ACCELERATING ACCESS TO ENERGY

Global Alliance for Clean Cookstoves

Kenya Market Assessment

Sector Mapping

GVEP International

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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.

Contents

Executive Summary
Sector Mapping

- The availability of Improved Cookstoves is much higher than in the rest of East Africa, with production on a commercial basis. However, much stove production is done through informal artisans and there is a lack of quality standards.
- Many cookstove initiatives have taken place in the country but often lacked a commercial focus and have not been sustained.
- The market for stoves is primarily in urban and peri-urban areas and is growing as urbanisation gathers pace.
- Access to modern fuels, such as kerosene and LPG, is relatively high in urban areas. Initiatives to switch users to cleaner technologies such as LPG by reducing upfront costs and purchasing quantity are been tested in the market.
- The cookstove value chain is highly fragmented. Production of components is often done separately and many middlemen exist to transport and retail stoves countrywide.
- Most production is done by small and medium scale enterprises. They often lack working capital to purchase materials in bulk & ensure continuous production, as well as capital to expand their markets.
- In rural areas the market is much weaker though GIZ appear to have been able to develop a commercially sustainable model working with local artisans.
- CO2Balance offers an alternative model which appears to achieve high levels of penetration in the communities it targets, though stoves are often given away for free.
- A number of policy studies have been undertaken in recent years and a strong network of stakeholders exists.
- Carbon finance plays an important role in reducing the cost of quality stoves to the customer and is likely to continue as the main source of subsidy.

Executive Summary
Implications for Intervention Options

- The government has adopted policy positions on domestic cooking fuels with support from various policy advisors. Opportunities exist to develop stronger, more coordinated, interventions.
- Reliable up to date information on the market does not exist and there is limited data on specific market segments and on successful marketing approaches.
- There is strong consumer demand for cleaner cooking technologies and the use of LPG could expand significantly. Innovations within the LPG sector show promise and should be engaged with.
- Ceramic jikos (charcoal) have achieved high levels of penetration in urban and peri-urban areas but the quality of most of these stoves is poor. There is an opportunity to raise
- Education in fuel use and cooking practice is needed as well as an increase in the quality of appliances.
- Encouragement of more consolidation among local producers would help with developing quality. Production of finished stoves at scale and of consistent quality would help raise quality in the market. The barriers to scaling from current artisan production are significant and entrepreneurs attempting to do this will need considerable support (financial and technical).
- Another way to drive quality is to lower entry barriers for large international cookstove players, encouraging them to invest in production facilities in the developing world instead of mass producing in low-cost countries like China.

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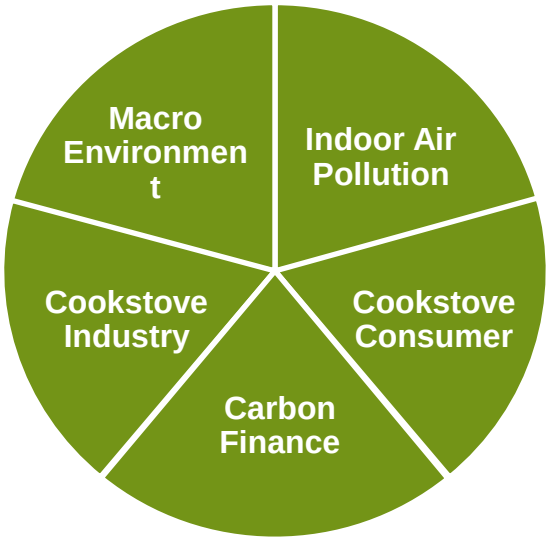
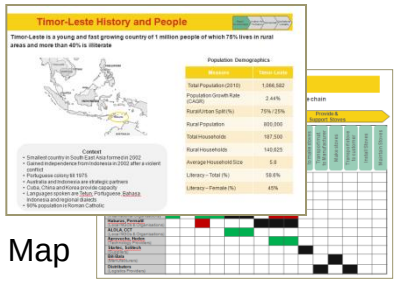
Project Approach

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

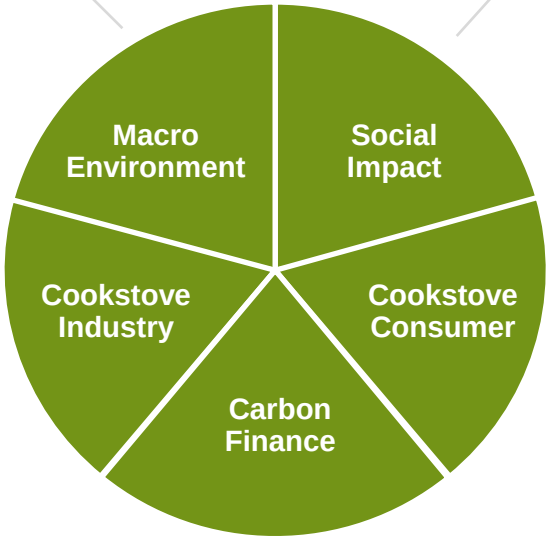
Identify Intervention Themes → **Develop Recommendations** → **Develop Operational Plan**

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 / categorized?
- How big is each customer segment and what are its characteristics?
- What are the specific needs of each customer segment?

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Project Approach
Intervention Options Approach

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

Sector Mapping

- 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

Intervention Themes Identification

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

Strategy Development

- 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

Operational Plan Development

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

Acknowledgements

The Alliance would particularly like to thank USAID for allowing GVEP and ADP to draw extensively from a Kenya stoves market assessment they conducted in Dec 2011.

Contents

Social Environment

Kenya lies on the Indian Ocean bordered by Tanzania, Somalia, Ethiopia, Sudan and Uganda. It has a population of 41 million with 78% living in rural areas.

- Kenya gained independence from British colonial rule in 1963. The country has since undergone various transformations including the enactment and declaration of a new constitution.
- The country is predominantly Christian, with Protestant 45%, Roman Catholic 33%, Muslim 10%, indigenous beliefs 10% and other 2%

Sources: CIA World fact book, World Bank, KNBS

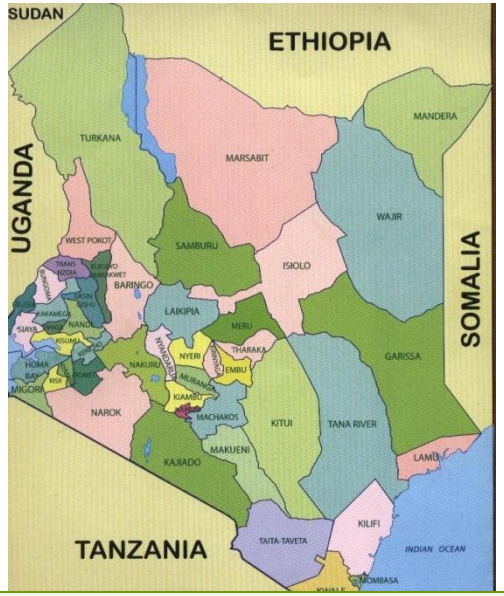
Population Demographic	Kenya
Total Population (2010)	41,070,934
Population Growth Rate (CAGR)	2.462%
Rural/Urban Split (%)	78% / 22%
Rural Population (2010)	33,979,200
Average Household Size	5
Literacy – Total (%)	87%
Literacy – Female (%) (2002)	82%
Life Expectancy (years)	55
Population below poverty line (2009)	50%

-Implications-

Kenya's population has continued to rise over the past decade putting increased pressure on natural resources.

Political Environment

Although tainted by post election violence in 2007, Kenya remains a relatively politically stable country and a regional hub for business and finance.



Political Structure

- Parliamentary Democracy with a National Unity government since disputed election in 2007
- President and Prime Minister share power in a 50/50 National Accord arrangement with President and Prime Minister each appointing half of the Cabinet. Elections are expected in late 2012 or early 2013.

Current Government

President Mwai KIBAKI (since 30 December 2002); Vice President Stephen Kalonzo MUSYOKA (since 10 January 2008); Prime Minister Raila Amolo ODINGA (since 17 April 2008)

Administrative Map

- Nairobi is the capital city
- Kenya is divided into 47 counties. Counties are divided into districts. Districts are further divided into divisions, locations and sub-locations

Working with the Government

- Several initiatives related to energy access and climate change are been tabled but may be venerable to political change from the upcoming election.
- Kenya is a relatively easy place to do business by sub-Saharan Africa standards, though challenging by international norms with high levels of corruption perceived.

-Implication-

Cookstove programs should seek support from the government and try to link into current policies.

Sources: CIA World fact book

Economic Environment

Kenya is regarded as a regional hub for business and finance. The service sector makes up over 65% of GDP although agriculture employs over 75% of the workforce. High inflation and a weakening Kenyan shilling put pressure on businesses in 2011, although rates have since stabilized.

Key Economic Indicators	
GDP (2010)	$31,408,632,915
GDP Per Capita (PPP) (2010)	$775
GDP Growth Rate (2010)	5.3%
Inflation Rate (2011 est.)	11%
Unemployment (2008 est.)	40%
Household income by percentage share – Lowest 10%	1.8%
Household income by percentage share – Highest 10%	37.8%

Key Economic Indicators	
Exports	$5.443 billion (2011 est.): tea, horticultural products, coffee, petroleum products, fish, cement Major markets: Uganda Tanzania, UK, Netherlands
Imports	$11.87 billion (2011 est.): capital equipment, vehicles, petroleum, medical supplies; cereals Major suppliers: China, India, UAE, South Africa
GDP composition	Agriculture: 22.2%, Industry: 16.4% and Services: 64.6% (2011 est.)

