



Ethiopia eCooking Market Assessment

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Lead authors: Richard Sieff, Karin Troncoso, Meron Tesfamichael

With contributions from:

MECS Workstream Leads: Matt Leach, Jon Leary, Martin Price, Simon Batchelor

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

EnDev/GIZ Ethiopia Team: Christian Borchard, Zewdy Gebremedhin, Samson Tolessa,

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 Ethiopia
- Clean cooking & electricity access
- Deep dive into:
 - Enabling environment
 - Consumer demand
 - Supply chain
- Recommendations for strategic interventions

Summary

- Electric cooking (eCooking) has been a feature of Ethiopian cooking practices since the 1970s when government programmes promoted eCooking appliances (particularly electric injera stoves) to create demand for surplus power and reduce the environmental impacts of biomass consumption.
- Yet, the majority (96%) of Ethiopia's population of 115 million (22% urban) still relies on polluting fuels for their cooking needs, with firewood most used (82%).
- Over the last decade, there has been a rapid increase in the use of electricity for cooking in urban areas and given the very low Ethiopian electricity prices and ongoing support from government programmes for eCooking, it is perhaps surprising that only 4.1% of all households use electricity as their primary cooking fuel.
- The ambitious [plans](#) to increase electricity access from the current 45% to 100% by 2025 offer further opportunities for eCooking going forward. To increase uptake and unlock the potential for eCooking in Ethiopia, measures are required to address electricity coverage and reliability issues while policy needs to better integrate electrification and clean cooking. Improved access to finance/payment plans could increase the affordability of electric stoves.

The clean cooking challenge

- Ethiopia faces a considerable clean cooking challenge: the majority of the population (96%) still relies on polluting fuels for their cooking needs, with firewood predominant as the primary cooking fuel for 82% of the population.
- Continued use of these fuels has led to an array of interlinked development challenges: there are 63,000 deaths each year in Ethiopia caused by in-door household air pollution (HAP) while the daily drudgery of collecting fuel and lighting/tending fires results in missed educational and economic opportunities [1]. These impacts disproportionately affect women and girls.
- Deforestation and environmental degradation are also major issues affected by the use of biomass and solid fuels for cooking.

The opportunity for eCooking

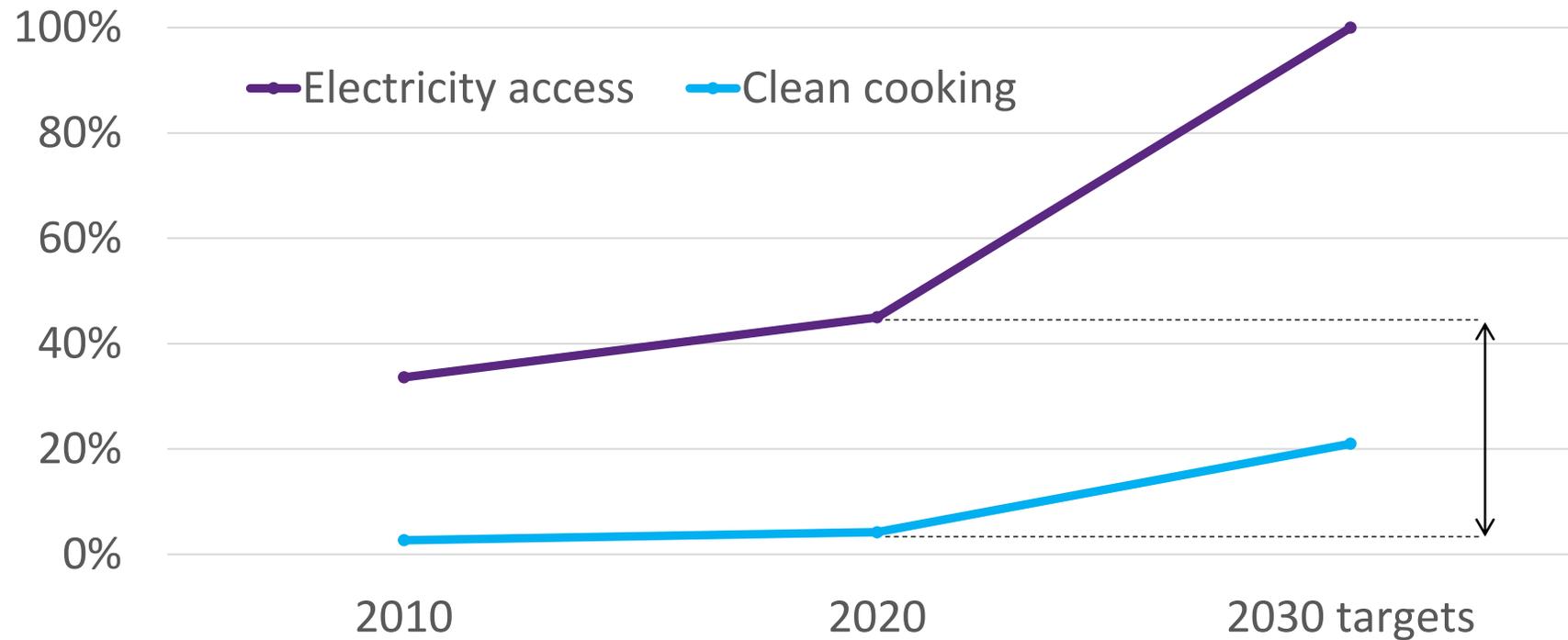
- 4.1% of all households use eCooking (half exclusively) and electricity has become the second most used cooking fuel in urban areas, with 65% of households in the capital Addis Ababa owning electric appliances [2] and 63% using it as their primary cooking stove [7].
- Opportunities for eCooking are likely to be greater in urban areas where existing usage is much higher (15.3%) compared to rural households (0.9%) due largely to greater access to grid electricity (urban: 96.2%, rural: 12.2%) [3].
- Fuel stacking in Ethiopian households is a major coping practice in response to fuel price fluctuation and availability of cooking fuels and there has been a significant increase in eCooking in the last decade which has led to reduced firewood usage.
- Given electricity access stands at 45% and the per unit cost of grid electricity very low, there is clear untapped potential to increase uptake of eCooking. In particular, 41% of the population appear to have an electricity connection but not use it for the majority of their cooking needs although an estimated 6-15% of the population have tier 1 connections which cannot support electric cooking (ESMAP (2020)/discussions with GIZ Ethiopia).

