REPUBLIC OF KENYA

MINISTRY OF ENERGY AND PETROLEUM

Kenya National electric Cooking Strategy

11 May 2024

FOREWORD

[To be developed for the Cabinet Secretary by MoEP)

ACKNOWLEDGEMENTS

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EXECUTIVE SUMMARY

Kenya's eCooking sector holds immense potential, not only as a pathway to cleaner and more sustainable cooking methods but also as an avenue to address broader developmental challenges such as public health, environmental conservation, and economic development. Despite achieving an 81 percent electrification rate in 2023, predominantly from renewable sources, a significant portion of Kenyans continue to rely on traditional biomass for cooking, leading to severe health and environmental consequences. A transition to eCooking at the household and institutional level would align with the Kenya Clean Cooking Compact 2021's goal for universal clean cooking access by 2028, contributing to Sustainable Development Goal 7. eCooking promises to lower emissions, enhance public health, reduce domestic labour, and save time, benefiting women and girls significantly.

This inaugural eCooking strategy provides a roadmap for building the foundation for a sustainable eCooking marketplace in the next five years, which will then enable an accelerated scale up over the next two decades to facilitate the 2050 Net Zero transition. As key strategic interventions, the document outlines system enablers to address bottlenecks in the enabling environment, among them, the establishment of a coordinating mechanism for eCooking initiatives, eCooking pilots, capacity building initiatives, electrification initiatives and market development activities that lower barriers for households to adopt eCooking between 2024 and 2028.

Proposed market development activities include Behaviour Change Communication, and financial relief measures such as VAT exemptions on eCooking appliances, subsidies and dedicated credit financing programmes will be rolled out for specific population segments. A total of 10.76 percent of households are expected to be successfully transitioned from other fuels into primary and secondary eCooking by 2028. The strategy provides a structured Monitoring and Evaluation (M&E) framework to assess its effectiveness and sustainability, and a cohesive stakeholder engagement plan to create a collaborative ecosystem that leverages the strengths and resources of diverse stakeholders.

Embedding eCooking within broader national strategies and related policy instruments is crucial for achieving integrated energy planning. The strategy outlines synergies with existing policies on energy, environment and climate action, health, and industrialization and innovation. By setting clear, ambitious, and time-bound targets, while continuously refining the interventions based on evolving market realities, Kenya can ensure the success of its electric cooking initiatives.

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LIST OF ABBREVIATIONS

AC	Alternating current
AEOs	Agricultural Extension Officers
AFD	Agence Francaise de Development
ATL	Above-The-Line campaigns
BCC	Behaviour Change Communication
BLEENS	Biogas, Liquified petroleum gas, Electricity, Ethanol, Natural gas and Solar
BTL	Below-The-Line campaigns
CAPI	Computer Assisted Personal Interviews
CCA	Clean Cooking Alliance
CCG	Climate Compatible Growth
CFAs	Community Forest Associations
DALYS	Disability-Adjusted Life Years
DC	Direct Current
EPC	Electric pressure Cooker
ESCOs	Energy Service Companies
FDI	Foreign direct investment
FGD	Focus Group Discussion
fNRB	fraction of Non-Renewable Biomass
GeCCo	Global Electric Cooking Coalition
GESIP	Green Economy Strategy and Implementation Plan
GHG	Green House Gas
ICS	Improved cooking solutions
INEP	Integrated National Energy Plan
IoT	Internet of Things
ITMO	internationally transferred mitigation outcomes
IVAs	Independent Verification Agents
KES	Kenya Shillings
KIRDI	Kenya Industrial Research and Development institute
KNeCS	Kenya National electric Cooking Strategy
KNES	Kenya National Electrification Strategy
KOSAP	Kenya Off-Grid Solar Access Project
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KPLC	Kenya Power & Lighting Company
KPLC	Kenya Power and Lighting Company
KWh	Kilo watt Hour
LCPDP	Least Cost Power Development Plan
LMCP	Last Mile Connectivity Programme
LPG	Liquified Petroleum Gas
MECS	Modern Energy cooking Services
MECS	Modern energy cooking services
MoEP	Ministry of Energy and Petroleum
MTF	Multi-Tier Framework
MTF	Multi-Tier Framework
NCCAP	National Climate Change Action Plan
NDCs	Nationally Determined Contributions
NGOs	Non- Governmental Organizations
OBF	On Bill Financing
OBR	On Bill Repayment

PAYC.	Pay-As-You-Cook
PAYGO	Pay-As-You-Go
PJ	Petajoules
PV	Photo Voltaic
RBF	Results Based Financing
RIAT	Ramogi Institute of Advanced Technology
ROSCA	Rotating Savings and Credit Association
SCODE	Sustainable Community Development Services
SDG	Sustainable Development Goals
SEforAll	Sustainable Energy for All
SEI	Stockholm Environment Institute
SEZ	Special Economic Zones
SHS	SHSs
SPA	Special Planning Area
STI	Science, Technology, and Innovation
TCS	Traditional cooking solutions
ToU	Time-of-Use
TVET	Technical and Vocational Education and Training
UN	United Nations
USD	United Stated Dollar
VAT	Value Added Tax
VAT	Value Added Tax
WUAs	Water Users Associations
YLD	years lived with disability
YLL	years of life lost

1. Introduction

1.1 Background

Over the past decade, Kenya has made remarkable strides in electrification, with coverage surging from a mere 25 percent in 2010 to an impressive 75 percent in 2022 (IEA, IRENA,UNSD, World Bank, WHO, 2023). Most of the nation's grid electricity now comes from renewable sources, primarily geothermal and hydro. However, despite these achievements, most Kenyans still rely on polluting fuels such as firewood, charcoal, and kerosene for cooking. With 0.9 percent[1] of the population using electricity as their primary cooking fuel, a vast untapped potential lies dormant, waiting to be harnessed (KNBS, 2019).