Sources: CIA World fact book, World Bank

Gender

Although Kenya is traditionally a Patriarchal society, women are increasingly taking on more empowered roles and gender mainstreaming initiatives are taking place. However barriers to equality still exist especially within rural areas.

Policy & Employment

- Ministry of Gender, Children and Social Development created in 2008 deals with issues of gender equality and women's empowerment.
- Women make up 70% of the agriculture labour force. They are also involved in the informal sector and make up almost 1/2 of MSMEs.
- Men are dominate in the formal and modern sector and more likely to migrate to urban areas in search of work while the women look after the rural home.

Cultural Background

- Kenyan society follows a patriarchal nature particularly in traditional rural areas where men take on the role of community leaders.
- In rural areas women are primarily responsible for domestic tasks, raising children, collecting water and fuel and caring for family members and others in the community.
- Inheritance traditions mean that women only hold around 1% of title deeds in the country limiting their economic progress

Gender Equality Statistics		
	Male	Female
Primary school attendance	72%	75%
Secondary school attendance	40%	42%
Youth Literacy (15-24 yrs)	92%	94%
Labour participation rate	88%	76%
Seats held in national government (2011)	90%	10%

Sources: World Bank, UNICEF, 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

Kenya has a fairly well developed infrastructure, transport and communication networks compared to other East African countries. However much can still be improved especially in rural areas where the majority of the population live.

Current Situation

Healthcare

- Infant mortality rate is 55 deaths / 1000 live births
- Only 31% of the population has access to improved sanitation (2008)
- HIV/AIDS prevalence in the country among adults is 6.3% (2009)

Infrastructure

- 53 out of every 100 people are mobile subscribers
- Over 4 million internet users
- The roads network is expansive but the state of the roads is a major concern.

Education

- 87% literacy rate
- Public spending on education is 6.9% of GDP.
- Free Primary Education Program running since 2003

Energy

- Around 20% of the population have access to grid electricity
- 82% of the total energy used in the country is derived from biomass.
- Highly dependent on hydroelectricity

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

Government Priorities

- Increasing access to health services
- Improving financing of the healthcare sector.
- Improving governance and transparency in order to optimize the use of the available resources

- Improving transport infrastructure in road and rail is a government priority
- Developing Nairobi's commuter rail network.
- Promoting the use of ICT

- Ensuring equal access to education
- Investing in school health, nutrition, hygiene and feeding
- Providing opportunities for further education and training

- Addressing issues of high energy cost
- Encouraging local investors to venture into energy generation
- Expanding the network in rural areas.
- Promoting geothermal development.

-Implications-

Government priorities in energy focus on expansion of the grid and expanding sources of electricity generation

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Environment

Kenya has many natural resources and wildlife but over exploitation, population pressure and lack of appropriate policy has led to a number of environmental problems.

Climate

- Kenya has a mid range tropical - temperate climate with arid areas in the interior.
- Temperatures vary across the different topographical regions with daytime temperatures above 21°C.
- Elevation ranges from 0 – 5199m.

Environmental Problems

- Water pollution from urban and industrial wastes; degradation of water quality from increased use of pesticides and fertilizers; water hyacinth infestation in Lake Victoria; deforestation; soil erosion; desertification; poaching
- Reoccurring drought and flooding during the rainy season.

Natural Resources

- Kenya's natural resources include gold, limestone, soda ash, salt gemstones, fluorspar, zinc, diatomite.
- The Kenya highlands are one of the most successful agricultural regions in Africa and there is varied wildlife.
- Traditional energy sources include biomass & hydroelectricity, whilst geothermal, wind and bioenergy are also being explored.
- Oil reserves have recently been discovered.

Emissions

- Kenya is a relatively low emitter of carbon with CO2 emission at 0.2 metric tons per capita.
- Exhaust fumes from motor vehicles and industries contribute to air pollution in the urban areas. This can contribute to photochemical smog, ozone depletion and has been observed to contribute to respiratory related infections and eye irritation.

Sources: CIA World fact book, World Bank, UNEP

-Implications-

Cookstove programs have the potential to contribute to wider environmental issues

Contents

Indoor Air Pollution in Kenya

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

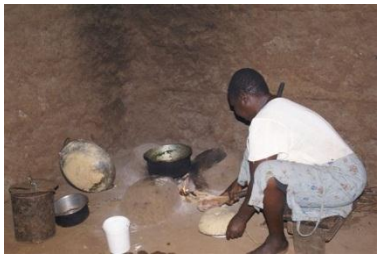
	Scenes	Comments
Cooking Fuel		• Low grade biomass and agricultural residue used as cooking fuel increases the exposure.
Cooking Device		• 3-stone wood fires and traditional cook stoves at both the residential and institutional level are the primary cause of indoor air pollution in rural homes. • Traditional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

Photo Source: 5cense.com, GVEP International

-Implications-

Cookstove programs need to educate people on best cooking practices as well as encouraging cleaner technologies.

Health Impacts of IAP

Female cooks and children are the main groups exposed to IAP which is linked to acute respiratory infections responsible for 14,300 deaths each year.

Who is Exposed to IAP

Group	Numbers Exposed
Households using traditional open fires in built kitchens	9.9 million
Female cooks	2.48 million
Institutional cooks and kitchen helpers	100,000
Secondary students age 13-19 who study with the Kerosene "candle"	3.3 million
Population directly affected by IAP	14.9 million

IAP Effects

- Awareness of acute respiratory infections (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.
- 26% of all deaths reported in hospitals are attributed to ARI.
- Health impacts of IAP include acute respiratory infections, eye problems and severe headaches
- IAP exacerbates the condition of HIV/AIDS patients as it breaks down immunity.
- 8% of children under five show symptoms of ARI at any given time
- IAP causes 14,300 deaths each year.
- Health impacts of IAP include: Acute respiratory infections, eye problems and severe headaches. IAP also exacerbates the condition of HIV/AIDS patients as it accelerates immunity breakdown.

-Implications-

Cooking with biomass has a big impact on the health of those most exposed. Switching to cleaner fuels would result in large health benefits.

Illustrative IAP Programs

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

Current

- Policy Innovation Systems for Clean Energy Security (PISCES) Project (DFID)
- Shimba Hills Improved Cook Stoves Project (CO2Balance)
- The Improved Cookstoves for Households and Institutions Project (EC)
- Energizing Development (GIZ)
- Africa Biogas Partnership Programme (SNV)
- Developing Energy Enterprises Programme (GVEP)

Past

- Combined Household Water Treatment & IAP Project in Cameroon & Kenya (WHO)
- Development & Marketing of Upesi Stoves Project (DFID)
- Promotion of Private Sector Development in Agriculture Stove Project (GTZ)
- Sustaining a Cleaner & Healthier Kitchen Environment Project (US EPA)
- Smoke, Health & Household Energy Project (DFID)

Other Outreach Programmes

- Access to Clean Energy Services in Kenya (UNDP/MOE)
- Coastal Rural Support Programme (AKF)
- The Renewable Energy and Adaptation to Climate Technologies REACT (DFID, others)
- Development of the Health Sector

-Implications-

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

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IAP Programs

Lesson Learned

- Awareness of the dangers of IAP is low and consumers are unlikely to buy a product because of its IAP-reducing properties. Other marketing angles are required.
- Despite several large-scale stove programmes with strong donor support, the impact on reducing IAP has been mixed, with rural households struggling to pay or not convinced of the benefits; though this is not always the case. Stove technology should be based upon the type of locally available fuel (e.g. agricultural residue). Most locally available improved stoves promoted have focused on fuel reductions not reduction of IAP to improve health.
- Considerable success has been achieved with the commercialisation of urban charcoal stoves and institutional woodstoves, because in these cases there are economic incentives for customers to upgrade their cooking systems. However quality is low and health benefits questionable.
- Innovative financing mechanisms and business skills support are required both for entrepreneurs in ICS production and households to be able to increase production and afford ICS products respectively.

Risks and Opportunities

- Dependence upon biomass fuels remains high (~80% of total household energy is sourced from biomass fuels) as it is often obtained free, very cheaply or from the user's own land
- Current energy policy emphasises electricity and fossil fuels but mentions the importance of biomass fuels, upon which most people depend for their cooking needs. There is need for a biomass strategy to be put in place.
- There is a significant informal manufacturing capacity through individual and group-based artisans in all major towns, but production is fragmented and quality often low.
- Strong collaboration opportunities exist with different programme partners who have long-standing experiences in implementing IAP programmes in Kenya.

-Implications-

Cookstove programs need to take an integrated and coordinated approach with emphasis on commercial aspects and quality.

The Role of Gender

Women have played an integral role in the Kenyan cookstove sector and have been able to leverage networking capability. Women are mainly involved in liner production, assemble and sales whereas metal work is dominated by men.