Breakdown of off-grid electricity access (ESMAP 2020)

Off grid technology	% of populations using as primary source of electricity	MTF tier
Solar lantern	12.8	Tier 0-1
Solar Lighting System	5.8	Tier 1
Solar Home System	4.9	Tier 1-3
Rechargeable batteries	0.2	Tier 2
Mini-grid	0.1	Tier 1-4
Generator	0.1	Tier 3

- ESMAP (2020) state 57% of the population have some form of electricity access but include solar lanterns which are excluded from most other sources who give access as 45%.
- Many of the other off-grid solutions used are tier 1 which cannot support electric cooking while grid reliability issues mean many grid connections can also be classified as tier 1.

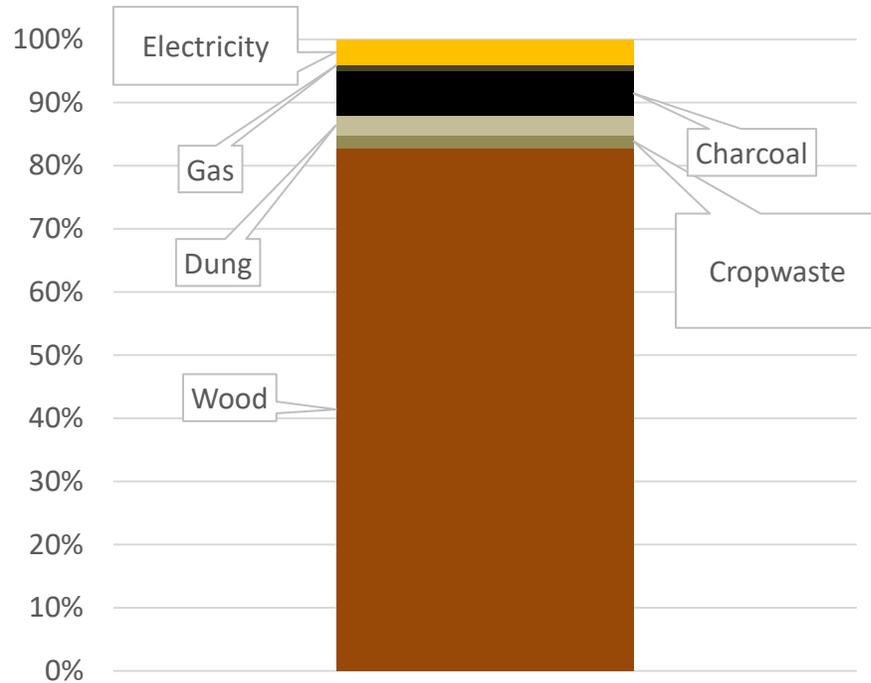
Clean cooking and electricity access in Ethiopia



41% now connected to electricity, but still primarily cooking with polluting fuels although an estimated 6-15% are tier 1 connections which cannot support electric cooking.