The clean cooking challenge in Kenya is immense. The latest estimates show that 61 percent of the population continues to depend on polluting fuels such as firewood (42 percent) and charcoal (17 percent) for their cooking needs, leading to a range of interconnected development challenges (KNeCS, 2023). Biomass fuels significantly contribute to Household Air Pollution (HAP) and major sources of Greenhouse Gas (GHG) emissions, and previous studies show that they account for up to 26.5 percent of Kenya's total GHG emissions. The Ministry of Health linked indoor air pollution to 21,500 premature deaths annually (Government of Kenya, 2019). The continued reliance on traditional biomass energy, coupled with population growth, places a strain on agricultural land, leading to reduced fuelwood supply (approximately 20 million tonnes per year). This, in turn, contributes to deforestation, famine, desertification, and land degradation (Government of Kenya, 2019; Schreiber, Waceke, Blair, Grant, & Ireri, 2020). Women and girls are disproportionately impacted, facing higher exposure to cooking smoke and the burden of collecting fuel—sacrificing educational and economic opportunities in the process. The government and non-governmental organizations have strongly advocated for Improved Cookstoves (ICS) as a solution to the clean cooking crisis. However, achieving long-term adoption has proven challenging, as many users abandon the cookstoves soon after initially accepting them (Government of Kenya, 2019). Moreover, recent studies indicate that the health advantages of ICS are not as significant as once believed (Government of Kenya, 2019).

In light of the environmental, social, economic and health impacts of traditional cooking practices, there is need for a paradigm shift in the approach to clean cooking. As a result, Kenya is now taking an integrated approach to energy planning which can enable the rapid progress in electrification to offer a new solution to this challenge, one that simultaneously addresses issues in the power sector itself. The increased electricity generation capacity in the country makes electricity a gamechanger in the clean cooking sector to transition Kenya to universal access to clean cooking solutions by 2028 as elaborated in the Kenya Clean Cooking Compact, 2021, thereby accelerating the achievement of Sustainable Development Goal (SDG) 7. Transitioning to eCooking could bring a host of positive changes—reducing emissions, improving public health, alleviating domestic drudgery and enabling time savings especially for women and girls. With falling appliance costs and growing awareness, Kenya is not just ready for this change; it is primed for a cooking revolution that promises wider benefits for society, the economy, and the environment.

It is against this background that the Ministry of Energy and Petroleum (MoEP) has developed the Kenya National eCooking Strategy (KNeCS). This initiative has been made possible through the technical and financial support from the Rapid Response Facility (RRF) Consortium, which includes Modern Energy Cooking Services (MECS), Climate Compatible Growth (CCG), and UK Partnerships for Accelerating Climate Transitions (UK PACT) programs. This strategy contributes

[1] KNBS. (2019). The 2019 Kenya Population and Housing Census Volume IV: Distribution of Population by Socio-Economic Characteristics. Nairobi: Kenya National Bureau of Statistics.

to the overarching Kenya National Clean Cooking Strategy (KNCCS) aimed to guide Kenya's transition from reliance on wood fuel to modern and clean forms of cooking energy by 2028.

The structure of this document is as follows: Chapter 1 outlines the problem statement and provides the rationale for the eCooking strategy. Chapter 2 offers a situational analysis of eCooking in Kenya, incorporating insights from an eCooking baseline study conducted in early 2023 and a subsequent SWOT analysis. Chapter 3 details the strategic approach, including the mission and vision, a strategic roadmap with scenario analysis to determine the most viable path for eCooking scale-up, and its impact on the electricity grid. Chapter 4 focuses on strategic interventions for scaling eCooking, enhancing the enabling environment, piloting eCooking projects, and market development activities. Chapter 5 explores the potential for integrating eCooking into other national policies. The appendices provide an in-depth look at the methodologies and findings, with Appendix 3 presenting a detailed action plan consisting of a monitoring and evaluation framework, and a stakeholder re-engagement plan.

1.2 Problem Statement

Despite achieving an impressive electrification rate of 75 percent as of 2022 due to The Last Mile Connectivity Project (LMCP) and Kenya Electricity Expansion Project (KEEP) fuelled largely by renewable sources, Kenya faces a glaring disconnect between electrification and the adoption of eCooking. Specifically, from the 2023 KNeCS baseline survey, Only 0.58 percent of households primarily rely on electricity for cooking. However, when considering a broader definition of cooking that encompasses conventional cooking, reheating meals, and boiling water as part of cooking process, the percentage rises to 3.88 percent. Despite this uptick, the prevalence of eCooking does not align with the high rate of electrification. Conversely, 61 percent still depend on polluting fuels like firewood and charcoal. These traditional cooking methods not only pose severe health risks but also contribute significantly to environmental degradation.

Additionally, despite the increase in connections, the new customers often have low electricity demand. Despite doubled connections between 2014 and 2018, electricity consumption rose by only 16%, with many households consuming below the lifeline tariff threshold. Low electricity demand limits revenue for the utility. Other challenges include high connection costs in rural areas and difficulties in revenue collection. As Kenya aims to increase its power generation capacity, stimulating electricity demand is crucial.

The absence of a national eCooking strategy in Kenya hampers the country's potential to accelerate its shift towards clean cooking solutions, particularly eCooking. This strategic gap not only hinders progress toward meeting Kenya's 2028 clean cooking targets, as outlined in the Kenya Clean Cooking Compact, but also impedes the achievement of Sustainable Development Goal 7. Therefore, there is an urgent need for a comprehensive strategy that prioritizes the transition to eCooking.