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
- Around 71% of households are male headed and 29% female headed (KIHBS 05/06)

Role of Women in the Cookstove Sector

- Women's groups have played an important role in the cookstove sector in Kenya in production and sales.
- Women are mainly involve in liners 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
Institute of Economic Affairs

-Implications-

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

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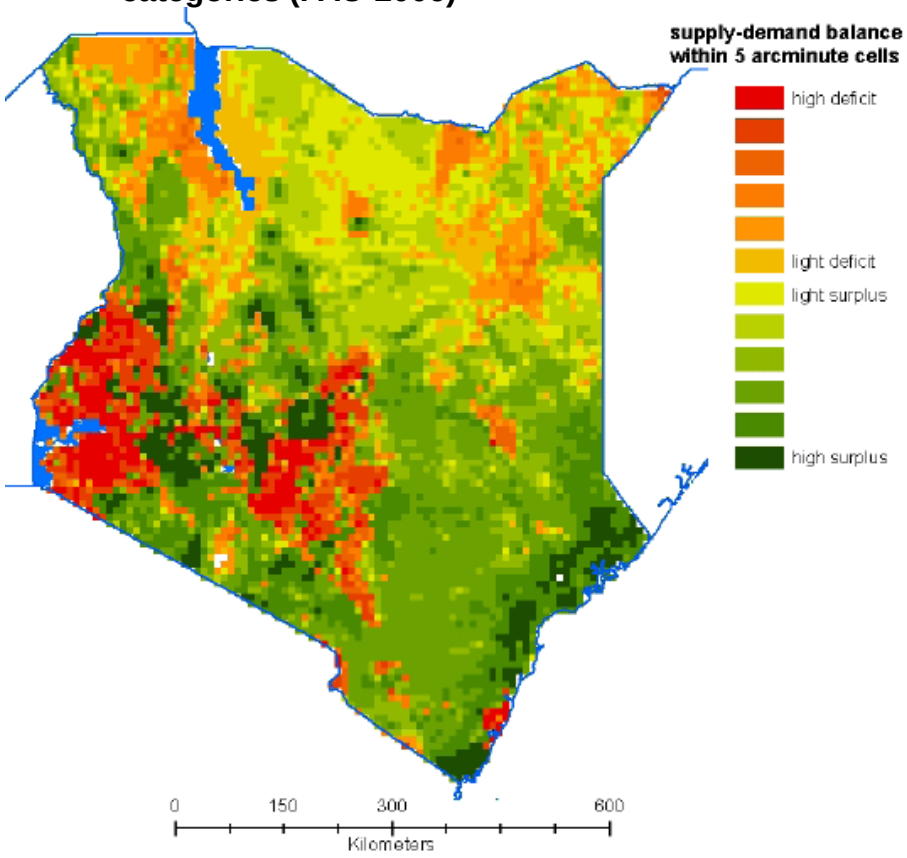
Deforestation

Forest cover in the country stands at between 2 - 6% of total land area. Deforestation due to intensive logging is a major concern in Kenya affecting the economy, water scarcity and ecosystems.

Deforestation

- The majority of wood harvested from forested areas is used for fuel. Wood is also harvested to make wood related products, for building and industry.
- Growing populations are putting large demand on land which is being cleared for agriculture and settlements.
- Competition for available resources can lead to heightened tensions between local communities as well as political issues, as demonstrated by evictions of settlements from the Mau Forest in Kenya in 2009.
- CMI / U4 estimate that 700,000 people are employed in the informal charcoal industry in Kenya which is estimated to be worth 32 billion KES a year.

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



Sources NEMA, FAO, CMI/U4, BBC

-Implications-

Rapid depletion of biomass resources is having environmental, social and economic effects.

Contents

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 Kenya was 34.7M (current 41M.) The population was divided according to region, income level and area:

	Rural (HH)			Urban (HH)		
	Poor (<$1)	**Middle ($1-$3)**	**Upper (>$3)**	**Poor (<$1)**	**Middle ($1-$3)**	**Upper (>$3)**
HHs	**2,690,000**	**1,580,000**	**1,110,000**	**1,260,000**	**950,000**	**320,000**
Tot HHs	**7,910,000**					
% of Tot	**34%**	**20%**	**14%**	**16%**	**12%**	**4%**
		2,700,000			**710,000**	

Subgroups of the total population were identified for detailed research. The Northern region was excluded because they are difficult to reach. Households with income levels lower than $1/day were also excluded on grounds of insufficient purchasing power. This left a total of approximately 2.7M 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 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	Nakuru rural (Central), Kakamega rural (West) & Voi (East)	59
2	Peri-urban	Firewood	$1-3/day	Makindu (Eastern) & Elburgon (Rift Valley)	50
3	Peri-urban	Charcoal	$1-3/day		53
4	Urban	Charcoal	$1-3/day	Nairobi & Kisumu	79
5	Urban	Charcoal	>$3/day		56

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

Rural firewood users mostly cook on 3-stone fires. Jiko stoves are widely used among charcoal users with the urban segment being most likely to own a clay lined Jiko. Most meals are prepared using heat-wasting aluminium saucepans often without lids (60% of rural respondent to 30% urban). People generally cook seated and do not prepare more than one dish at a time.

Typical meals

• Tea (and porridge in rural locations) are the two main hot beverages taken for breakfast. Both require intense heat for boiling water

• Maize meal is most often consumed for supper and lunch

• Lunch is less commonly cooked then the other meals, as households tend to make enough supper for the next day or cook for lunch during breakfast

• No big differences in food preferences are observed across the segments

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

-Implications-

Cooking needs are similar across segments. Fast cooking is preferred. More efficient cooking pots and water heating systems may make sense. Solar cooking is not suitable for most needs.

Consumer View of Cooking Systems

Segments	Fuel availability	Issues	Benefits	Other uses	Switching fuels
Rural firewood	40% buy for 7.2/month	Smoke	Affordability	Heating water for bathing, heating the room, roasting foods and socialising	52% want to switch to charcoal / gas
Peri-urban firewood	71% buy for $11.3/month	Smoke, cost, availability			69% want to switch to gas/ charcoal
Peri-urban charcoal	$9.7/month	Smoke, cost	Taste		58% want to switch to gas
Urban charcoal	$11/month	Smoke, cost			54% want to switch to gas
Urban charcoal >$3/day	$11.8/month	Smoke, cost, difficulty to ignite			57% want to switch to gas

-Implications-

Price is critical across all segments, although most parts of the population and all charcoal users already pay for fuel. Charcoal users show a strong desire to switch to LPG. Other uses of stoves need to be taken into account when proposing alternative solutions.

Consumer Purchasing Preferences

Purchases are not frequent and strictly based on household needs. However, most families own a radio and many bicycle/TV depending on location. The most commonly bought item is furniture.

Future purchases are likely to be on furniture/deco/repairs and a good percentage has no plans to spend at all. However, kitchen items, mostly utensils, score comparably high. Buying on credit is not common.

% / Segments	Rural firewood	Peri-urban firewood	Peri-urban charcoal	Urban charcoal	Urban charcoal >$3/day
Bought item $15-30 in the past year	30	39	60	33	39
Bought stove $15-30/ plans to buy	7 / 6	0 / 2	0 / 4	0 / 2	5 / 0
Bought kitchen utensils $15-30/ plans to buy	20 / 8	21 / 10	13 / 20	6 / 19	11 / 24
No plans to buy at all	30	20	14	23	31
Ever bought on credit	34	17	20	29	24

-Implications-

The habit of buying stoves seems absent and would need to be nurtured. New stoves should offer clear cost advantages in such a tight market where buying on credit is not frequent. Fuel efficient utensils capable of speeding the cooking time could be appealing to customers.

Consumer Segments (1/2)

The rural segment mostly relies on collected solid fuels and has very low willingness to pay. The peri-urban firewood group however has difficulties to find the fuel and pays a high price for it . All experience problems with smoke and aspire to cleaner/easier fuels.

	Segment 1 Rural Firewood	**Segment 2 Peri-urban Firewood**
No of HH	--	--
Income	$1-3day	$1-3day
Rural / Urban	Rural	Peri-urban
Willingness to pay	Minimal (mostly collects)	Moderate (often buys)
Stove ownership	2% improved firewood stove	8% improved firewood stove (half installed free)
IAP awareness	Low	Low
IAP exposure	High	High
Fuel choice	Firewood Some desire to switch to charcoal/gas	Firewood Most desire to switch to charcoal/gas

-Implications-

Woodstoves need to offer clear benefits and 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	--	--	--
Income	$1-3day	$1-3day	$>3day (av $5/day)
Rural / Urban	Peri-urban	Urban	Urban
Stove ownership	Jiko, approx half clay lined	Jiko, approx 70% clay lined	Jiko, approx 90% clay lined
Willingness to pay	Moderate to high (already pays for charcoal)	Moderate to high (already pays for charcoal)	Moderate to high (already pays for charcoal)
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 program could consider opportunities for gas/LPG. 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

High awareness of smoke provoking cough and eyes itching but low of long term risks. Ventilation and better quality / different fuel seen as solution

Cost is an issue but customers seem willing to buy where there is a clear benefit

Kerosene and LPG are the only relevant alternatives, reasonably accessible in urban areas

Alternate use for water and room heating scores highest

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

-Implications-

A comprehensive household energy program should look at the entire energy delivery chain – fuel - energy service - appliance.

How Big is the Existing Market?

The total existing market – households owning an improved stove – is around 2.5-3 m households.

