricity generation and grid expansion
- − Challenging business environment compared to international standards

Moderately Favourable

Social Impact

- \+ Number of IAP related deaths creates a strong case for change
- \+ Potential to positively impact lives of women
- \+ Deforestation is having negative economic, social and environmental effects
- − Awareness of IAP and related health problems is low
- − IAP is not a policy priority

Moderately Favourable

Consumer

- \+ Similar cooking habits across the population
- \+ Some consumers aspire to more modern fuels
- − Several barriers to purchasing efficient appliances exist
- − Market based approaches may not be suitable for all segments
- − The existing market is small and further research is needed to establish its true size

Unfavourable

Cookstove Industry

- \+ Strong and diverse cookstove sector (both NGO & SME)
- \+ Innovations have taken place and a range of stoves available in the market
- − Many low quality products in the market Majority bring limited health benefits
- − Quality producers lack demand to make at large scale.
- − Investment challenges for business expansion

Moderately Favourable

Carbon Finance

- \+ Several projects in the pipeline
- \+ Range of implementation partners available
- − Validation process is slow and bureaucratic
- − Low market prices poses risk
- − Challenges in distribution and monitoring

Moderately Favourable

-Implications-

Tanzania is a tough market but there is potential for expansion if supply and demand of quality stoves can be increased.

Interviewees

We are grateful to the following individuals and organisations who gave up their time to speak with us during the research for this assessment.

TaTEDO	Estomih Sawe, Executive Director
Partners for Development	Mark Pommerville, Country Program Director,
Envoctec service Ltd.	Mr Mwambije
L's Solutions	Arnold Nzali
CAMARTEC	Evarist Ng'wandu, Director General
M&R Appropriate Technology Engineering	Leonard Rweyemama, Managing Director
SNV	Francis Songela, Senior Advisor - Renewable Energy,
Ministry of Energy and Minerals	Edward Ishengoma, Acting Assisstant Commissioner - New & Renewable Energy
Tanzania Renewable Energy Association	Matthew Matimbwi, Executive Secretary

SIDO	Mr Kiyenze, Regional Manager
ICSEE	Bob Lange
SECCO	Filbert Shoo, Manager
University of Dar-esSalaam	Dr Hassan Rajabu, Senior Lecturer - Department of Mechanical and Industrial Engineering
University of Dar-esSalaam	Dr Matheo Raphael
Rural Energy Agency	Mr Arfaksad Ndilanha, Energy Officer
Kiwia and Lausten	Bjarne Laustsen, Director
ARTI	Dennis Tessier, Programs Director
TIRDO	Kalutu Koshuma, Director General

Glossary of Terms

AIDS	Acquired Immunodeficiency Syndrome
ARI	Acute Respiratory Infections
ARTI	Appropriate Rural Technology Institute
BMZ	The Federal Ministry for Economic Cooperation and Development
CAMARTEC	Centre for Agricultural Mechanization and Rural Technology
CDM	Clean Development Mechanism
CO	Carbon Monoxide
CO2	Carbon Dioxide
COSTECH	Tanzanian Commission for Science and Technology
CPA	CDM Programme Activities
DFID	Department for International Development
DGIS	Netherlands Directorate-General for International Cooperation
EAC	East African Community
EAETDN	East Africa Energy Technology Development Network
EU	European Union
EUR	Euros
GDP	Gross Domestic Product
GEF	Global Environment Facility
GIZ	Gesellschaft für Internationale Zusammenarbeit
GS	Gold Standard
GVEP	Global Village Energy Partnership
HBS	Household Budget Survey
HH	Households
HIV	Human Immunodeficiency Virus
HIVOS	Humanistisch Institut voor Ontwikkelingssamenwerking
IAP	Indoor Air Pollution
ICS	Improved Cookstoves
ICSEE	International Collaborative for Science, Education, and the Environment
KCJ	Kenya Ceramic Jiko
LCD	Least Developed Country
LPG	Liquid Petroleum Gas
M	Million
MFI	Microfinance Institution
MSME	Micro, Small & Medium Enterprise
MW	Mega Watts
NGO	Non-Governmental Organization
NORAD	Norwegian Agency for Development Cooperation
PDD	Project Design Document
PoA	Programme of Activities
ProBEC	Programme for Basic Energy and Conservation
REA	Rural Energy Agency
SA	South Africa
SADC	Southern African Development Community
SIDO	Small Industries Development Organisation
SME	Small Medium Enterprise
TAREA	Tanzania Renewable Energy Association
TaTEDO	Tanzania Traditional Energy Development and Environment Organisation
TB	Tuberculosis

Glossary of Terms

tCO2	Tonnes of Carbon Dioxide
TLUD	Top Lift Up Draft
TZS	Tanzanian Shillings
UAE	United Arab Emirates
UCB	University of California Berkley
UK	United Kingdom
UNCHR	United Nations High Commissioner for Refugees
UNDP	United Nations Development Program
USAID	United States Agency for International Development
USD	US Dollars
USEPA	United States Environment Protection Agency
VER	Verified Emissions Reductions
VICOBA	Village Community Banks
WFP	World Food Programme
WHO	World Health Organisation

References

- Institutional Stove Impact Assessment Report, Evodius Rutta, Probec Tanzania, July 2010.
- Desk-Study: The Household Improved Cook Stove Sector in Tanzania, SNV & Round Table Africa, Feb 2011
- Environmental Crisis or Sustainable Energy Development Opportunity? Transforming the charcoal sector in Tanzania, The World Bank 2009
- The Energy Access Situation in Developing Countries: A Review Focusing on the Least Developed Countries and Sub-Saharan Africa, UNDP/WHO 2009
- http://www.illegal-logging.info/approach.php?a_id=71
- Gender and Economic Growth in Tanzania, Creating Opportunities for Women, World Bank 2007
- STOVE PRODUCER IMPACT ASSESSMENT REPORT 2010, Assessing the Impact of Stove Businesses on Stove Entrepreneurs in Tanzania, Evodius Rutta, Probec 2010