1.3 The Rationale for a National eCooking Strategy

The mandate for a national strategy to guide the transition from biomass to eCooking aligns closely with international and national policies focused on sustainable development, climate change, and public health. Internationally, the United Nations Sustainable Development Goals (SDGs), particularly SDG7, advocates for universal access to affordable, clean energy by 2030. eCooking advances not only SDG7 but also has cross-cutting benefits for SDG 3 (Health), SDG 5 (Gender Equality), SDG 13 (Climate Action), and SDG 1 (No Poverty). The global initiative Sustainable Energy for All (SE4All) furthers this cause by targeting universal access to modern energy services by 2030 and doubling the global rate of improvement in energy efficiency. Kenya's national targets are aligned with SE4All, aiming to provide electricity and clean cooking

solutions to 100 percent of its population while achieving 80 percent renewable energy. Kenya also set an energy efficiency goal to reduce total energy intensity by 2.78 percent annually.

The Paris Agreement, to which Kenya is a signatory, further underscores the urgency. Kenya's updated Nationally Determined Contributions (NDCs) targets are to reduce greenhouse gas emissions by 32 percent by 2030 compared to a business-as-usual scenario (Government of Kenya, 2020a). Scaling up eCooking can contribute to this goal. Similarly, eCooking can help reduce the health risks associated with household air pollution from cooking as per the guidelines of the World Health Organization (WHO) on indoor air quality. On the African front, scaling eCooking aligns to the World Bank and African Development Bank's (AfDB) New Deal on Energy for Africa that aims to achieve universal access to electricity in Africa by 2025, and increase access to clean cooking energy for around 130 million households across Africa. African Union's Agenda 2063 supports the expansion of renewable energy generation and grid infrastructure.

National policies in Kenya offer a supportive backdrop for eCooking. The 2010 Kenyan Constitution includes provisions for environmental rights, climate change, and sustainable development. Kenya's Vision 2030 development blueprint identifies key areas such as energy access, renewable energy, and gender equality that can foster an environment conducive for eCooking. Though existing energy-related policies don't explicitly mention eCooking, they create an enabling environment for its adoption. The Energy Act No. 1 of 2019 serves as a comprehensive legal framework covering renewable energy, energy efficiency, and rural electrification, which can be leveraged for eCooking. Kenya's National Energy Policy of 2018 aims to transition from traditional biomass to cleaner alternatives like electricity, emphasizing the importance of energy efficiency. This indirectly promotes the adoption of energy-efficient eCooking appliances. The National Electrification Strategy (2018-2022) aims for universal electrical access, impacting eCooking positively by making electricity available to all households.

The Integrated National Energy Plan (INEP) provides a coherent and coordinated approach to energy planning that encompasses all aspects of the energy sector, including for scaling electrification and clean cooking. The Least Cost Power Development Plan (LCPDP) and County Energy Plans are part of this mechanism, allowing for strategic planning that incorporates eCooking into national energy plans.

Table 1.1 National-Level Policies and Strategies and their relevance to eCooking

Policy/Strategy	Relevance to eCooking
Kenyan Constitution of 2010	Provides provisions on environmental rights, adequate housing, sustainable development, and climate change.
Kenya's Vision 2030	Supports energy access, renewable energy, infrastructure development, climate change, and gender equality.
Sessional Paper No. 4 of 2004	Outlines the energy policy framework for the country.
Energy Act No. 1 of 2019	Provides a legal framework for energy development and regulation.
National Energy Policy of 2018	Emphasizes clean cooking, energy efficiency, and renewable energy adoption.
Kenya's National Electrification Strategy (2018-2022)	Aims for universal access to electricity, which is a key foundation for universal eCooking .
Integrated National Energy Planning Framework	Aims for a coordinated approach to energy planning, including eCooking.
Least Cost Power Development Plan (LCPDP)	Identifies cost-effective power generation projects considering eCooking demand.

Climate Act 2016	Aim to pave the way for the inclusion of eCooking in Kenya's energy planning strategy, integrating it into both the Article 6 and Voluntary Carbon Markets for enhanced sustainability.

Beyond the energy sector, other policy frameworks intersect to support clean cooking and electrification. The 2017 National Climate Change Action Plan projected that using improved cookstoves and alternative fuels could result in annual reductions of up to 5.6 million tonnes of CO2 emissions, and an update is under development. The 2016 Forest Conservation and Management Act indirectly fosters clean cooking by regulating logging and charcoal production to mitigate deforestation. Additionally, the 2019 Kenya Gender Policy in Energy ensures gender-equitable access to opportunities in the energy sector, including clean cooking solutions. Collectively, these policies create an enabling environment for the adoption of cleaner, more efficient cooking technologies like electric stoves.

In summary, Kenya's policy landscape, although not explicitly mentioning eCooking, provides a fertile ground for its scaling, aligning with broader objectives of sustainable development, energy security, and climate action. A national eCooking strategy in Kenya would play a vital role in driving the widespread adoption of eCooking solutions in the country, leading to various economic, social, and environmental benefits.

Table 1.2 Other policies and initiatives

Policy/Initiative	Relevance to eCooking
National Climate Change Action Plan (NCCAP) (2023)	- Projects potential annual savings of up to 5.6 million tonnes of CO2 equivalent by adopting improved cookstoves and alternative cooking fuels. - includes the target of >10% use of electricity as a primary cooking fuel by 2030
	- Supports the establishment of a program to raise awareness and promote clean cooking. - Advocates decarbonisation of the electricity supply and clean cooking transitions
Kenya National Climate Change Response Strategy (2010)	- Endorses improved cookstoves and suggests subsidies and tax waivers to assist impoverished households in acquiring energy-efficient stoves.
Forest Conservation and Management Act (2016)	- Regulates logging and charcoal production, indirectly encouraging the use of cleaner cooking fuels and technologies to reduce deforestation.
Kenya Gender Policy in Energy (2019)	- Aims to ensure equal access to clean and efficient energy services, including eCooking, for both men and women.