Cooking energy

4% cook primarily with electricity

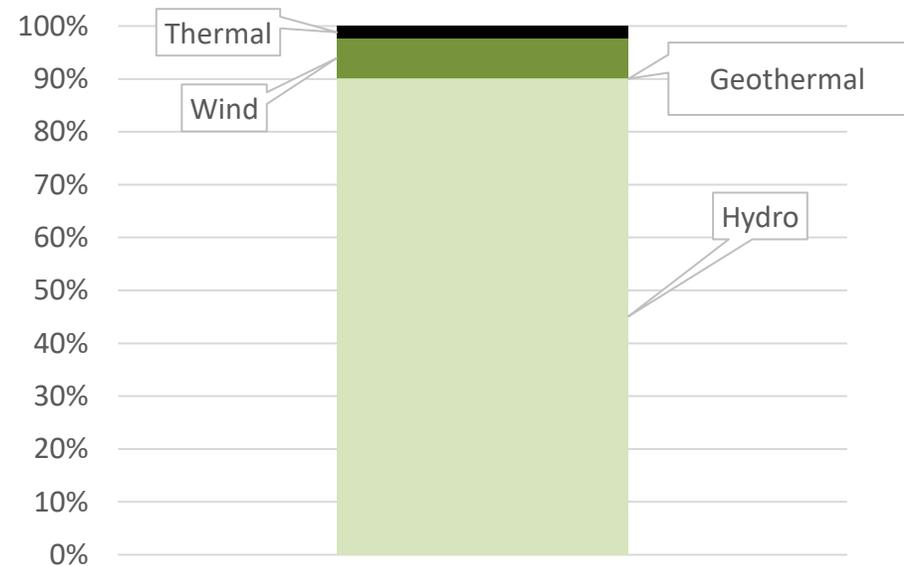


8% cook primarily with commercialized polluting fuels (charcoal)

95% cook primarily with polluting fuels

Electricity generation (on-grid)

98% renewable

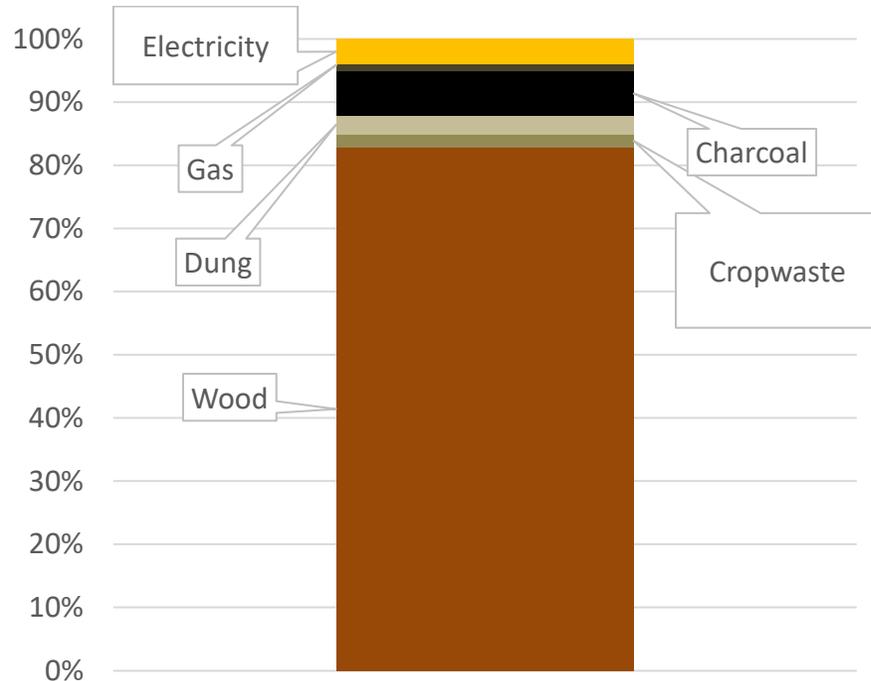


27% surplus power generation but major deficits (up to a **44% shortfall**) when hydropower water levels are low

Reliability issues: 81% power availability (SAIDI*SAIFI= 1634 hrs/yr)

Cooking energy

4% cook primarily with electricity



8% cook primarily with commercialized polluting fuels (charcoal)

95% cook primarily with polluting fuels

Electricity generation (off-grid)

Mini-grid & off-grid sectors:

- **15,000** mini-grid customers
- **14** mini-grid developers
- **7.6m** 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