GoK 2004
1.5m

•GoK Sessional Paper no.4 (2004) set out govt targets for increased adoption of improved stoves based on 'current' figures of 47% ICS use amongst urban charcoal users and 4% ICS use by the rural population. This suggests around 1.5m households with improved stoves.

Shell Fdn
2.25m

•In the Shell Foundation research 2% of rural firewood users and 8% of peri-urban firewood users had bought an improved stove, while 50% of peri-urban charcoal users , 70% of urban charcoal users $1-3, and 90% >$3 owned an improved stove. This equates to approximately 2.25m households with improved stoves.

ADB
3.1m

•ADB Finesse programme Module 4 gives an estimate of stove penetration in Kenya of 3.1m citing AFREPREN 2006 as source.

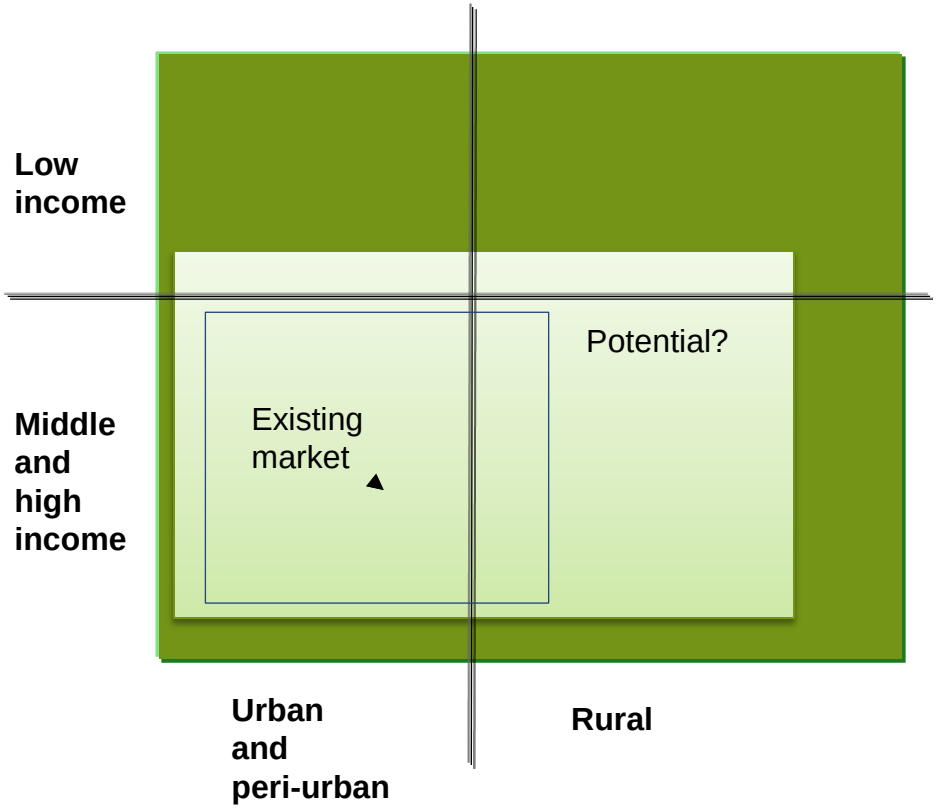
These figures may overstate true market size as some stoves were not purchased. The quality of many of the stoves in use is likely to be poor.

-Implications-

The existing market is much larger than in Uganda or Tanzania though still largely urban and peri-urban. More research is needed to establish the actual size of the market and the different segments within it.

What is the Potential Market?

'Improved' stoves have already achieved a high level of penetration of urban and peri-urban markets - though it difficult to quantify exactly 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.

Sales of high quality stoves limited but growing suggesting demand in some segments.

Breathing Space report (and others) indicate significant potential for expansion of LPG.

In rural areas penetration of stoves is low but GIZ and CO2 Balance approaches both show up take.

-Implications-

Opportunities exist for higher quality biomass stoves and for LPG in urban markets. A rural market could be developed for low cost stoves. More research is required to identify true market segments and potential for commercial development.

Contents

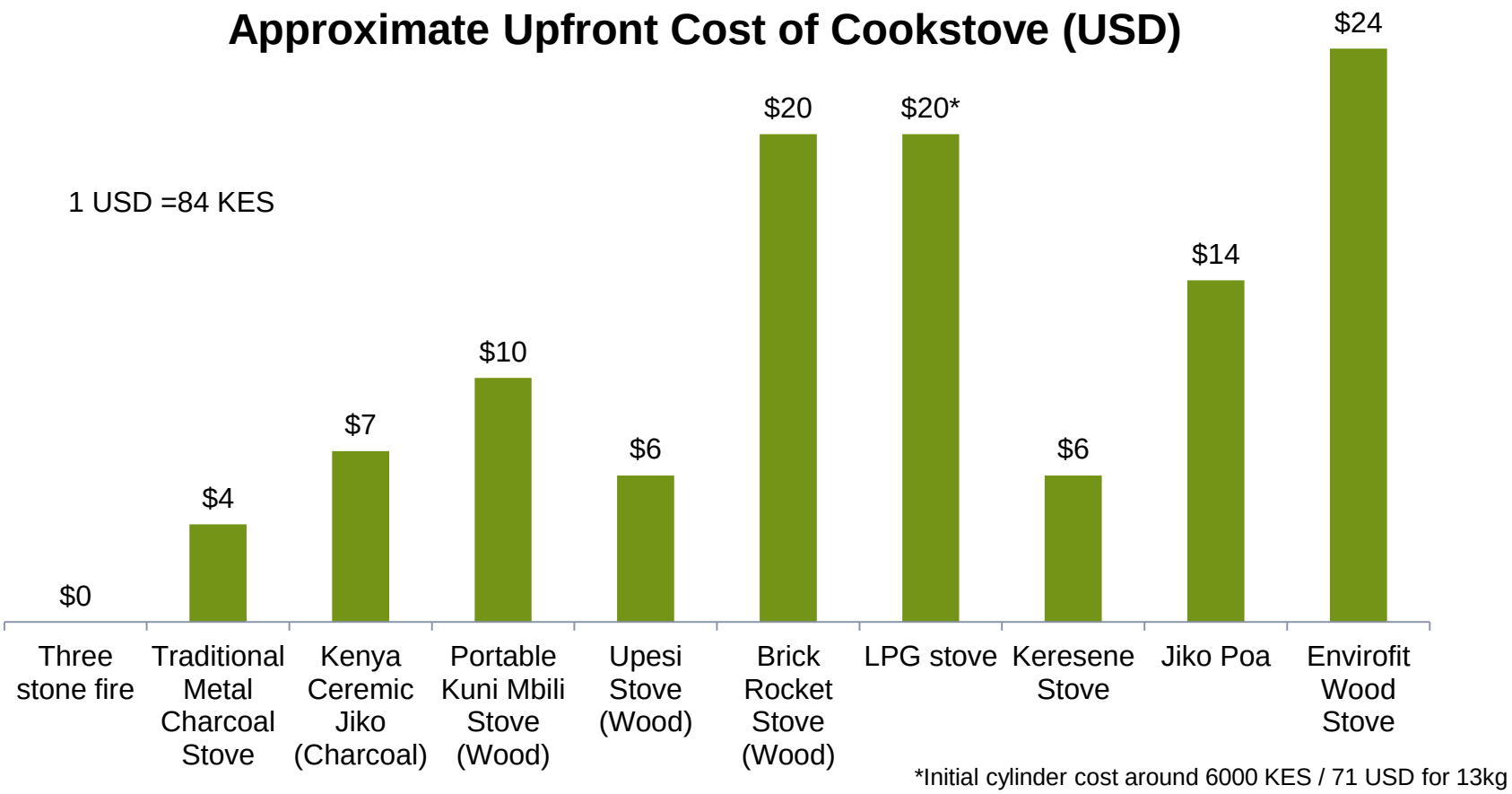
Available Cookstove Usage and Cost (1/2)

Although many people still use traditional cooking methods, improved cookstoves have experienced commercial success in Kenya, especially within Nairobi and Mombasa. Within urban areas kerosene stoves are widely used but LPG use is still quite low.

Cookstove Usage

- Wood stoves are prevalent in rural areas, whereas most people use kerosene or charcoal stoves in urban centers.
- Many households use multiple fuels to meet their cooking needs and hence own several stoves.
- Improved cookstoves have been promoted in Kenya since the early 80's and access is high compared to other East African countries, however the quality and health benefits of the stoves are often poor.
- Imported stoves such as Envirofit and Jiko Poa have been introduced to the market over the past 2 years. Initial sales are promising although restricted to urban and peri-urban areas.
- Kerosene stoves are used by many low income urban households because they are cheap and convenient to use or because people do not own their homes so are unable to put in a fixed stove. Households tend to switch from this fuel as income and family size increases.
- Cooking with Biogas has been promoted under the Kenya Domestic Biogas Program with the aim to installing 8000 digesters by 2013.
- Uptake of LPG is higher in urban areas but still relatively low, due to high up front cost of stove and gas cylinder.
- Stoves are paid for upfront in cash.