2 Situational Analysis

This situational analysis aims to provide a comprehensive understanding of the opportunities, challenges, and critical factors associated with the integration of eCooking in efforts toward meeting Kenya's 2028 clean cooking targets, as outlined in the Kenya Clean Cooking Compact Kenya's national strategy.

2.1 Research Methodology

The analysis draws from the output of the Kenya National eCooking Survey (KNeCS), conducted between December 2022 and May 2023, which analysed the status of eCooking in Kenya. Specifically, the study examined the state of household electrification and access to clean cooking, in particular eCooking appliance adoption and usage, household cooking practices, the supply chain for eCooking appliances, and the enabling policy environment for eCooking in Kenya.

The study used a mixed-method approach to investigate eCooking in Kenya. A desk review analysed previous national survey reports, academic literature, industry reports, and policy documents to understand the status quo of eCooking in Kenya and to identify data gaps. It also informed the survey design. The study followed a nationally representative sampling approach, whereby cluster analysis divided Kenya's 47 counties into 8 archetypal groups based on variables like population density, household size, grid connectivity, and regional attributes. Two outlier counties were also included, making it a total of 10 clusters for the study. A total of 2432 households were sampled. Post-stratification was implemented to achieve unbiased statistical estimates and enable the generalization of survey results nationally, and adjustments to the weights were made accordingly.

The survey was complemented by Focus Group Discussions in four counties representing different market segments: Bungoma, Kilifi, Nairobi and Garissa. The FGDs elucidated rich insights particularly on communities' attitudes, belief systems, norms and values about cooking in general, and eCooking. Expert knowledge was obtained through in-depth semi-structured interviews with relevant individuals and organisations active in eCooking or the broader electrification or clean cooking sectors. Interviews were done with policy actors, retailers of eCooking appliances, energy technology companies, development partners, parastatals, research institutes, energy sector utilities and the regulator.

2.2 Status of eCooking in Kenya

Household access to electricity

The survey of households revealed that 76.5 percent of Kenyan households primarily use grid electricity, with 93.7 percent in urban areas and 66.3 percent in rural areas. Solar Home Systems (SHSs) are the leading off-grid source at 13.3 percent, while private mini-grids serve 2.6 percent, and rechargeable batteries account for 0.3 percent of households. No household reported using the generator as the main source of electricity, though 0.7 percent used them for back-up. Grid electricity is predominantly used by urban households while SHSs are dominant in rural areas.

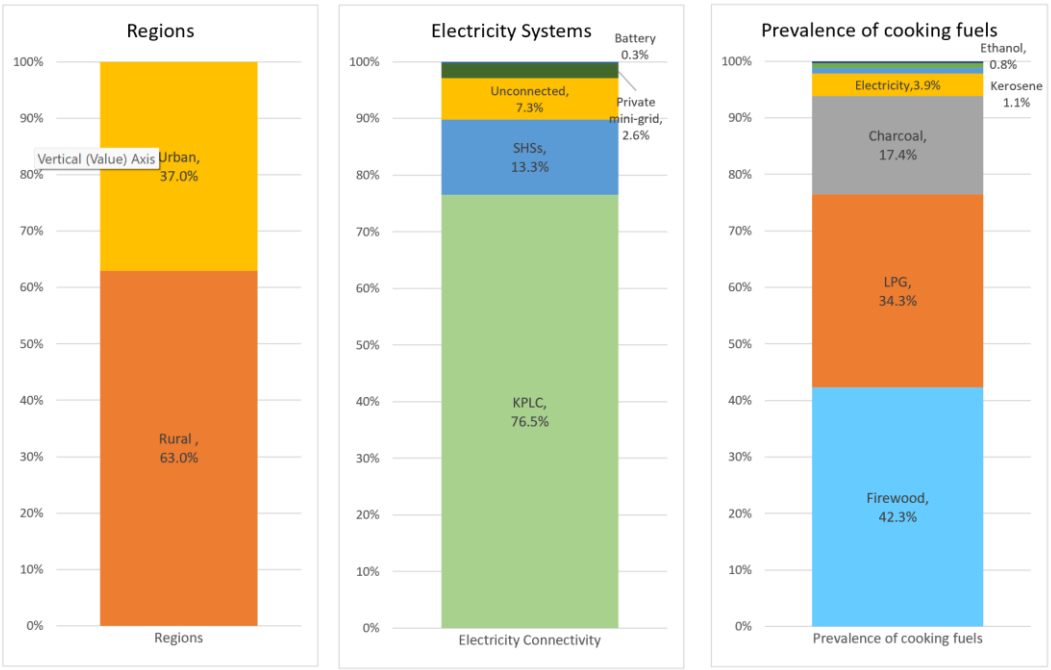

Figure 2.1 Market segment descriptive statistics

The analysis of household electricity using the Multi Framework for electricity access finds considerable potential for eCooking adoption as illustrated in Table 2.1. 68.9 percent of households on the main grid have electricity suitable for eCooking and interestingly, rural households fare better (70.9 percent) than their urban counterparts (66.6 percent). 68.36 percent of households connected to mini-grids have electricity that can support eCooking. At present, negligible 0.15 percent of households have SHS that can support eCooking, since the capacity of most SHS lies within Tier 2 or below. Most of the households on SHSs will thus need to upgrade to higher capacity tiers prior to transitioning to eCooking.

