



Kenya eCooking Market Assessment

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Lead author: Jon Leary jon@gamos.org

With contributions from:

MECS Kenya Team: Joanes Atela, Tom Randa, Victoria Chengo, Joel Onyango, Syprose Ochieng, Mourine Chepkemoi, & Paul Osogo

MECS Workstream Leads: Matt Leach, Nick Rousseau, Simon Batchelor

EnDev eCooking Team: Gregor Brömmling, Simone Fehrenbach, Verena Brinkmann

EnDev/GIZ Kenya Team: Walter Kipruto, Anna Ingwe

EnDev/MECS eCooking Market Assessments

- Part of a series of publications produced jointly by Energising Development (EnDev) and the Modern Energy Cooking Services (MECS) Programme.
- Strategic insight on the current state of electricity access and clean cooking, identifying the key opportunities and challenges to the scale up of eCooking in 8 countries across sub-Saharan Africa and South Asia.



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Overview

- Summary of the opportunity for eCooking in Kenya
- Clean cooking & electricity access
- Deep dive into:
 - Enabling environment
 - Consumer demand
 - Supply chain
- Recommendations for strategic interventions

Summary

- Kenya is the **birthplace of mobile money** and a **hotbed for innovation** in the development sector.
- Many of the **new electric cooking technologies and business models** developed by MECS are being **piloted in Kenya**, where they are able to leverage the ecosystem of actors and the strong enabling environments in the converging clean cooking and electrification sectors.
- Kenya has made **enormous progress on electrification** with coverage increasing from 19% to 75% in just 10 years, and the majority of its **grid electricity is generated from renewable sources**, mainly geothermal and hydro.
- However, **most of the population still rely on polluting fuels** such as firewood, charcoal and kerosene for cooking.
- **Currently 0% of Kenyans use electricity as their primary cooking fuel**, meaning that there is an **enormous untapped potential for electric cooking**, which is increasingly drawing the interest of the government, consumers and the private sector.