Ethiopia

Overall:
79th/130

On-grid eCooking:
0.47 – 91st/130

Mini-grid eCooking:
0.32 – 109th/130

Off-grid eCooking:
0.43 – 43rd/130

Key opportunities

- Electricity tariffs are among the lowest in sub-Saharan Africa
- Declining availability and increasing price of biomass and LPG
- Significant increases in grid generation capacity projected
- Significant local manufacturing base for electric cooking appliances and maintenance

Key challenges

- Unreliable grid electricity service and lack of coverage in many areas
- Off-grid access is predominantly tier 1 which cannot support eCooking [1].
- Affordability of electric cooking appliances. Firewood freely available in many rural areas.
- Traditional attachment to biomass fuels and limited awareness of alternatives

Potential impacts of scaled uptake in most viable market segment

If Ethiopia's grid-connected charcoal users in urban areas (4.2m ppl, 0.9m HHs) switched to eCooking, the [WHO's BAR-HAP](#) tool suggests that:

- **903 DALYs/yr** avoided
- **2.2m tonnes/yr CO₂eq** emissions reduced
- **0.4m tonnes/yr** reduction in unsustainable wood harvest
- **132m hrs/yr** of women's time saved (272hrs/HH/yr)
- **14 months payback** for eCooking appliances (\$130/HH upfront cost, \$110/HH/yr savings on fuel energy costs)
- **517 GWh** demand for electricity stimulated

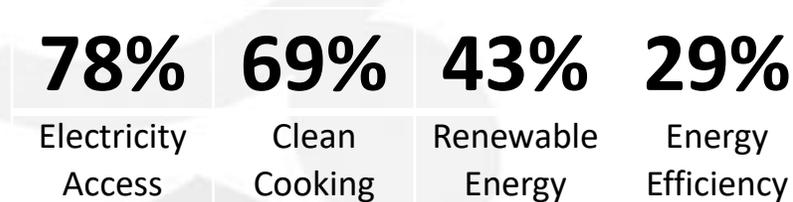


Enabling environment

Enabling environment

- **eCooking policy outlook:** embraces a range of clean cooking solutions including eCooking although still considerable emphasis on improved biomass cookstoves. **Electricity access:** clear priority area for national government but lacks a clear integrated planning framework connecting cooking and electrification policy.
- **Key policy stakeholders: Government:** Ministry of Water, Irrigation and Energy (MOWIE); Ethiopian Electric Power (EEP); Ethiopian Electric Utility (EEU); Ethiopian Energy Authority (EEA); Ministry of Mines and Petroleum (MOMP); Environment, Forest, and Climate Change Commission (EFCCC); and regional level offices of MOWIE, MOMP and EFCCC. **Development Partners:** World Bank, African Development Bank SNV, GIZ, MECS

RISE (Regulatory Indicators for Sustainable Energy) scores:



eCooking cuts across all 4 pillars

Targets:

Electricity access	Clean cooking
100% electricity access by 2025 (65% grid/35% off-grid)	33% clean cooking access by 2030 (includes ICS)
96% grid/4% off-grid electricity by 2030	21% modern energy cooking access by 2030

Main energy sector contributor to Ethiopia's Nationally Determined Contributions (NDCs)

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

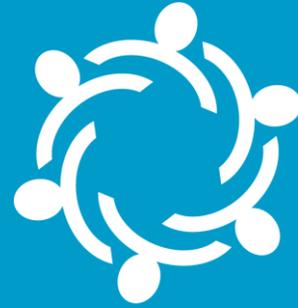
- [The National Electrification Program 2.0 \(2019\)](#) targets universal electrification by 2025 through grid (65%) and off-grid (35%) connections as a stepping stone to 96% grid/4% off-grid access by 2030.
- **Growth and Transformation Plan (Phases I-IV)** is the overarching economic and social development strategy. Energy is seen as a core enabler and the plan incorporates a massive expansion of hydropower resources and electrification drive.
- **Reducing Emissions from Deforestation and Forest Degradation Strategy (REDD+, 2016)** sets 2030 cookstove distribution targets of: 3m ICS, 0.8m biogas plants, 1m other stoves (electric, LPG & solar).
- **National Hygiene and Environmental Health Strategy: 2016 – 2020 (2016)** recommends measures to mitigate the impacts of HAP from biomass cooking (e.g. chimneys, separate kitchen area).
- **Ethiopian Power System Expansion Master Plan Study (2014)** assumes 95% of households will be grid connected by 2037 and that a large share will (in the long run) use electric cooking. A household scenario is envisioned of *“a 1000 W electrical cooker operating for 1.2 hours per day for 365 days”*.
- **Energy Policy (Draft 2013)** promotes a range of cooking fuels and technologies, namely electricity (specifically electric injera mitads in both urban and rural areas), biogas, biofuels, solar, and kerosene.
- **Biomass Energy Strategy (2013)** has a range of recommendation including: efficiency improvements for biomass cooking; using electricity and other renewable fuels as substitutes for biomass cooking; and providing credit for stove producers.
- **National Improved Cookstoves investment program (NICSP, 2013)** aimed to distribute 9 million improved cookstoves (ICS) in 4.5 million households by 2018 (aligned to CRGE strategy of reducing biomass cooking GHGs).
- **Climate Resilient Green Economy strategy (2011)** states clean cooking as the largest energy sector contributor of greenhouse gas (GHG) to Ethiopia’s Nationally Determined Contributions (NDCs) and aims to distribute 5 million electric stoves.
- **Public-Private Partnership (PPP) Proclamation and Legal Framework (2010)** has opened vast opportunities for private investment in the energy sector as the government seeks to accelerate the transition to modern energy services while reducing its financial burden.