Available Cookstove Usage and Cost (2/2)



-Implications-

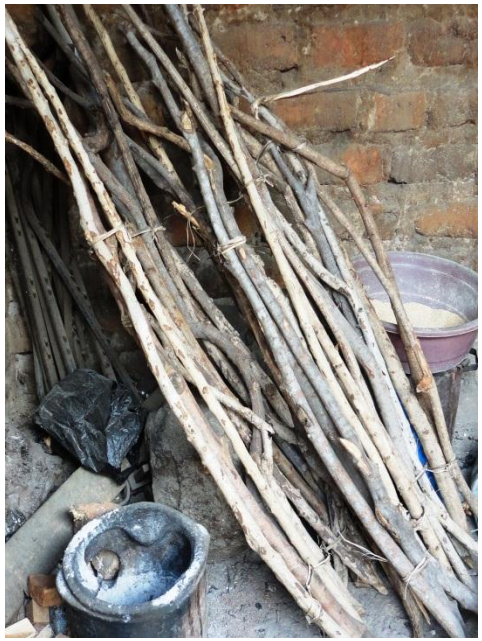
Cookstove program could build on the relative success of market by concentrating on raising standards and consumer awareness.

Availability of Fuel and Cost (1/2)

Biomass is the primary fuel used by the population. Whilst cost is a significant factor affecting fuel purchase, availability and minimum quantity sold are also important along with social and cultural factors.

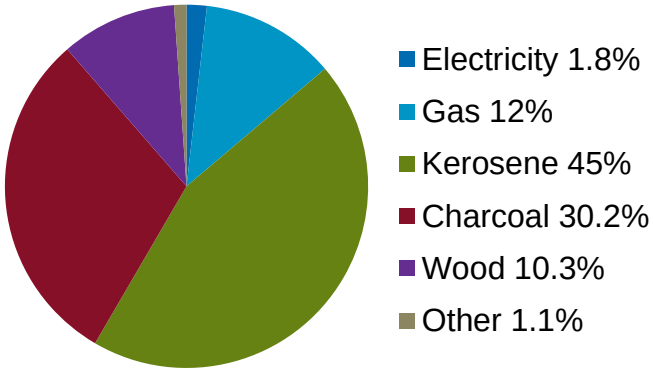
Fuel Usage

- The majority of rural households use firewood for cooking whilst in urban areas households use mainly kerosene and charcoal.
- Many households use multiple fuels depending on the type of food being cooked and the time of day.
- 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 is subject to seasonal fluctuations.
- Access to modern fuels in Kenya is higher than in other parts of East Africa especially in urban areas where 58.4% of the population have access.
- LPG usage is low in rural areas. It is used by a small proportion of the urban population and initiatives are being trialed to increase its use among urban, low income households.
- Use of wood and kerosene tends to decline with rises in income whilst use of LPG, electricity and biogas increases with income.
- Recycled biomass briquettes have been promoted but their use is very low and they struggle to compete with charcoal in the market.
- Many middlemen exist in the fuel supply chain each adding their mark-up and increasing the price to the end user.

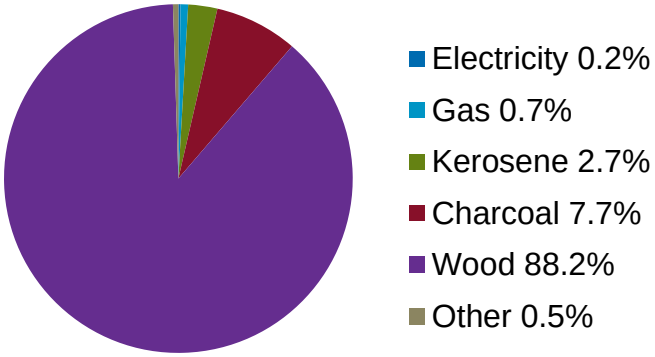


Availability of Fuel and Cost (2/2)

Whilst cost is a significant factor affecting fuel purchase, availability and minimum quantity sold are also important along with social and cultural factors.



Fuels Used for Cooking Urban Areas (UNDP/WHO 2009)



Fuels used for Cooking Rural Areas (UNDP/WHO 2009)

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

Fuel	Purchase Unit	Usage	Cost	Cost per week
Wood (Urban**)	Bundle (20kg)	2 days	210 KES/ $2.5	$8.75
Charcoal	1 bag (30kg)	3 weeks	1200 KES/ $14.3	$4.8
LPG	13kg	30 days	3000 KES/ $35.7	$8.33
Keresene	1 litre	2 days	100 KES/ $1.2	$4.2

1 USD =84 KES

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

***Urban wood users are likely to use some sort of improved stove and hence fuel costs would be lower. In rural areas wood can be collected for free or at lower cost.*

-Implications-
Programs should consider consumer purchasing factors and issues along the fuel supply chain

LPG Initiatives – Pima Gas

Initiatives are been trialed in the LPG sector to target low income households by reducing the upfront cost of LPG hardware and refilling costs.

Pima Gas

- Many low income households can not afford the upfront cost of LPG hardware and the bulk purchasing of large cylinders.
- Pima Gas promoted by Premier Gas aims to overcome these issues by offering a 1kg gas cylinder and refills of as little as 50 KES ($0.6)
- The scheme has started rolling out in Nairobi with dispensers located in low income areas around the city.
- 1500 users in the first one month

Cost of complete unit:	2000 KES / $23
Cost of 1kg refill:	300 KES / $3.5
Minimum refill amount:	50 KES / $0.6

-Implications-

Making LPG more accessible to low income households can open up new markets and access to cleaner fuels

Production of Improved Cookstoves (1/2)

The majority of cookstove production is done on a small to medium scale. Production of liners is often done separately in areas where good clay is available. These are then transported to other areas of the country where assemble is done, often within the jua kali artisan sector. Liner producers often work in groups sharing tools and a kiln. The majority of production is done by hand with the exception of Fine Engineering who use mechanization to produce the Jiko Poa. Producers often struggle to buy materials in bulk and lack working capital to ensure continuous production**.**

Components of a Kenya Ceramic Jiko

Cladding

- Made from sheet metal. Scrap metal sometimes used to reduce cost.
- Sheet metal costs around $1.2 /kg or separate clads can be bought for $2.4 each.
- Metal sourced from urban centers.
- Painted after complete assemble.

Liner

- Made from clay mixed with sand
- Clay costs around $12/ton & sand around $10/ton depending on the source. Sometimes freely available.
- Liner often sourced separately for as little as 0.25 USD each.
- Additional requirements: liner mould & fuel for firing the kiln.

Insulation

- Made from cement and vermiculite
- Vermiculite cost around 13 USD per ton depending on quality.
- Cement is sourced from local hardware shops whilst vermiculite is delivered by suppliers.

-Implications-

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

Production of Improved Cookstoves (2/2)

Fixed wood stoves such as the Upesi and Rocket Stove have been promoted intermittently in some areas of the country by organizations such as GIZ and Practical Action since the 80's. These stoves can be made from locally available materials and constructed by locally trained artisans. In regions of promotion use of improved cookstoves has increased.

Components of an Upesi Stove

Liner	The liner is made from clay then fired. It acts as a liner for the combustion chamber.
Stove Body	The stove body is made from clay and ant hill soil or good red soil.
Production / Supply	The liner is fabricated by small enterprises. The user purchases the liner separately for around 250 KES and pays an installation fee of around 200 KES.

-Implications-

These stoves are efficient and affordable and further work could be done to develop the market for such technologies.

Current Cookstove Market

Most stoves are produced by small and medium size producers in dispersed areas across the country. Established producers exist around Kisumu and Muranga where good clay is available. Stoves are then distributed around the country.

	Kenyan Ceramic Jiko 	**Uhai Stove** 	**Mulit-purpose stove** 
Cost Range	$4-$10	$10 - $18	$9
Thermal Efficiency	30-40%	36%	20% (Wood) 30% (Charcoal)
Manufacturer	Various	Keyo Pottery Enterprise, various	SCODE, around Kiria, various
Key Features	Ceramic liner with metal cladding. Production has been sustained on commercial basis	Improvement on the KCJ with clay rim to retain and direct heat.	Ceramic liner and metal cladding with removable charcoal grate so it can be used with both wood and charcoal
Production Capacity	Demand driven. Collectively large but individual producers make a few hundred a month. Liner producers may have higher capacity.	Not extensively produced- demand driven. Most production in the hundreds per month.	Not extensively produced- demand driven. Most production in the hundreds per month.
Distribution Channels	Complete stoves sold through middlemen, retailers, markets & small vendors.	Sold through retailers, middlemen and markets.	Sold through retailers, middlemen and markets.
Availability and Use	Use ◑ Availability ◕	Use ◔ Availability ◔	Use ◔ Availability ◔

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

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Current Cookstove Market

	 **Fixed Brick Rocket Stove**	 **Co2Balance**		 **Envirofit Wood Stove**
Manufacturer	Various, GIZ trained	Made in Mombasa, distributed by Co2Balance	Fine Engineering, Nairobi	Envirofit (Imported)
Cost Range	Starting at $15	Free (subsidized), installation $2	$14 (subsidized)	$23.5 (subsidized)
Thermal Efficiency	24%-32%	Around 35%	22%	33%
Key Features	Fixed wood stove made from fired clay bricks held together with mortar.	Wood stove made entirely from ceramics based on rocket stove principle.	Ceramic liner inside metal cladding with pot skirt.	Highly engineered wood stove manufactured in China.
Production Capacity	Demand driven, end user gathers material and pays for installation.	GS projects will install 20,000 stoves each	Can produce 100 pieces a day, soon expanding to 200.	Demand Driven
Distribution Channels	Direct sales	Stove distributed within in venerable communities free of charge.	Distributed through paradigm project	New to the market, still setting up distribution networks
	Use ◔ Availability ◔	Use ◔ Availability ◔	Use ◔ Availability ◔	Use ◔ Availability ◔

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

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Institutional Cookstoves

The majority of institutions in Kenya use inefficient cooking methods such as a three stove fire resulting in high expenditure on wood. Improved institutional stoves are being promoted in the country but uptake has been low mainly due to lack of financial mechanism to cover up front costs.