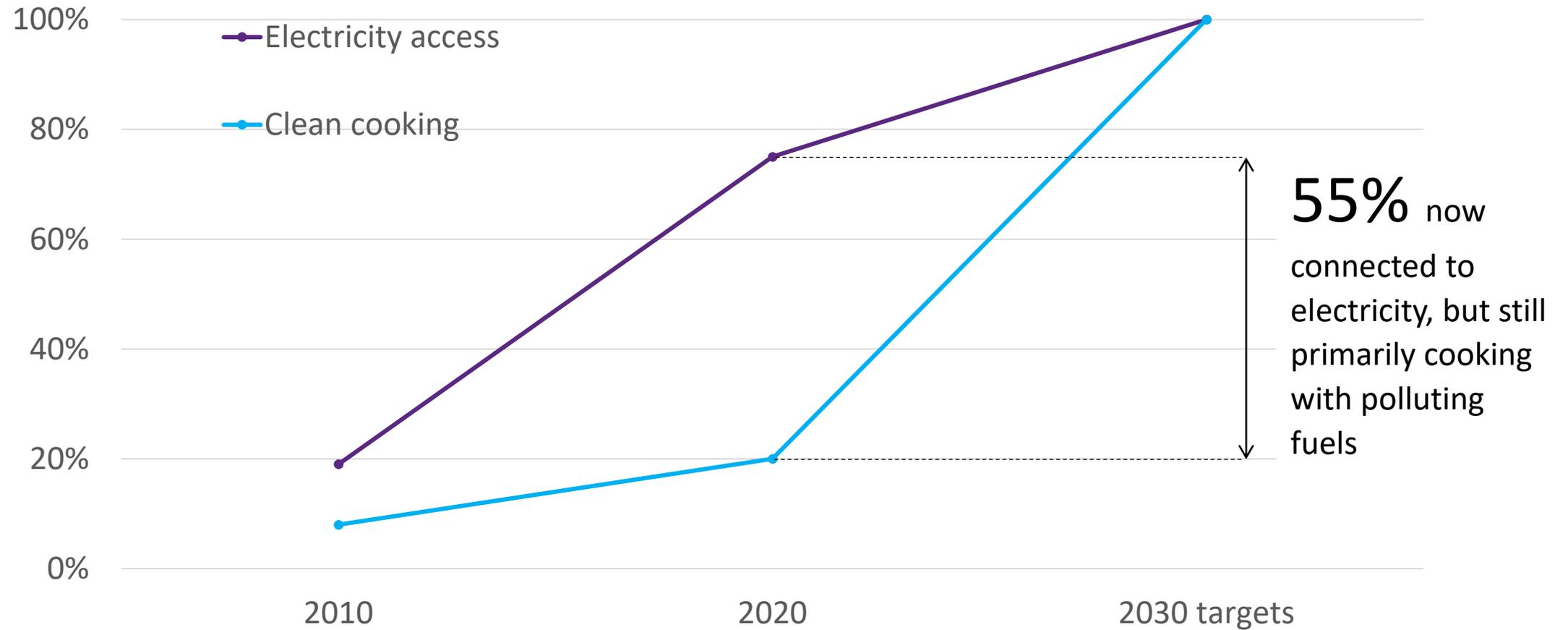
The clean cooking challenge

- Kenya faces a formidable clean cooking challenge: the majority of the population (81%) still relies on polluting fuels such as firewood (65%), charcoal (10%), and kerosene (6%) for their cooking needs (GoK, 2019).
- This has led to an array of interlinked development challenges: GoK (2019) estimates that in Kenya, 21,560 deaths/yr are caused by household indoor air pollution; 8-11Mton/yr. woody biomass is lost due to forest degradation, and 13.6 MtCO₂e/yr is emitted.
- Women and girls are disproportionately affected, with greater exposure to cooking smoke, as well as the drudgery of collecting fuel and lighting/tending fires, which results in missed educational and economic opportunities.
- Historically, Improved Cookstoves (ICS) have been heavily promoted in Kenya through government and non-governmental initiatives to promoting clean cooking.
- However, sustainable uptake has been a major challenge characterized by high rates of abandonment after initial acceptance (GoK, 2020). Recent evidence also shows that the health benefits of ICS are much more limited than previously thought (WHO, 2016).

The opportunity for eCooking

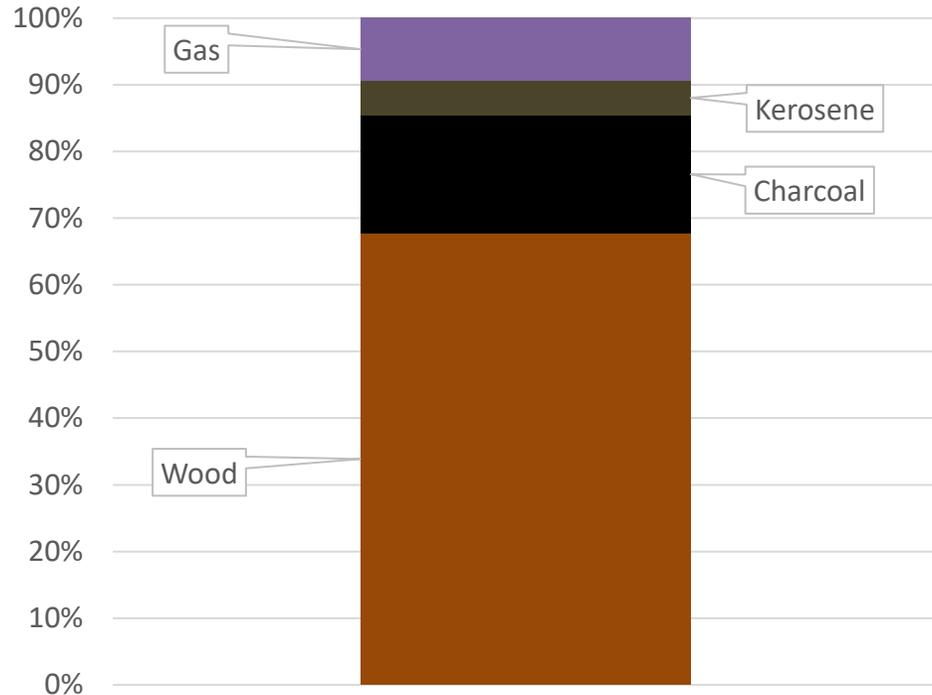
- eCooking presents a potentially transformative opportunity for Kenya's clean cooking sector to break out of this 'business as usual cycle'.
- Currently, 0% of Kenyan's use electricity as their primary cooking fuel.
- This highlights the enormous untapped potential, as 75% of the population is now connected to some form of electricity, but doesn't yet use for the majority of their cooking needs.
- Meanwhile, Kenya Power is desperately trying to stimulate demand for its almost exclusively renewable electricity, as the Last Mile Electrification Programme has connected many new customers with very low demand.
- Kenya has a rich history of progress in the energy sector, with a world-leading solar sector and modern energy cooking technologies such as LPG already seeing widespread adoption.
- These transitions have laid the groundwork for Kenya to take the next step towards its goal of achieving universal access to energy ahead of the 2030 SDG targets, by leveraging the progress it has made in electrification to drive forward the clean cooking agenda.