Table 2.1 Household access tiers across the grid, mini grids and SHSs and eCooking capacity

Household access (percent)		Tier 0	Tier 1	Tier 2	Tier 3	Tier 4	Tier 5	eCooking Capacity
The grid	National	0.5	2.3	28.3	27.9	22.2	18.8	68.9
	Urban	0.1	2.1	31.2	25.6	21.5	19.5	66.6
	Rural	0.8	2.4	26.0	29.9	22.7	18.2	70.9
Mini grids	Rural	1.7	8.4	21.6	15.0	11.0	42.4	68.4
SHSs	Rural	34.5	58.1	7.2	0.13	0.02	0.00	0.15

eCooking Appliances Ownership

In Kenya, a variety of eCooking appliances are gaining traction due to the country's drive for cleaner and more efficient energy. These appliances include Electric Pressure Cookers (EPCs), Induction Cookers, Rice Cookers, Air Fryers, Mixed LPG-Electric Standalone Cookers, Microwave Ovens, Electric Solid Plate or Coil Hobs, and Electric Kettles and Immersion Coil Water Heaters. Each appliance offers distinct advantages and challenges for Kenyan cooking styles and energy efficiency.

Ownership patterns from the KNeCS baseline survey data reveal that 25.2 percent of Kenyan households own at least one eCooking appliance. Of these, 3.5 percent can be considered complete cooking solutions, i.e. electric pressure cookers, induction cookers, rice cookers and electric hobs, while 21.5 percent are task specific, e.g. electric kettles, water heaters and microwave ovens. Figure 2.2 provides a breakdown of appliance ownership. The survey showed that households revert to Firewood, LPG, Charcoal, Ethanol, and Kerosene to meet their complete cooking needs. However, when considering eCooking alone, households shift to energy-inefficient appliances when they broaden their usage beyond task-specific activities, as shown by Controlled Cooking Tests (CCTs)(Banda et al., 2024) and eCooking diagrams in informal settlements (Nayema et al., 2023).

Rural households surprisingly reported higher ownership of eCooking appliances. Gender and wealth also play a significant role in eCooking, with male-headed households being more likely to own eCooking appliances, and ownership skewed towards higher wealth quintiles, with some exceptions like the high prevalence of inefficient electric coil stoves among lower-income households. Households connected to the main grid own more eCooking appliances.

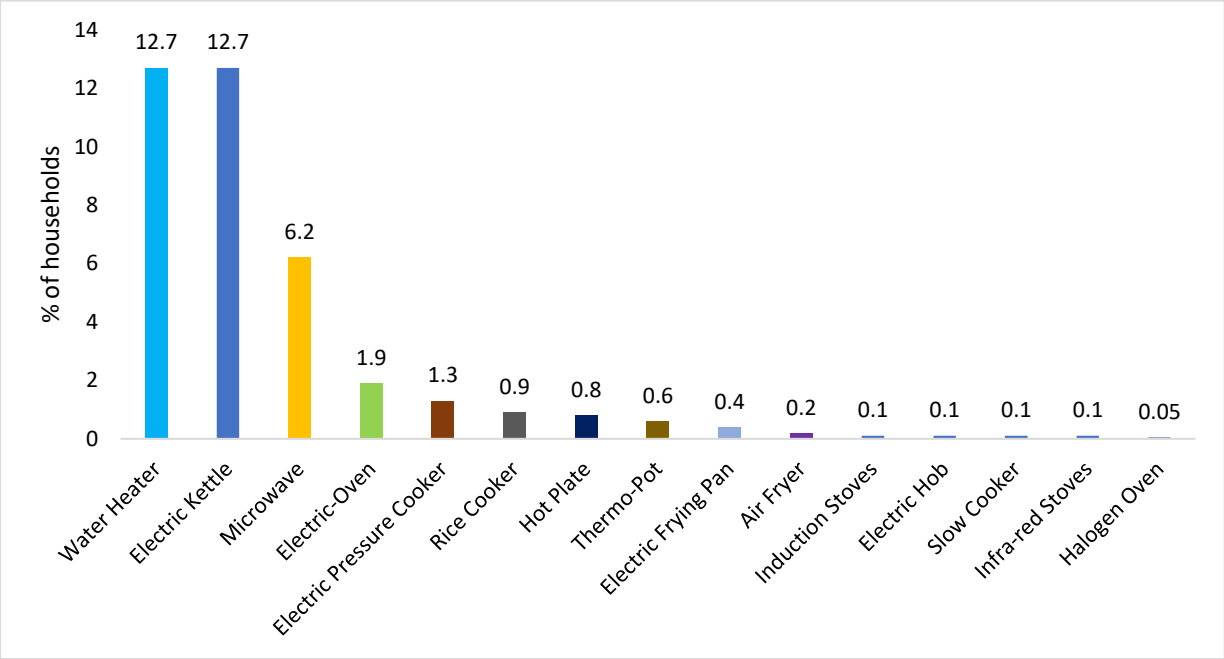

Figure 2.2 eCooking appliances ownership

Appliance Usage and Cooking Practices

The KNeCS baseline survey provides a more nuanced understanding of eCooking prevalence in Kenya by incorporating comprehensive definitions and accounting for stacking practices in households. This study found that 0.58 percent of households use eCooking appliances for conventional cooking**.** However, 3.88 percent of Kenyan households use eCooking appliances as their primary solution for conventional cooking, reheating meals and boiling water for cooking (see Figure 2.3). Thus, strong appliance ownership does not necessarily translate into strong use. The findings also imply that eCooking plays an important role in task-specific cooking activities.