Institutional Stoves

- Improved Institution stoves can have efficiencies over 40% and save up to two thirds on fuel consumption.
- Improved institutional stoves are disseminated at a price range between 100,000 -250,000 (1200 – 3000 USD) depending on cooking capacity.
- They vary in size from 20 liters up to 300 liters
- Produced by individually run businesses often receiving training from Bellerive Foundation or GIZ.

Challenges

- There is seasonality within the market with orders from schools following patterns in the payment of school fees.
- Lack of financing for producers and end user, makes the stoves unaffordable to many institutions and leads to compromises in quality.
- Often schools are unaware of stove options and/or suffer from slow decision-making processes

Promotion of Institutional Stoves

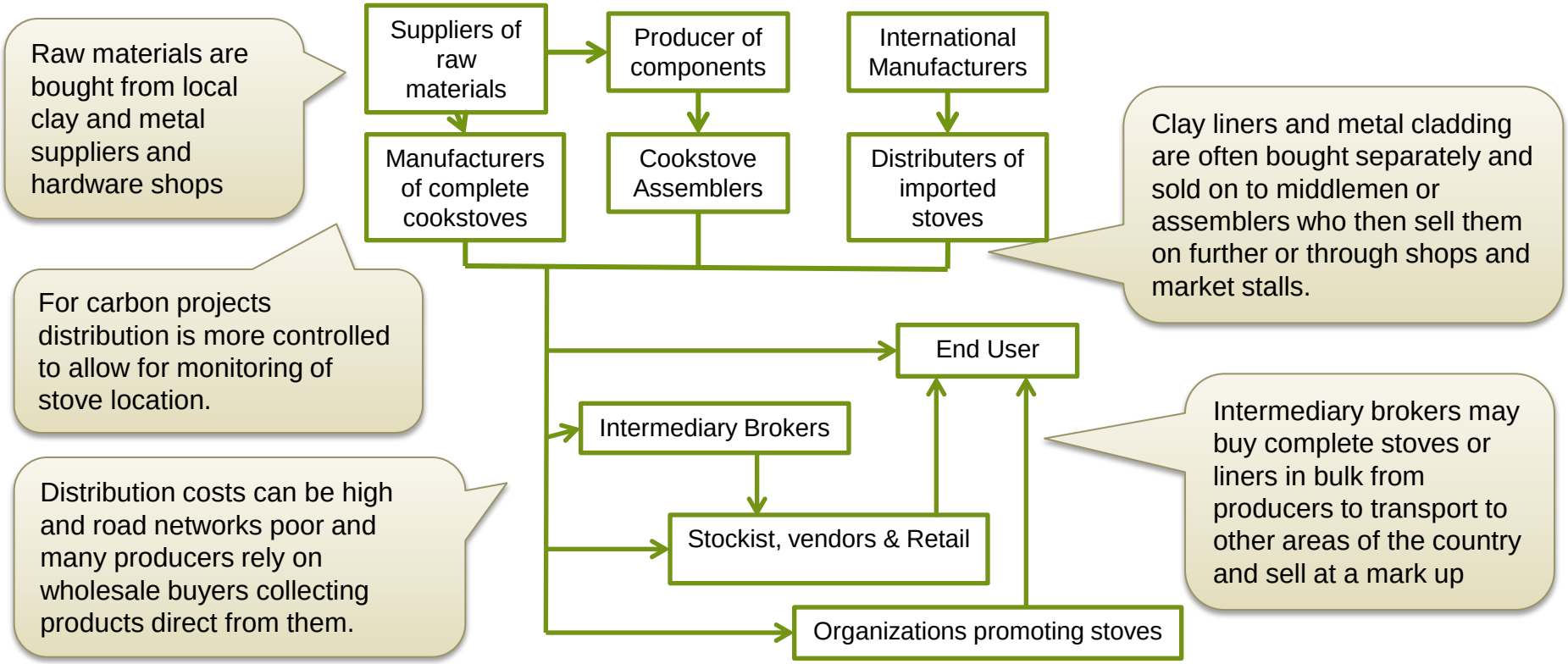
Organizations and manufacturers that are active in promoting institutional stoves in Kenya include GIZ, UNDP, WFP, Kartech, Rural Technology Enterprise, Technotech and Botto Solar.
The government is considering legislation to mandate the use of institutional stoves in schools.

-Implications-

Institutional stoves have the potential to reduce biomass consumption and should be supported by appropriate financing mechanisms.

Current Industry Value Chain

The cookstove value chain in Kenya is fragmented with several options for production and distribution existing. Components are often made separately and assembled by other business. Several middlemen exist in the value chain before stoves are sold through markets and retailers.



-Implications-

The cookstove value chain is complex with different challenges and opportunities at each stage.

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
- Ministry of Agriculture
- Ministry of Health
- Ministry of Environment and Natural Resources
- National Environment Management Authority (NEMA)
- National Economic and Social Council
- Kenya Bureau of Standards (KEBS)
- Kenya Industrial Research Development Institute (KIRDE)
- Energy Regulatory Commission
- Community Development Trust Fund (CDTF)

Donors

- European Union (EU)
- DGIS
- World Bank
- DFID
- USAID
- Shell Foundation
- HIVOS
- German Government
- Global Environment Facility (GEF)

Stakeholders in the ICS Sector

A variety of international and national 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

- Practical Action
- GIZ
- CARE International
- GVEP International
- SNV
- East Africa Energy
- UNCHR
- Millennium Village Projects
- International Lifeline Fund
- World Vision
- Food for the Hungry
- Energy Sector Management Assistance Program (ESMAP)
- UNDP
- RETAP
- AFREPREN/FWD
- Winrock International

National & Regional NGO's

- Solar Cookers International
- SCODE
- Kakamega Environment Education Programme (KEEP)
- The International Small Group Tree Planting Program (TIST)
- African Christians Organization Network (ACON)

Stakeholders in the ICS Sector

There are many private sector individuals and business involved in the cookstove sector many through small informal business. Within the past few years carbon developers have entered the market in Kenya.

Private Sector

- Paradigm Project
- Musaki Enterprises
- Improved Stove Association of Kenya
- Premier Gas Company Limited
- Keyo Pottery Enterprise
- Kartech
- Envirofit
- Unilever
- Ekero
- Riumbaini Energy Saving Stoves
- Lakenet Energy Solutions
- Chujio Ceramics
- Rural Technology Enterprise
- Fine Engineering

Carbon projects / Developers

- CO2Balance
- Uganda Carbon Bureau
- Carbon Manna
- Eco2librium
- Impact Carbon
- My Climate

Finance

- Faulu Advisory
- Muramati SACCO
- Acumen Fund

Research

- University of Nairobi
- African Centre for Technology Studies (ACTS)
- Berkeley Air Monitoring Group

Cookstove Initiatives in Kenya
NGO(1/2)*

The following tables list examples of cookstove initiatives in Kenya. Many NGO programs are currently active in Kenya concentrating on up scaling production capacity, business development and improving access to finance for cookstove producers.

	The Improved Cook Stoves for Households and Institutions Project (2011-2015)	Developing Energy Enterprises Program (DEEP) – (2008-2013)	Improved Cookstove for East Africa
Who	The project is run by HIVOS, working with SCODE - a local NGO and assembler of improved cookstoves.	Implemented by GVEP International with technical support from IT Power.	Collaboration between Uganda Carbon Bureau, Care International and the Nordic Climate Facility
What	The program aims to build the capacity of SCODE a local NGO and stove assemblers so that they can go on to further support small scale producers, end users and institutions with the aim of scaling up the commercialization of the technology. SCODE will open up 5 new branches under the project.	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 Kenya.	The project aims to provide sustainable access to affordable and efficient cook stoves. Improving affordability of these cook stoves 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	Maintaining consistent quality of the cookstoves when parts are sourced from different suppliers.	Changing mindset of entrepreneurs to realize market potential of energy business.	Delays in registering project in country. Identification of suitable stove producers to work with.
Partners	HIVOS, SCODE, EU, ETC	IT Power, Practical Action, Coastal Rural Support Program Kenya	Uganda Carbon Bureau, CARE International, Nordic Climate Facility.