Clean cooking and electricity access in Kenya



Cooking energy

0% cook primarily with electricity

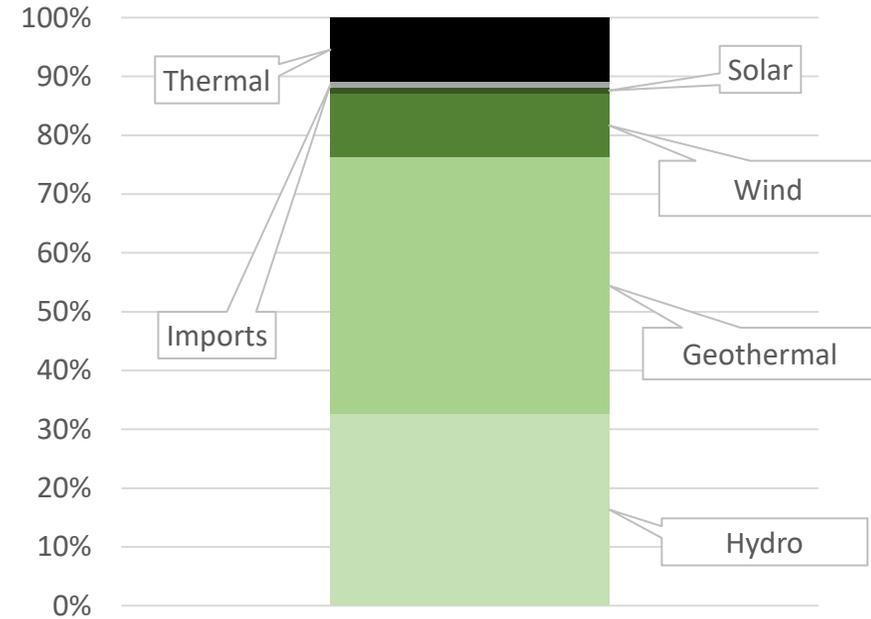


22% cook primarily with commercialized polluting fuels
(charcoal & kerosene)

91% cook primarily with polluting fuels

Electricity generation (on-grid)

89% renewable

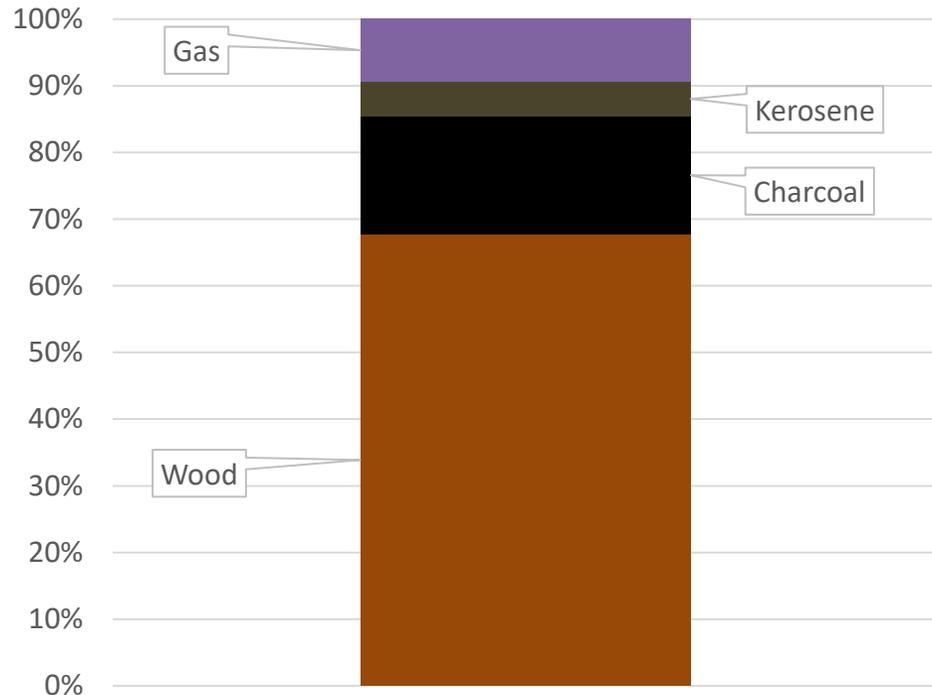


45% surplus power generation

High reliability: 99% power availability (SAIDI*SAIFI=83hrs/yr)