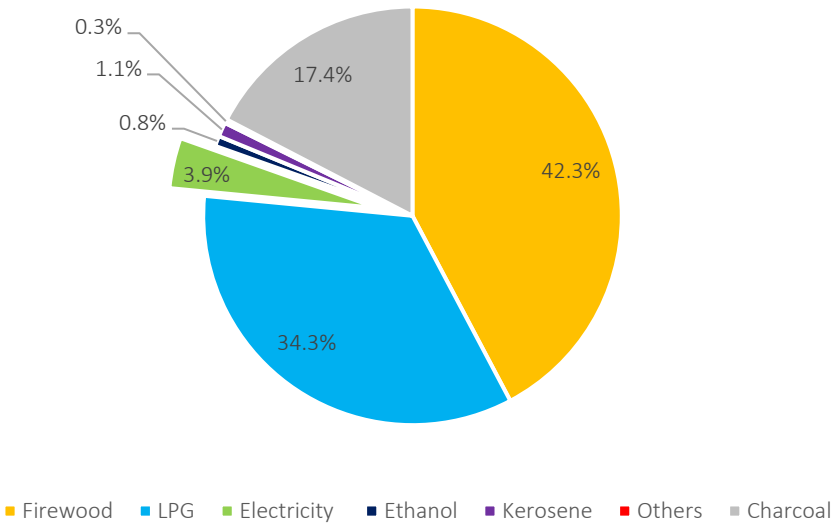

Figure 2.3 Primary cooking solutions used in Kenya

Despite the increase in appliance ownership, the data shows that owning an appliance does not necessarily mean it is used. This implies the need for educational initiatives alongside financial incentives like subsidies to encourage the adoption and effective utilization of eCooking appliances.

The study also analysed appliance usage, cooking practices, and typical cuisines in Kenyan households. Most households use electric appliances mainly for boiling water (63.2 percent) and reheating food (12.7 percent) as shown in Figure 2.4. The study further explores typical meals in Kenyan households, finding that supper is the most frequently prepared meal, and fewer households prepare lunch regularly compared to breakfast and supper. Breakfast primarily consists of hot beverages and porridge, with the former being consumed by nearly twice as many households as the latter. Lunch and supper have similar constituent dishes. Generally, Kenyan household menus are narrow and include rice, ugali, vegetables, cereals, meat stews, and roots. Further, common meals vary by wealth and gender, with upper-class households showing a greater variety in dishes. Taste preferences are deeply influenced by a matrix of cultural, economic, and social factors.

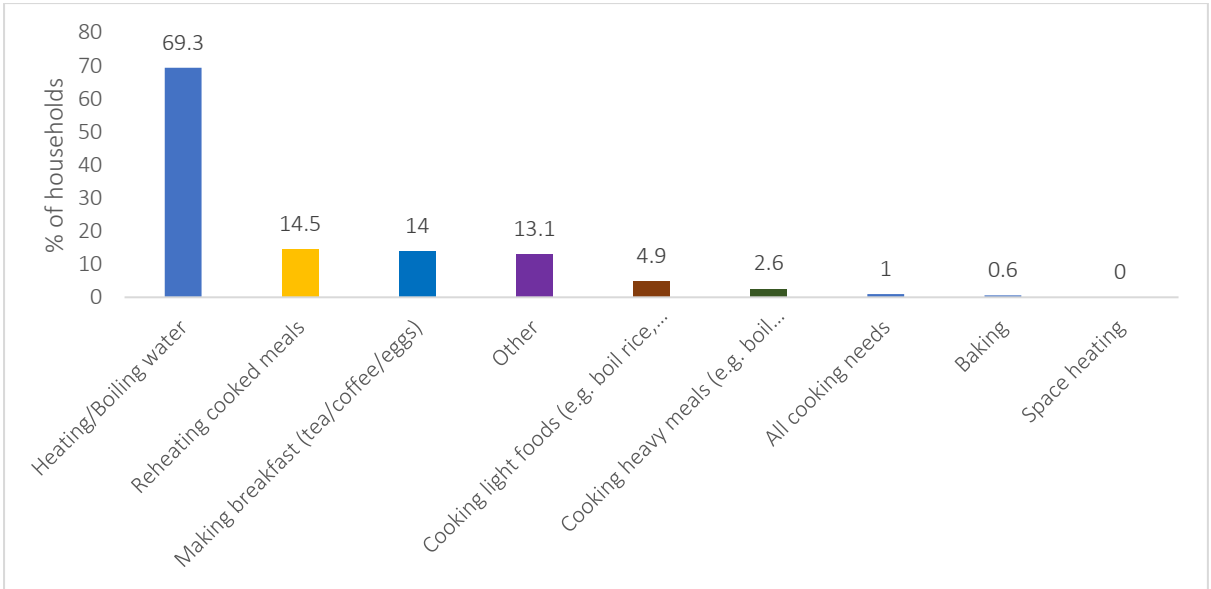

Figure 2.4 How the most popular appliances are used in households

Cooking techniques vary across dishes, with boiling and frying being dominant. Baking is least popular and mainly used for preparing snacks. Overall, modern eCooking appliances like Electric Pressure Cookers, induction cookers, rice cookers, air fryers and electric kettles are largely compatible with Kenyan cooking techniques and dishes, as shown in Table 2.2.

Table 2.2 Cooking techniques for typical cuisines in Kenyan households and compatible appliances