Key barriers/drivers in the enabling environment

- Electricity access is a major priority area for the national government
- Clean cooking access is also a priority for the government as evidenced by the sector's prominent place in meeting Ethiopia's Nationally Determined Contributions (NDCs)
- Recent stakeholder insights indicate key government actors are pushing for eCooking in light of surplus power coming on line from prestige projects such as the Grand Renaissance Dam
- No clear integrated planning framework connecting cooking and electrification policy: the NEP2.0 does not provide plans or estimates on electricity use by consumer groups or end uses (such as cooking).
- The policy framework embraces a range of clean cooking solutions including electricity but still places considerable emphasis on improved (biomass) cookstoves (ICS).



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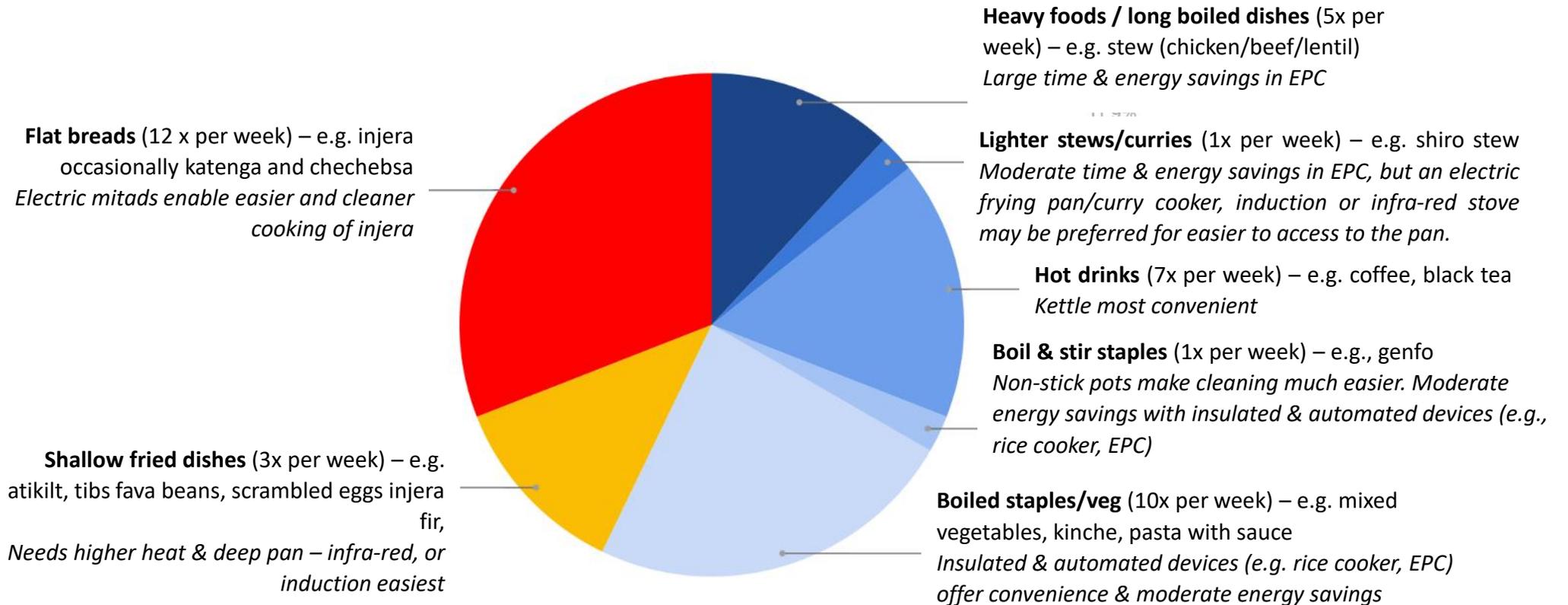