Cooking energy

0% cook primarily with electricity



22% cook primarily with commercialized polluting fuels
(charcoal & kerosene)

91% cook primarily with polluting fuels

Electricity generation (off-grid)

World leading mini-grid & off-grid sectors:

- **0.1m** mini-grid customers
- **20** mini-grid developers
- **13m** off-grid lighting/appliance customers

MECS eCooking GMA viability scores/rankings

- GMA = Global Market Assessment
- Scored all low & middle income countries using international indicators for:
 - economics (clean fuels, market size, financial sector strength)
 - human (policy, health, gender, development, business environment)
 - infrastructure (electricity access, reliability, RE share)
- MECS.org.uk/GMA

Kenya	Overall:	On-grid eCooking:	Mini-grid eCooking:	Off-grid eCooking:
	7th/130	0.59 – 19th/130	0.43 – 27th/130	0.55 - 2nd/130

Key opportunities

- Rapid expansion of access to electricity in last 10 years
- Diversified mix of renewable electricity generation both on- and off-grid
- Market leader for SHS sales in SSA
- National utility actively stimulating demand growth for surplus electricity
- EPC highly compatible with popular 'heavy foods'
- Strong ecosystem for innovation and political will for change

Key challenges

- LPG already the aspirational fuel for many
- Electricity commonly perceived as 'too expensive for cooking', even though clean fuel stacks (LPG & EPC) often the most cost-effective solution
- Policy makers have identified need for integrated planning, but framework not yet in place

Potential impacts of scaled uptake in most viable market segment

If 40% of Kenya's grid-connected charcoal users (2.6m ppl, 0.7m HHs) switched to eCooking, the [WHO's BAR-HAP](#) tool suggests that:

- **1,203 DALYs/yr** avoided
- **1.9m tonnes/yr CO₂eq** emissions reduced
- **0.4m tonnes/yr** reduction in unsustainable wood harvest
- **191m hrs/yr** of women's time saved (272hrs/HH/yr)
- **9 months payback** for eCooking appliances (\$80/HH upfront cost, \$110/HH/yr savings on fuel energy costs)
- **422 GWh** demand for electricity stimulated



Enabling environment

Enabling environment

- **eCooking policy outlook:** Strong policy in place in both the electricity access and clean cooking sectors, with key policy makers starting to create an integrated policy framework that cuts across the two sectors
- **Key policy stakeholders:** Ministry of Energy, Energy and Petroleum Regulatory Authority (EPRA), Renewable Energy and Rural Electrification Corporation (REREC), Kenya Power and Lighting Company (KPLC), County governments, Kenya Bureau of Standards (KEBS)

RISE (Regulatory Indicators for Sustainable Energy) scores:

76%	79%	59%	67%
Electricity Access	Clean Cooking	Renewable Energy	Energy Efficiency

eCooking cuts across all 4 pillars

Targets:

Electricity access	Clean cooking
100% electricity access by 2030 (grid/off-grid)	100% clean cooking access by 2028
100% renewable grid electricity by 2030	40% modern energy cooking access by 2028
	Specific eCooking targets under development

Key government/NGO programmes creating the enabling environment in which eCooking can scale