TYPICAL DISHES	COOKING TECHNIQUES	COMPATIBLE eCooking APPLIANCES
PORRIDGE	Boiling	EPC, Induction Cooker, Electric Kettle *(to pre-boil water)*
HOT BEVERAGES	Boiling	Electric Kettle *(to pre-boil water),* Induction Cookers, Electric solid plate/coil hob
SNACKS	Deep Frying, Shallow frying, Baking	Air Fryer, Microwave Ovens, Electric oven
CAKES AND BREADS	Baking, Frying, Roasting	Electric oven, Microwave Oven
EGGS	Boiling, Shallow Frying	Induction Cookers, Electric solid plate/coil hob
SAUSAGES/BACON	Shallow Frying, Deep frying	Air Fryer, Induction Cookers, Electric solid plate/coil hob, Electric oven
CHAPATI	Shallow Frying, Baking, Roasting	Induction Cookers, Electric solid plate/coil hob, Electric Oven
ROOTS	Boiling, simmering, shallow frying, deep frying, Steaming, Stir frying	EPC, Rice Cooker, Electric Kettle *(to pre-boil water)*
RICE	Boiling, simmering, Sautéing/stir frying	Rice Cooker, EPC, Induction Cookers, Electric solid plate/coil hob, Electric kettle *(to pre-boil water)*
CEREALS	Boiling, Sautéing/stir frying	EPC, Rice Cooker
UGALI	Boiling, Simmering	Electric Kettle *(to pre-boil water),* EPC, Induction Cookers, Electric solid plate/coil hob
VEGETABLES	Stir Frying, Boiling, Simmering, Steaming	Induction Cookers, Electric solid plate/coil hob, EPC
MEAT STEW	Sautéing/stir frying, Boiling, Simmering, Deep frying, Roasting	EPC, Induction Cookers, Electric solid plate/coil hob
SOUPS	Boiling, Sautéing/stir frying, Deep frying, Simmering	EPC, Rice Cooker, Electric Kettles *(to pre-boil water)*
DEEP FRIED MEAT	Deep Frying, Boiling, Sautéing/stir frying, Roasting	Air Fryer, Electric oven
ROAST MEAT	Sautéing/stir frying, Roasting, Boiling, Deep frying, Baking	Air Fryer, Electric oven, EPC
SHALLOW FRIED MEAT	Shallow Frying, Boiling, Roasting	Induction Cookers, Electric solid plate/coil hob, Electric oven

Off-grid eCooking

Solar-based electricity systems are the dominant primary off-grid electricity systems in rural Kenya. Kenya has the highest PV-eCook viability score globally, particularly when assessed in the context of commercialized polluting fuels. Battery-supported direct current (DC) devices that can enable cooking on weak grids, mini-grids, and stand-alone systems are emerging in the sector (ESMAP, 2020). Further, Kenyan mini-grids are now adapting their business models to ensure sustainability by venturing into the eCooking subsector (Batchelor et al., 2018). Consequently, off-grid eCooking presents an additional avenue to support Kenya's transition to clean cooking.

To accelerate off-grid eCooking, efforts should focus on upgrading households to higher-capacity solutions, incentivizing R&D and local manufacturing of affordable higher-capacity options, leveraging mobile money such as 'such as pay-as-you-solar' for cost alleviation, and expanding last-mile distribution through existing networks of SHS entrepreneurs.

Willingness to Pay for eCooking Appliances.

Households are asked to price a hypothetical eCooking appliance that can be used to prepare all the foods they currently cook. Households expressed a willingness to pay between KES. 3,000 and KES. 15,500 for that appliance as illustrated in Figure 2.5. This range gives an indication of how to best price an eCooking appliance in Kenya.

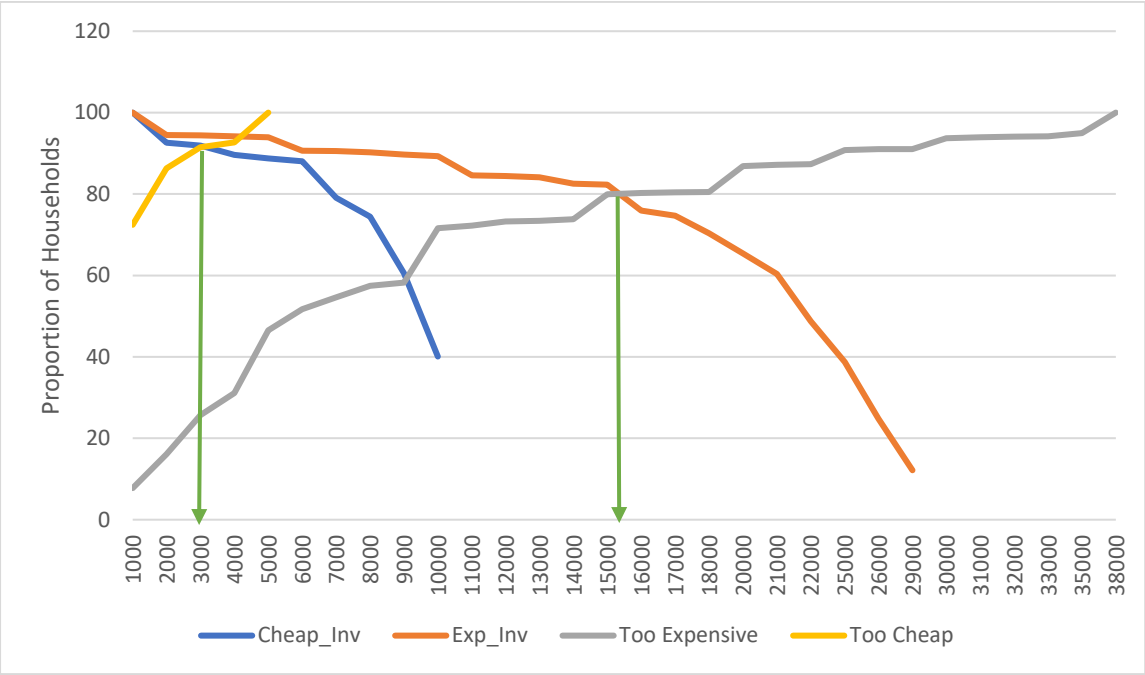

Figure 2.5 Households' willingness to pay for an eCooking appliance price range

The study further found that the decision to purchase eCooking appliances is influenced by a variety of factors including recommendations from friends and family, affordability, and cooking speed. Urban and rural households, as well as male and female-headed households, prioritize different factors when choosing to purchase these appliances. Rural households seemed to rely more on recommendations from trusted parties such as friends and SACCOs. Urban households were more inclined to purchase an eCooking appliance due to their affordability, availability, less electricity consumption, access to appliance financing options and versatility in food preparation compared to households in rural areas. Rural households were mainly influenced by the convenience of the appliance(s), lower pollution, aesthetic appeal, faster cooking times and lower electricity consumption compared to urban households.