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Consumer demand

Consumer demand

In an average week, a typical Ethiopian cook might prepare:



Popular meal combinations in Ethiopia

- *Injera* is a fluffy thin pan-cake type bread baked on a 'mitad' – a large circular griddle plate either made of clay and used over a fire or made of metal as part of an 'electric mitad'.
- *Sauce ('wot')* is the most common dish in Ethiopia and is eaten with injera. Wot can be made with various ingredients including legumes, vegetables and meat and involves both frying (e.g. for onions) and boiling processes.
- *Boiled meat* is either boiled separately before adding to a sauce, or boiled with spices and onion as a dish on its own ('kikil').
- *Vegetables:* spinach, round cabbage, potato, cassava and other roots, and onions are the common vegetables in the Ethiopian diet. These are mostly boiled or cooked as stew with other ingredients.
- *Fried meat ('tibs')* can be eaten alone but is usually fried with onion, green chilli and spices in flat frying pans.
- *Stiff porridge ('genfo')* is prepared in almost all parts of Ethiopia and typically made from barely, maize or wheat flours. It is a staple food in Bale, almost all of Gambella, and the Borena Zones in Oromia.
- *Rice and pasta* have increasingly become one of the most frequently cooked dishes in urban households, and the main dish cooked in both urban and rural areas of Somali, Harari and Afar regions.
- Most viable energy-efficient appliances: **electric mitad, single and double electric cookstove (either induction, infra-red, or less efficient hot plate), kettles, electric pressure cookers (EPCs), rice cookers.**

Demand creation

- Key marketing messages:
 - Very low tariffs mean eCooking is clearly the cheapest way to cook in Ethiopia. Energy-efficient appliances further increase cost savings, while also offering substantial time savings and enable multi-tasking.
 - EPCs are the cheapest and most convenient way to cook heavy foods.
- Key demand creation programmes
 - Several government policies have significant electric stove distribution targets.
 - The flagship electrification project, the Grand Ethiopian Renaissance Dam is now being positioned politically as the means to transition women away from cooking with biomass although this push for eCooking not been incorporated into a formal policy.
 - Several development agencies interested to engage in the sector: DRC, UNDP, UNHCR [7]

Key market segments

- *Urban and peri-urban areas*

- Urban and peri-urban areas have seen a rapid uptake of eCooking over the last decade. In particular in Addis Ababa, where 65% of households use electric cooking. The expansion of the electricity network is also likely to facilitate a greater shift to electrical cooking [4].

- *Charcoal users (particularly in urban areas)*

- 8 million Ethiopians use charcoal as their primary fuel and many more use it as part of their fuel stack. Approximately half live in urban areas and are connected to the national grid. Unlike firewood, charcoal is almost always purchased, creating an attractive existing expenditure to convert into electricity units.

- *Urban female headed households*

- FHHs are more likely to own a clean fuel stove (electricity, LPG or biogas) than male-headed households (MHHs) - 8.3% compared to 3.2%. Similarly, fewer FHHs (43%) use a three-stone fire for cooking than MHHs (63%) [3]. These differences are mostly due to a higher concentration of female-headed households in electrified urban areas. A higher proportion of women who cook exclusively with electricity are engaged in income generation which suggests that cooking exclusively with electricity may liberate time for women to engage in income generating activities or that they can afford the capex on the electric stoves [5].

Key demand side barriers/drivers

- Electricity tariffs are among the lowest in sub-Saharan Africa
- Declining availability and increasing price of biomass and LPG
- Widespread recognition of the inconvenience of firewood for cooking (including from wood users)
- Firewood remains freely available in many rural areas.
- Traditional attachment to biomass fuels and limited awareness of alternatives
- Affordability of more reliable electric cooking appliances



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Supply chain

Supply chain

- **Key domestic eCooking appliance manufacturers:**

- Significant local manufacture (almost entirely in the informal sector) of single/double electric stoves centred in Merkato (Addis Ababa), involving traditional potters, metal artisans, and electric component suppliers. Electric mitads used locally are almost exclusively made in Ethiopia [7]
- Leggio Aluminium – best known local electric mitad manufacturer. Sales volume unavailable.
- A and H Development Solutions PLC: well-organized local electric stove manufacturer. Average electric stove production: 10,000 units/year. Production capacity for electric stoves: 30,000 units/year [7]
- Other electric mitad manufacturers: Wub and Wass Electronics. Wass building large manufacturing facility in Debre Birhan.