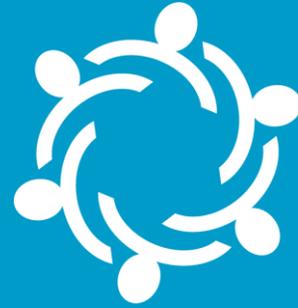
- [Last mile connectivity programme](#) – increased electricity connectivity from 56% in 2016 to 74% in 2018 by extending the national grid into rural areas and densifying the network to reach low-income households in slum areas.
- [National Electrification Strategy](#) - outlines the necessary policy direction, investments and collaborative environment required to achieve universal access to electricity in Kenya by 2022.
- **National eCooking Strategy** – Ministry of Energy currently preparing to develop a baseline study and strategic plan to support the scale up of eCooking in Kenya.
- [KOSAP](#) – eCooking in scope for GoK's RBF programme incentivising supply chain development for off-grid electricity and clean cooking devices in underserved counties.
- **CrossBoundary/CLASP/ESMAP/KPLC** - Appliance financing scoping study underway with eCooking one of several key appliance groups. Funding not yet secured for piloting designed during scoping study.
- [CLASP Global LEAP+RBF](#) – Global LEAP Awards identifies best in class energy-efficient appliances. 2020/21 EPC competition identified safe, durable, affordable and user-friendly models. Global LEAP Usability Testing empowered everyday cooks in Nairobi to select which models of EPC they prefer. CLASP/EnDev EPC RBF programme supported sale of 5,000 EPCs in 2020/2021, with follow on programme for 3,000 EPCs about to begin.
- **KPLC** – [Pika na Power](#) programme raising awareness and creating opportunities for eCooking appliance retailers to demonstrate and sell their products to KPLC's 7 million customers.
- [Strathmore University](#) – understanding the supply chain for eCooking appliances and developing scalable quality assurance and repair infrastructure.
- These should all be hyperlinked wherever possible

Key barriers/drivers in the enabling environment

- KPLC in financial difficulties as revenue per customer dramatically decreased after connecting many new customers, as the majority are rural households where electric demand is low, and costs of maintenance are very high due to long distribution lines. As a result, they are keen to stimulate demand for electricity, but unable to finance appliances themselves.
- Kenya's Ministry of Energy (MoE) is a vocal champion for clean cooking on the global stage and are now taking an integrated planning approach that can leverage the rapid progress in electrification to drive forward the clean cooking agenda.



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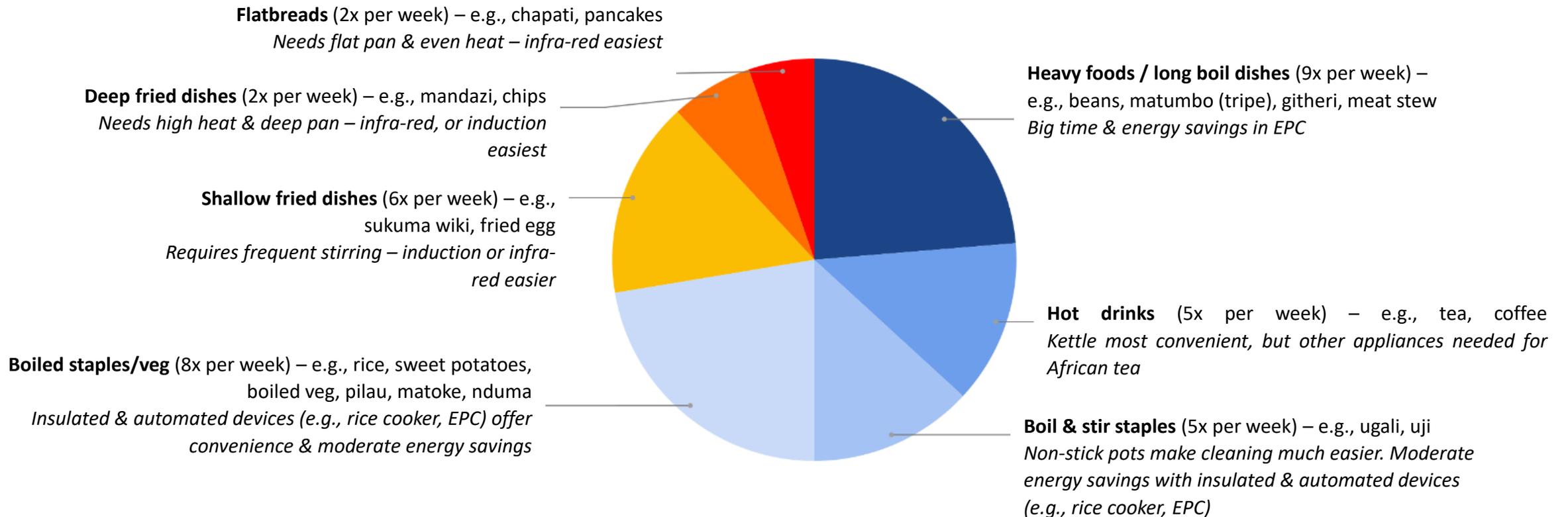


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Consumer demand

Consumer demand

- In an average week, a typical Kenyan household might prepare:



Popular meal combinations in Kenya

- *Ugali and sukuma wiki* – ugali is a maize meal porridge that is boiled and vigorously stirred. It's very easy to cook in an EPC or rice cooker and the non-stick pot is much easier to clean, although most people won't believe you until you show them. Sukuma wiki (kale) is usually fried and can also be cooked with an EPC, although many people may choose induction/infra-red so they can use a shallow pan that is easier to stir.
- *Beans and rice* – there are many varieties of beans, which are boiled from 30 mins to several hours and typically served with a tomato or coconut sauce. Rice is simply boiled, so an EPC and a rice cooker would be an ideal combination.
- *Githeri* – one pot meal, beans and maize stew boiled for several hours, usually served with a tomato and onion sauce. EPCs are the obvious choice, offering big time and energy savings.
- *Sweet potatoes or nduma (arrow roots) and tea* – boiled tubers and African tea (tea leaves boiled in milk) is a popular breakfast combination. EPCs are also an obvious choice for the tubers and although you can cook African tea very easily on an EPC (without pressurizing), many people will choose a sufuria (saucepan) on an infra-red/induction stove instead.
- Most viable energy-efficient appliances: **EPCs, rice cookers, induction, infra-red, kettles**

Demand creation

- Key marketing messages:
 - Energy-efficient appliances offer substantial time and cost savings and enable multi-tasking.
 - EPCs are the cheapest and most convenient way to cook heavy foods.
- Key demand creation programmes
 - KPLC's Pika na Power promoting eCooking via bi-weekly cooking classes, social media and national TV.
 - Influential food bloggers such as Jikoni Magic & Nimoh's Kitchen creating eCooking content on Instagram, YouTube & other popular platforms.
 - Shamba Shape Up featuring EPCs on national TV.

Key market segments

- *Charcoal users*
 - 7 million Kenyans use charcoal as their primary fuel and many more use it as part of their fuel stack.
 - The majority of whom are located in urban areas and are now connected to the national grid.
 - Unlike firewood, charcoal is almost always purchased, creating an attractive existing expenditure to convert into electricity units.
 - Charcoal prices rose dramatically in 2019 with the enforcement of logging ban to protect the nation's dwindling forests.
 - Charcoal is now the most expensive way to cook, leaving many looking for an alternative.
 - Charcoal is typically preferred for heavy foods, as it burns slowly and many people still believe it is the cheapest way to cook them.
 - The EPC offers a highly attractive modern alternative that can greatly reduce expenditures on cooking fuel, however the upfront cost is a substantial barrier for many who use charcoal, which can be purchased in small quantities.

Key market segments

- *LPG users*

- Kenya's LPG market has expanded rapidly in recent years, positioning it as the aspirational fuel for many and over 5 million already using it as their primary fuel.
- Whilst the social impact of transitioning LPG users to electricity may be limited, many wealthier households who currently cook with LPG are starting to integrate task-specific eCooking appliances such as kettles and EPCs into their fuel stack.
- These early adopters have a vital role to play in building the supply chain for eCooking appliances as their liquidity is high enough to make cash purchases of appliances.

Key demand side barriers/drivers

- Rapid urbanization (4%/yr) driving broader changes in lifestyle: shifts towards purchasing cooking fuel and wider range of income generating activities driving demand for time savings.
- Mobile money widely adopted (78% penetration).
- Widespread perception that electricity is 'too expensive for cooking'
- Over 90% of the everyday Kenyan menu can be cooked in an EPC, with big time and energy savings on the most energy-intensive dishes (heavy foods), which make up around 25% of the weekly menu.
- Limited awareness of the range of the available modern energy-efficient electric cooking appliances and their compatibility with Kenyan cuisine.
- Deep-rooted social-cultural perceptions built over histories of biomass dependency and widely-promoted intermediary technologies such as improved biomass cookstoves, including the perception that food cooked with electricity doesn't taste the same and that electricity is 'too expensive for cooking'.
- Cooking with energy-efficient electric appliances such as an EPC can be much cheaper than popular cooking fuels, yet the high upfront cost of energy-efficient appliances is prohibitive for the low- and middle-income households that would stand to benefit the most.