*list not exhaustive

Cookstove Initiatives in Kenya

NGO (2/2)

	Improved Stoves and Portable Solar Lighting Program	Kenyan Stoves Project (Energizing Development, EnDev) (2005 – 2012)	East Africa Energy
Who	SNV provide capacity building and advisory services in renewable energy	EnDev is a programme financed by Germany-Federal Ministry of Economic Cooperation & Development (BMZ), Netherlands-DGIS and the NL Agency in the Ministry of Economic Affairs, Agriculture and Innovation and Norway-Ministry of Foreign Affairs	East Africa Energy are an NGO focusing on reducing carbon emissions through market based approaches.
What	Since 2011 SNV have expanded their activities into the cookstove sector working on a model for commercialization. They are working with various partners including GIZ and ISAK and Envirofit distributors to build capacity, create market linkages, strengthen distribution and improve access to finance.	The project supports access to modern cooking energy by promoting the sustainable production, marketing, installation and use of improved cooking stoves. These stoves include the portable or installed Jiko Kisasa stove and the built–in mud or fired brick stove, the Rocket.	East Africa Energy are distributing the Envirofit imported charcoal stove in urban areas of Kenya through development of a network of vendors. They are also linking with existing networks to distribute products through. The project will be linked to carbon finance to provide the stove at a subsidized price.
Challenges	Raising consumer awareness on improved cookstoves. Developing standards for the sector.	Maintaining quality standards amongst producers. Educating end user on proper use & maintenance of the stoves.	Delays in registration of the carbon project. Monitoring of the stoves for tracking purposes.
Partners	GIZ, ISAK	Ministry of Energy, Ministry of Agriculture, Ministry of Education, ISAK	Envirofit, AdvanceAid

Cookstove Initiatives in Kenya

Carbon Developers*

A range of carbon projects have begun in Kenya in the past 2 years with different balances of profit making and social and environmental development.

	The Paradigm Kenya Efficient Stoves for Livelihoods and the Environment Project	Improved Cookstove Project – CO2Balance	Stoves for Life – Eco2librium
Who	Paradigm Project are a carbon project developer focusing on sustainable change.	CO2Balance are a UK based carbon project developer.	Eco2librium develops and implements carbon projects to foster sustainable energy and natural resource use.
What	Paradigm project aims to distribute approximately 250,000 improved household cooking devices in 7 years. It is selling the Envirofit wood stove and jiko poa stove through a network of stove vendors on a commercial basis and through NGO's.	CO2Balance have several projects in Kenya including Kisumu, The Abadares and Shimba Hills. Projects focus on communities with high biomass use and distribute stoves virtually free of charge subsidized by carbon revenue. Communities are also educated on stove use .	Eco2librium works with local groups to build their capacity to produce the ceramic Upesi stoves and provides mechanisms to distribute and sell stoves to communities. The project works around Kakamega forest and provides the stove at 80-90% subsidy.
Challenges	Setting up effective distribution networks. Monitoring requirements for carbon credits restrict distribution methods.	Creating continuous funding for projects.	Unknown
Partners	Food for The Hungry, World Vision, World Food Program		My Climate

*list not exhaustive

Enabling Environment

Several donors and research institutes with experience in the stove sector exist. Government policy and financial access also contribute to enabling the growth of the sector

Government

- Ministry of Energy & Ministry of Agriculture have been active in stove promotion.
- Government promoting initiatives around climate change prevention, universal energy access and vision 2030 that relate to the biomass sector.

Donors

- Donors have included - EU, DGIS, German government, UNDP, Aga Khan Foundation
- Donors have been involved in distributing stoves in refugee areas.
- 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.
- Some institutes such as Faulu Advisory and Muramati SACCO are starting to develop energy portfolios
- Carbon credits have opened up new sources of revenue but local producers are yet to benefit from them.

Research

- Universities and research institutes such as KIRDI, ACTS & AFREPREN exist to provide support to the sector.
- KEBS have developed a standard for biomass stoves but only a few producers have attained it.
- Several stove testing facilities exist. Support provided by international organizations such as Berkley Air and Aprovecho

-Implications –

Creation of an enabling environment is important to support the scaling up of quality cookstove sales and encourage greater use of cleaner fuels

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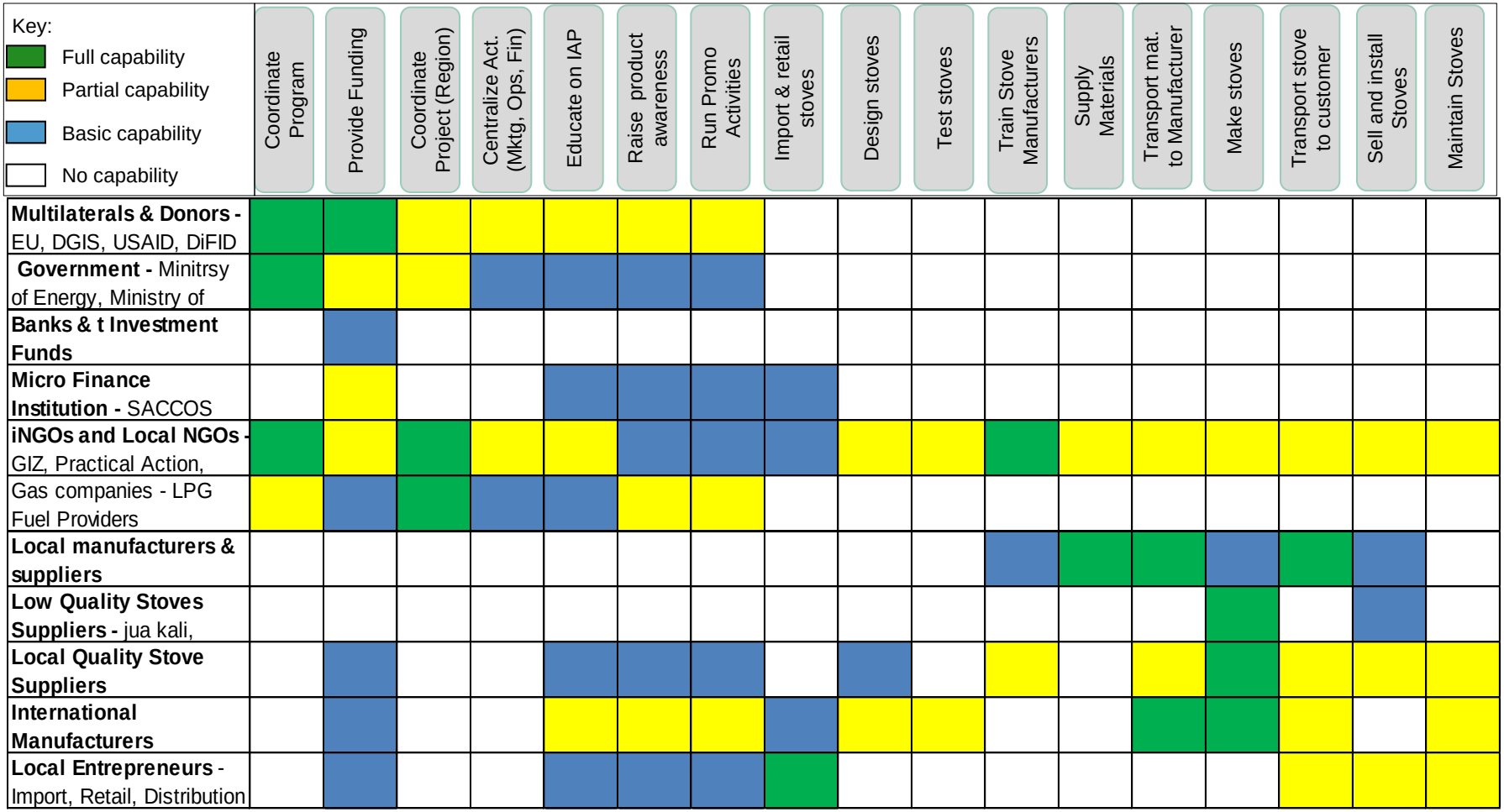
Cookstove Industry Stakeholders

Kenya has some local and international manufacturers that are capable of making and distributing stoves however further capacity to scale up and reach new markets is needed.



Contents

Country context on carbon finance

Kenya is well placed, resourced and market connected within East Africa. A strong pipeline of carbon projects currently exists.

Institutions

Country Institutions

- Government bodies are in place and various carbon finance companies are based in Kenya creating good local conditions
- 5 projects are registered under the VER Gold Standard
- 5 PoAs exist with plans in Kenya

Methodology

Carbon Finance Accounting

- The Voluntary Carbon Market is well developed with 5 registered projects
- Wood stoves appear to be preferred for carbon finance, due to carbon calculations

Additionality

Kenya is not listed as a Least Developed Country (LDC) and is thus not except from proving that the project is additional. However, given:

1. The low affordability and availability of improved stoves
2. The high contribution of carbon finance to project costs

Additionality should not be a problem

-Implications-

Cookstove programs could take advantage of the relatively well resourced and developed carbon market in Kenya

Existing Carbon Finance Projects in Kenya

There is a big upcoming pipeline of carbon projects in Kenya. Five carbon projects on cook stoves have already been registered with another nine under validation.

CDM Projects

Single CDM projects

- 6 projects have been registered in Kenya and since 2011, 9 projects have entered the validation phase. However, no cookstoves projects are amongst them.

CDM PoAs

CDM Programme of Activities

- 16 PoAs are in validation with Kenya as a Host Country but none have yet been registered.
- 5 of these focus on cookstoves, 3 with a Kenyan CPA to be validated.

Gold Standard

GS VER Projects

- This is a popular option for cookstoves projects
- 5 of the 7 registered GS projects in Kenya are on cookstoves
- 7 of the 9 GS projects in validation are on cookstoves

-Implications-

Carbon projects should consider the different registration options available and which is the most suitable for the project type.