- **Key eCooking appliance distributors:**

- Mekerez Engineering Service: based in Addis Ababa supplying mainly locally manufactured stoves, but also imported stoves from China and Turkey. Sales of locally manufactured electric stove and mitads are 60 and 45 per month respectively.

Innovative eCooking pilot projects

- 1970s government programme promoted eCooking to create demand for surplus power, facilitate sales of government produced electric stoves, and reduce the environmental impact of biomass consumption. The programme led to high adoption of electric injera baking stoves in grid connected (and almost always urban) households but low uptake of other electric cookstoves.
- MECS have produced several reports providing situational analysis of the eCooking and clean cooking sectors in Ethiopia, which could support eCooking pilot projects
- GIZ formed an eCooking Community of Practice in 2021, which includes plans to implement eCooking projects (also in 2021).

Key supply side barriers/drivers

- Significant increases in grid generation capacity and electricity access projected
- Significant local manufacturing base for electric cooking appliances and maintenance
- Current grid electricity network lacks coverage and the service has considerable reliability issues
- Tariff system may be unsustainable long term and can deter low electricity users from adopting eCooking
- Off-grid access is predominantly tier 1 (mostly solar lanterns) which cannot support eCooking. There are also very few mini-grids. Barriers to expanding to larger off-grid systems and offering flexible payment options need to be analysed and addressed [3].
- The more rudimentary local production methods cannot cater for the increasing demand for eCooking appliances. Imports of appliances have increased as a result but tend to be cheaper, poorer quality devices requiring frequent repair [4].

Popular appliances in Ethiopia today

- Stove ownership has increased significantly over the last decade from 300,000 households owning at least one electric stove in 2011 to an estimated 1.8m in 2017 [2, 4].
- Electric mitads for baking injera have been common in grid connected urban households since the 1970s
- Uptake of single and double electric cookstoves (mainly hotplates or spiral rings) has increased over the last decade as kerosene, LPG and charcoal prices have risen [4].
- The authors were unable to source appliance specific sales data to complete. In terms of aggregated annual sales data, estimates range from that 200,000 [7] to 2.1m [4] locally manufactured electric stoves sold.

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

Appliance	Sales volumes	Typical retail price (5)
Oven/cooker (elec & elec/gas)		8000-15000 ETB (170-320 USD)
Single Hotplate		350-470 ETB (7-10 USD)
Double hotplate		650-1500 ETB (14-32 USD)
Rice Cooker		
Kettle		
Electric Pressure Cooker (EPC)		
Microwave		
Induction/infra-red stoves		2000-3000 ETB (43-64USD)

Relative cost of eCooking vs. popular cooking fuels

- The heavily subsidized electricity prices mean cooking on electricity is nearly always the cheapest way to cook (except for collected firewood).
- Cooking all your food with grid electricity (on band 2) on energy efficient appliances is 1.6 times cheaper than kerosene, 1.8 times cheaper than purchased firewood, 4.5 times cheaper than LPG, and 6 times cheaper than charcoal (Figure 1).
- When using non-efficient appliances, cooking exclusively on grid electricity (on band 2) is still cheaper than all other fuels: 1.2 times cheaper than kerosene, 1.4 times cheaper than firewood, 3.6 times cheaper than LPG, and 5 times cheaper than charcoal.