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Supply chain

Supply chain

- **Key domestic eCooking appliance manufacturers:**
 - Burn Manufacturing (EPC Global LEAP Awards winner).
- **Key eCooking appliance distributors:**
 - Hotpoint Appliances (EPC Global LEAP Awards winner), Ramtons, ARMCO, Sayona

Innovative eCooking pilot projects

- [Burn](#) – Designing an EPC specifically for African cooks for manufacture in their modern cooking device factory in Nairobi.
- [Bidhaa Sasa](#) – Selling EPCs to rural women’s savings groups through their network of leaders in Western Kenya.
- [ATEC](#) - Preparing to pilot PayGo induction stoves in the Kenyan market.
- [SunCulture](#) – Piloting EPCs as an additional appliance for their PayGo solar irrigation systems.
- [SCODE](#) – Piloting solar electric cooking systems and LPG/electric clean fuel stacks for off-grid and weak-grid customers.
- [SNV](#) – Preparing to pilot larger EPCs with off-grid institutions in Kakuma refugee camp.
- WFP – Preparing to pilot larger EPCs with schools in Nairobi and Isiolo.
- [MKopa](#) – Exploring the viability of adding eCooking to their portfolio of digitally financed assets.
- [Jikoni Magic](#) – Selling EPCs via social media, live cooking demonstrations and developing partnerships with financial institutions (SACCOs, chamas, etc.).
- [Perybere Energy](#) – Piloting EPCs with 100 newly electrified customers in Western Kenya.
- [Caritas Kitui](#) – Piloting EPCs, LPG and ICS as part of the Energy Delivery Models (EDM) framework to support evidence-based policy making in Kitui County.
- [RVE Sol](#) & [PowerHive](#) – Piloting EPCs with mini-grid customers and incentivizing usage with dedicated cooking tariffs.
- [Biolite](#) – Developing an interoperable DC EPC for off-grid solar systems.
- [Fosera](#) – Developing off-grid eCooking appliances with customized cooking algorithms to optimize energy-efficiency.

Key supply side barriers/drivers

- Strong supply chains for importation of appliances from China in place, with many companies now expanding product range into energy-efficient eCooking appliances.
- Rapidly growing demand for EPCs with over 10 models now available through a variety of retail channels.
- Early piloting of innovative consumer financing mechanisms underway to enable low-income households to unlock low-cost cooking with energy-efficient appliances.
- Limited access to after-sales services for modern energy-efficient electric cooking appliances.
- Reliability of electricity now high in major cities, but still a challenge at the fringes of the grid (slums, rural areas) and many regions still off-grid.

Popular appliances in Kenya today

- Oven/cookers using electricity only or a mixture of electricity and LPG are currently the best selling appliances in Kenya, mainly to wealthy households.
- Task-specific appliances such as rice cookers and kettles are popular amongst a wider range of income brackets.
- Stove-top pressure cookers are popular in Kenya, but EPCs have only recently broken into the market.
 - In 2018, only 1 high end model was available in any substantial quantity, however in 2021 over 10 different models are now on sale through a variety of retail channels.
- Hotplates are the most popular counter-top appliance and are particularly popular amongst students and low-income households who share an electricity meter with their landlords as they either pay a fixed rate for electricity or nothing at all.
- Induction and infra-red stoves have yet to see substantial uptake, as LPG is already widely adopted, but their popularity is slowly growing.

Table 1: Import volumes and typical retail prices for selected eCooking appliances in Kenya.

Appliance	Sales volumes (Jul-Dec 2019 import data)	Typical retail price (MECS Appliance Availability Survey – online retailers in Nairobi)
Oven/cooker (elec & elec/gas)	68,859	5k-23k KES (50-230 USD)
Hotplate	21,401	900-5k KES (9-50 USD)
Rice Cooker	14,780	3k-10k KES (30-100 USD)
Kettle	18,465	700-6k KES (7-60 USD)
Electric Pressure Cooker (EPC)	6,500	5k-15k KES (50-150 USD)
Microwave	313	5k-200k KES (50-200 USD)
Induction/infra-red stoves	138	3k-180k KES (30-180 USD)

^[1] No. EPCs actually lower as this includes some conventional stove top pressure cookers.