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Existing Carbon Finance Projects in Kenya

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

Partner	Activities
Paradigm Project	GS VER project registered with estimated emission reductions of almost 200,000tCO2 per year from household stoves only.
CO_2Balance	Four GS VER projects registered and another 4 in validation with estimate emissions reductions of almost 400,000tCO_2 per year. CDM PoA is in validation.
Envirofit	CDM PoA in validation
Carbon Manna / Climate Pal	CDM PoA in validation
Uganda Carbon Bureau	PoAs in validation but no Kenyan CPA yet
Green Development SA	PoAs in validation but no Kenyan CPA yet

Implementation Partners

- Cookstove producers and local and international NGOs like Food for the Hungry or World Vision
- Level of local management differs widely from project to project

Existing Carbon Finance Projects in Kenya

Both imported and locally produced stoves are used in carbon finance projects, but all rely on central manufacturing and quality oversight.

Imported stoves

Envirofit distributes different imported stoves under carbon finance. The wood fuel stove is registered under the VER Gold Standard Paradigm Project, a different charcoal stove is the first CPA under a CDM PoA in Validation.

Locally produced stoves

- Fine Engineering and Chujio Ceramics produce the Jiko Poa deployed in the Paradigm Project.
- KONSAVA stove was developed by Carbon Manna Africa and Climate Pal
- REECON produces stoves locally for CO_2 Balance GS VER Projects in Coast Province
- Gennex produces rocket stoves for CO_2 Balance GS VER Project in Kisumu
- ECO2LIBRIUM (Eco2) and Kakamega Environment Education Programme (KEEP) work with a Women's group in Kakamega but in validation since 2009

- 2 carbon finance project target the whole of Kenya and12 have a local focus on Districts
- Estimated sales vary from just above 1,000 to 22,000 stoves per year.

The Paradigm Project

Paradigm project have been distributing the Envirofit wood stove and Jiko Poa stove in Kenya since 2010 on a commercial approach. The stoves are subsidized through carbon finance.

Efficiency:	22%
Distribution Target:	Total of 36,000 stoves sold
Retail Cost: (with CDM)	Jiko Poa = $14 Envirofit = $23.5

The Project

- Started in 2010 distributing Jiko Poa and Envirofit wood stove through. Have sold 36,000 stoves so far
- Have business managers in 4 regions who distribute stoves though network of dealers
- Have also partnered with NGO's to distribute stoves through.
- Jiko Poa is made locally by Fine Engineering through mechanised process. Liner made locally in Limuru.
- Have also started exporting Jiko Poa to other East African countries.

Carbon Finance

Carbon revenue subsidies the price of the stoves by around 25-30%

Financial Considerations

tCO_2

Emissions Reductions

The stoves in carbon finance projects in Kenya claim reductions between 2.4 to 3 tCO_2 per year

If all projects are registered and successful 300,000 VERs and 1.2 million VERs will be issued per year

Total Emission Reductions *of all CPAs and GS VERs over 7 years is* ***5.1 million tCO_2***

Funding

Funding from carbon finance

Historically low market prices of EUR 2.5-3.5 per CER. VERs around EUR 2

Together the Kenya projects would mobilise EUR 1.6 million per year or EUR 11 million over their 7 year lifetime

If prices increase to again EUR 10 per CER in the following years the total value of the assets is over ***EUR 40 million*** *over the next 7 years.*

Subsidy

Benefit sharing and free stoves

Most projects subsidise the stoves in order to reduce upfront costs for the customer and increase uptake

Subsidy for household stove is between 4-15 USD

1 Project aims to distribute 300,000 free of charge (all claims only in PDD and can't be verified)

-Implications-

Cookstove carbon projects have the potential to generate significant revenue and provide subsidized stoves for the end user

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Operational Considerations

No project has so far issued credits and hence their success is unknown. Solutions to a number of traditional issues such as distribution and monitoring are very important for carbon finance projects.

Pricing

Affordability of stoves

Prices for expensive high quality stoves can be reduced but still leaves them at 14-24 USD in retail

It is unclear if low cost & free-of-charge strategies will bind the user to the product over the time required to accumulate carbon credits

Distribution

Central manufacturing leaves the challenge of distribution to be solved

In order to comply with carbon finance regulations on the uniformity of the stove and to ensure quality, central manufacturing appears favourable for carbon finance.

The end-user of the stove needs to be traceable which requires associate dealers - contrary to the existing market situation of fragmented supply chains

Monitoring

User monitoring

Ensuring constant use over the project period is a challenge

Information on the end-user, including transfer of carbon rights, must be channeled back to the managing entity for carbon finance. For informal manufacturers this is difficult to achieve.

-Implications-

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

Contents

Cookstove Industry Summary

The Kenya cookstove sector is relatively well developed within East Africa and has the potential to develop further by up scaling the production of quality stoves to reach further markets. This could reduce biomass consumption and reduce household energy bills. Impacts of reducing health risks more difficult to achieve.

Macro

- \+ Pressure on natural resources could expand market further
- \+ Government developing biomass strategy
- \+ Regional hub for business and finance
- − 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 need for change
- \+ Low forest cover creates case to reduce reliance on biomass
- \+ Potentially to positively impact lives of women
- − Awareness of IAP and related health problems is low.
- − Biomass stoves offer limited health benefits

Favourable

Consumer

- \+ Similar cooking habits across the population
- \+ Consumers aspire to more modern fuels
- \+ Potential to expand the market in urban and rural areas but different approaches needed.
- \+ Potential to scale up LPG use
- − Cookstoves competing in a tight market where price and availability are important factors.

Favourable

Cookstove Industry

- \+ Strong and diverse cookstove sector (both NGO & SME)
- \+ Established business and high product availability in urban areas.
- \+ Opportunity to expand
- − Many low quality products in the market.
- − Highly fragmented and uncoordinated value chain
- − Investment challenges for business expansion

Moderately Favourable

Carbon Finance

- \+ Strong pipeline of projects exists
- \+ Kenya is well placed and resourced with a range of implementation partners available.
- − Low market prices and lack of proven success poses risks
- − Challenges in distribution and monitoring

Moderately Favourable

- Implications -

There is potential for market growth if challenges in quality control and barriers to up scaling production can be overcome.

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Interviewees

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

SCODE	John Maina
Practical Action	Lydia Muchiri,
University of Nairobi	Dr Jacob Kithinji
Envirofit	Micah Allen, Alan Campbell,
Fine Engineering	Mohamed Elias
KIRDI (ceremics)	Paul Gitobu
Paradigm Project	Mathew Kimolo
Mama Nyambura	
Ecozoom	Ben West, CEO
GIZ	Pauline Wanjohi, Maxwell Musoka, Anna Ingwe, Reimund Hoffman.
Musaki Enterprises	Teddy Kinyanjui

East Africa Energy	David Dickie
Co2balance	Steve Hewson,
SNV	Guy Dekelver, Jechoniah Kitala
Premier Gas	Michael Momanyi
JMM Clay Products Producers, Kiria	Joseph Muriuki
Erastus Kimani	
Ndede Group	Joyce Achola Oliech, Edward Oliech Gwara
Keyo Women's Group	Janet Atieno Odoyo
Kariestop	Peter Otieno Obel Bibian Mugele Obambo Ruth Achieng Odhiambo
Kartech	Boniface Kario, Anthony Riri
Ranen Group	Lydiah Awuor Dede, Paul Ogalla Dede, Carolyne Awuor Kwaka

Glossary of Terms

ACTS	African Centre for Technology Studies
AFREPREN/ FWD	Energy, Environment and Development Network for Africa
AIDS	Acquired Immunodeficiency Syndrome
AKF	Aga Khan Foundation
ARI	Acute Respiratory Infections
CDM	Clean Development Mechanism
CO	Carbon Monoxide
CPA	CDM Programme Activities
DFID	Department for International Development
DGIS	Netherlands Directorate-General for International Cooperation
EU	European Union
EUR	Euros
GDP	Gross Domestic Product
GIZ	Gesellschaft für Internationale Zusammenarbeit
GoK	Government of Kenya
GS	Gold Standard
GVEP	Global Village Energy Partnership
HH	Households
HIV	Human Immunodeficiency Virus
HIVOS	Humanistisch Institut voor Ontwikkelingssamenwerking
IAP	Indoor Air Pollution
ICS	Improved Cookstoves
ICT	Information and Communication Technologies
ISAK	Improved Stove Association of Kenya
KCJ	Kenya Ceramic Jiko
KEBS	Kenya Bureau of Standards

KES	Kenyan Shillings
KIRDI	Kenya Industrial Research Development Insitutute
KNBS	Kenya National Bureau of Statistics
LPG	Liquid Petroleum Gas
MFI	Microfinance Institution
MOE	Ministry of Energy
NGO	Non-Governmental Organization
PDD	Project Design Document
PoA	Programme of Activities
PSDA	Private Sector Development in Agriculture
RETAP	Rural Energy Technology Assistance Programme
SACCO	Savings and Credit Cooperatives
SCODE	Sustainable Community Development Services
tCO2	Tonnes of Carbon Dioxide
UAE	United Arab Emirates
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
VER	Verified Emissions Reductions
WFP	World Food Programme
WHO	World Health Organisation

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