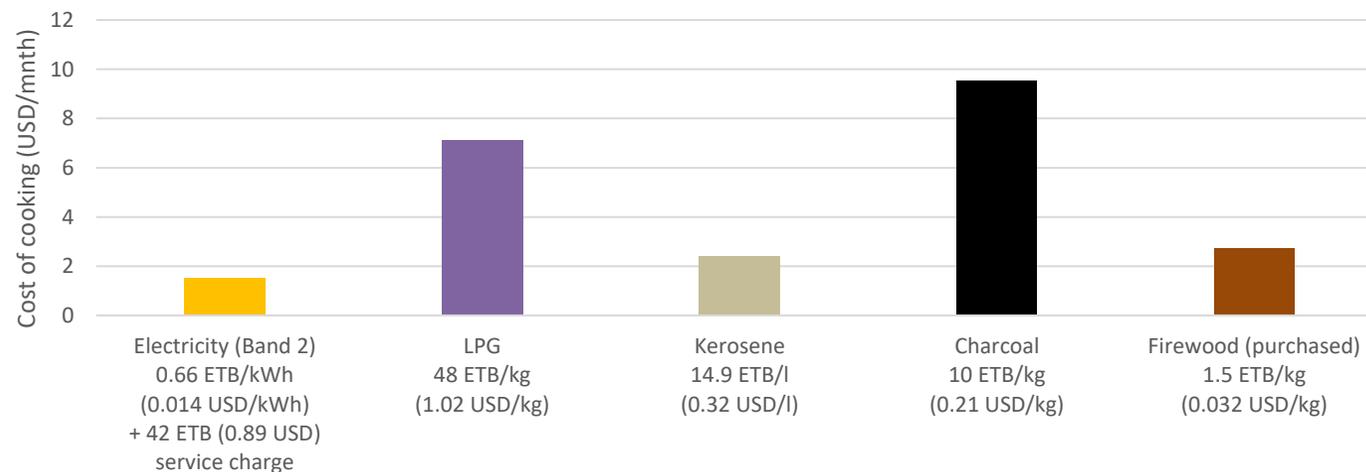


Figure 1: Cost comparison of different cooking fuels based on international averages for cooking energy demand from ESMAP (2020) and local electricity/fuel prices.

Grid electricity tariffs:

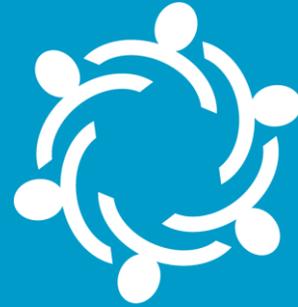
- **Band 2: 0.6644 ETB/kWh (0.014 USD/kWh) 51-100kWh/mnth + service charge 42 ETB (0.89 USD)**
- **Band 1: 0.2730 ETB/kWh (0.006 USD/kWh) < 50kWh/mnth + service charge 10 ETB (0.21 USD)**

Mini-grid tariffs:

- National legislation governing mini-grid tariffs under development by EEA
- Data could not be sourced on Private sector avg



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Recommendations for strategic interventions

Recommendations

	Current status	Recommended interventions
Market segments	<p>On-grid</p> <ul style="list-style-type: none"> ▪ Very low tariffs – key enabler ▪ Heavily subsidised tariffs may be unsustainable long term. Jumps in per kWh price and service charge between bands 1-2 and 2-3 may deter low electricity users from adopting eCooking. 	<ul style="list-style-type: none"> • Review tariff system to explore whether tariff bands and their relevant service charges can be adjusted to incentivise eCooking – in particular for bands 2 and 3. • Review tariff system to better understand mechanisms to introduce cost reflective tariffs to ensure long term sustainability of grid electricity .
	<p>Mini-grid</p> <ul style="list-style-type: none"> • Only 0.1% of population use mini-grids [3] • Government policy: huge emphasis and subsidies on grid and intention to decrease off-grid electricity between 2025-2030 disincentivises and hinders mini-grid/off-grid investment. 	<ul style="list-style-type: none"> • See off-grid (SHS) point below
	<p>Off-grid (SHS)</p> <ul style="list-style-type: none"> • 31.6% of rural households use an off-grid solution but mostly tier 1 devices which cannot support eCooking [3]. 	<ul style="list-style-type: none"> • Analyse barriers to expanding to and offering flexible payment options for larger off-grid systems

Recommendations

	Current status	Recommended interventions
TToC dimensions	Supply chain <ul style="list-style-type: none"> • Low availability, quality, and reliability of grid electricity 	<ul style="list-style-type: none"> • Improve the availability (especially in the evening), reliability, and quality of grid-electricity - likely to increase eCook uptake as it already makes economic sense. • Investigate feasibility of battery supported grid cooking to enable cooking during outages (e.g. payback periods, customer profiles)
	Consumer demand <ul style="list-style-type: none"> • Affordability challenges with the upfront costs of eCooking appliances • Availability of better quality energy-efficient appliances is lacking • Lack of awareness of eCooking benefits (health) • Buildings with multiple single room tenants often forbidden by landlords to use eCooking as shared meter does not allow disaggregated bills. 	<ul style="list-style-type: none"> • Introduce financing mechanisms to increase affordability of eCooking stoves (e.g. payment plans). Gender-targeted mechanisms may be required to incentivize female-headed households (a key market segment). • Raise awareness and advocate for the health benefits of eCooking • Advocate for policy/regulatory change to address issues of shared meters
	Enabling environment <ul style="list-style-type: none"> • Lack of distinct eCooking policy focus (i.e. many clean cooking fuels are promoted) and lack of integrated eCooking/electrification planning. 	<ul style="list-style-type: none"> • Create intersectoral working group to integrate & coordinate electrification and clean cooking. Platform created by CCA and Electrical Appliances Manufacturers Association could be used to advocate for this group.

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