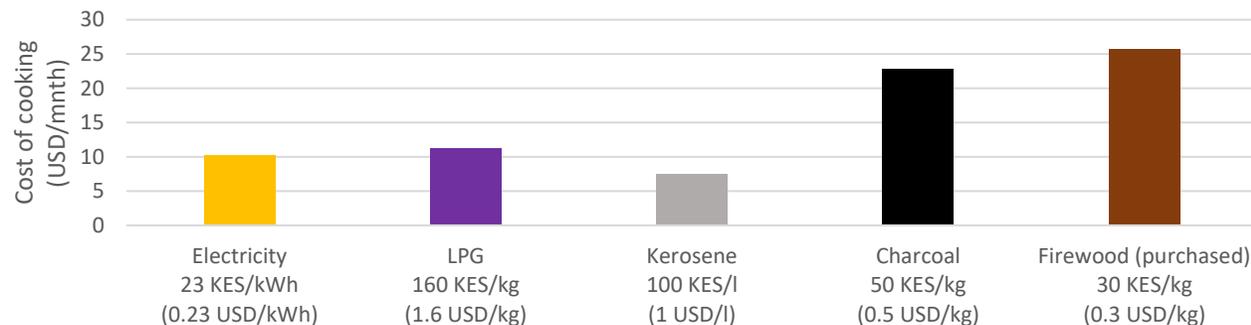
^[2] No. microwives actually higher, as the majority are captured under a different import classification (HS code).

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Relative cost of eCooking vs. popular cooking fuels

- In urban grid connected areas, cooking heavy foods with EPCs is over 5x cheaper than charcoal, LPG or kerosene (Leary, Fodio Todd et al, 2019).
- A clean fuel stack of LPG and an EPC is usually the cheapest way to cook (except collected firewood) (ESMAP, 2020).
- Cooking all your food with grid electricity is cost comparable to LPG or kerosene and cheaper than purchased biomass (ESMAP, 2020).



Grid electricity tariffs:

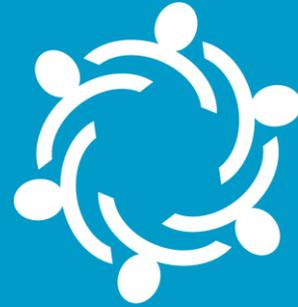
Regular: 23 KES/kWh (0.23 USD/kWh)
Lifeline: 17 KES/kWh (0.17 USD/kWh) < 100kWh/mnth

Mini-grid tariffs:

Private sector avg.: 56 KES/kWh (0.56 USD/kWh); KPLC mini-grids = grid tariff



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Recommendations for strategic interventions

Recommendations

	Current status	Recommended interventions
On-grid	Majority of population now grid-connected, but uptake of eCooking very limited. Utility keen to stimulate demand for surplus electricity.	Support KPLC to expand their cooking with electricity demand stimulation programme to low-income households by funding the eCooking component of the consumer finance piloting designed by CrossBoundary/CLASP/ESMAP.
Mini-grid	Pilots carried out on solar-hybrid MGs with encouraging results, but high tariffs are major barrier. Innovative developers experimenting with price signaling to encourage off-peak eCooking.	Leverage new Gold Standard methodology for streamlined verification of eCooking projects with smart metering to subsidised dedicated cooking tariffs.
Off-grid (SHS)	Several SHS companies piloting solar eCooking, but high import tariffs for battery storage and DC eCooking appliances increasing price point above commercial viability.	Lobby government to reduce import tariffs on DC eCooking appliances and battery storage sized for cooking.

Recommendations

	Current status	Recommended interventions
TToC dimensions	<p>Supply chain</p> <p>Product/market fit of EPCs established with early studies, Global LEAP+RBF EPC pilot programmes have enabled distributors to explore the market, but sales volumes still measured in thousands.</p>	<p>Build upon the EPC RBF pilots to design and implement a much larger EPC RBF programme. Connect with EnDev electrification RBFs to offer EPCs with new grid/mini-grid connections to ensure sufficient demand for electricity to justify connection costs.</p>
	<p>Consumer demand</p> <p>Consumer awareness campaigns carried out to raise profile of energy-efficient appliances (in particular EPCs) involving a blend of live cooking demonstrations, TV and social media.</p>	<p>Support KPLC to expand their network of demonstration centres and retail outlets outside of Nairobi by connecting with GIZ local offices and other local champions who can establish local retail outlets and carry out cooking demonstrations with local dishes.</p>
	<p>Enabling environment</p> <p>Strong policy framework for clean cooking & electrification in place and Ministry of Energy about to start work on National eCooking Strategy.</p>	<p>Support Ministry of Energy to integrate lessons learned from previous GIZ/EnDev clean cooking & electrification interventions in Kenya (e.g. EPC RBF) into the development of the National eCooking Strategy.</p>



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Find out more

Visit www.MECS.org.uk or <http://endev.info> for:

- The full Kenya eCooking Market Assessment
- The full set of 8 country studies
- Cross-country comparison
- Impact modelling methodology
- Guiding framework