Knowledge, Attitudes, and Beliefs about eCooking

Social cultural beliefs significantly shape the adoption of modern cooking appliances. Many view using these appliances as foreign and believe that food cooked traditionally tastes better. 74.6 percent of households believe there is a difference in taste between food cooked on electric appliances and those prepared using traditional methods. The major perceived differences between electric and traditional cooking are due to speed (77.9 percent), taste (66.3 percent), and cost (24.5 percent). Focus group participants deemed foods like chapati, pilau and ugali to be better tasting when cooked traditionally. The findings emphasize the importance of knowledge

and cultural beliefs in the adoption of new technologies, and the role of behaviour change campaigns and consumer education on the benefits of eCooking.

Profiling household cooking – A Multi-Tier Approach

A Multi-Tier Framework (MTF) analysis uncovers complex trends in cooking practices across urban and rural areas and among various wealth quintiles. While traditional cooking solutions (TCS) are notably more prevalent in rural areas (87percent), urban regions are more open to improved cooking solutions (ICS) and modern energy cooking services (MECS), with 42percent and 9percent adoption rates respectively (see Figure 2.7). Interestingly, poorer households tend to use ICS more frequently, whereas middle to wealthy households not only rely more on TCS but also have higher adoption rates for MECS. The MTF data also reveal that over 70percent of households with grid connections capable of supporting eCooking are currently using TCS or ICS, suggesting a ripe market for promoting eCooking adoption with minimal intervention costs.

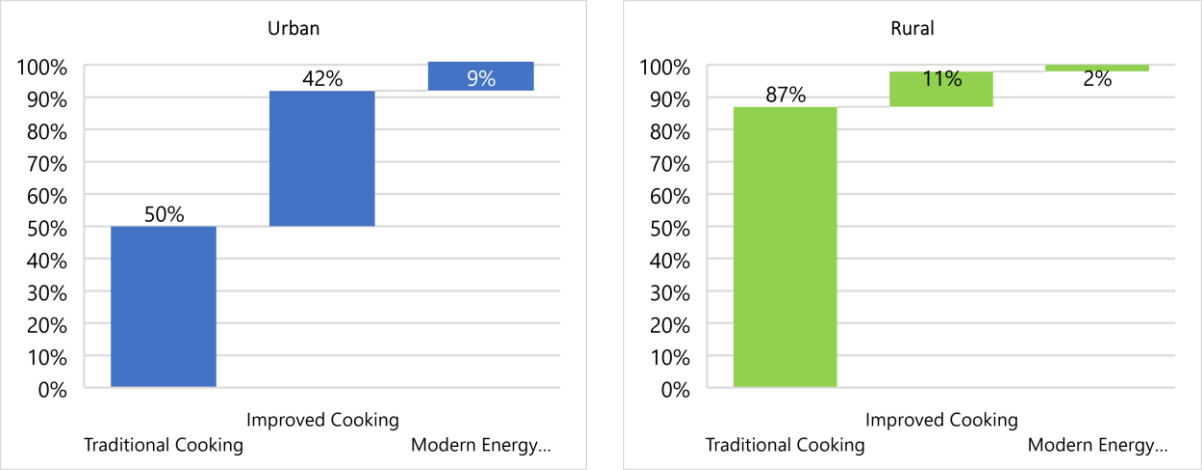

Figure 2.6 Household adoption of cooking services: a rural/urban comparison

Stacking of cookstoves

Stacking refers to the use of multiple fuels and technologies in a household to meet their energy needs. A typical household "stack" includes at least a three-stone open fire, an LPG stove, and an improved charcoal stove. Around two-thirds of households use more than one type of stove, a practice common in both urban and rural areas (see Table 2.3). Further, wealthier households are more likely to own multiple stoves, with the wealthiest quintile showing the highest ownership of three stoves. Notably, as households transition from using a single stove to multiple stoves, LPG stoves become increasingly significant. Among households with three stoves, the LPG stove is the most commonly owned.

Table 2.3 Household stacking of cookstoves across regions and wealth

Categories		**Zero Cookstoves (percent)**	**One Cookstove (percent)**	**Two Cookstoves (percent)**	**Three Cookstoves (percent)**
Region	National	0.07	36.6	42.6	20.7
	Urban	0.2	36.1	42.5	21.3
	Rural	0.0	36.9	42.7	20.3
Wealth Quintiles	Poor Quintile	0.0	53.2	33.3	13.5
	Lower Middle Quintile	0.0	52.1	33.6	14.3
	Middle Quintile	0.0	36.1	47.3	16.6

	Upper Middle-Class Quintile	0.4	28.2	52.4	19.1
	Wealthy	0.0	16.5	45.9	37.6

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BEYOND HOUSEHOLDS: Focus on institutions and food businesses

Institutional access to eCooking

Transitioning to eCooking in institutions in Kenya holds significant potential for contributing to the efforts to reduce greenhouse gas emissions as outlined in the Nationally Determined Contributions (NDCs), which targets a 32 percent reduction by 2030 compared to business-as-usual scenarios. An assessments of cooking energy access in social institutions like schools, health facilities, and correctional facilities reveal a heavy reliance on firewood and charcoal-based cooking solutions (Ipaid Africa, 2024). The predominant cooking solutions include the three-stone open fire, *Kartech* Improved Cooking Stoves (ICS), traditional metallic cookstoves without chimneys, brick rocket stoves, and Liquefied Petroleum Gas (LPG), with LPG being more prevalent in health institutions.

Examining the types of foods typically prepared in these institutions, such as beverages and staple foods like Githeri, Rice, Ugali, and Chapati, reveals that they are well-suited for eCooking. A recent study on the energy consumption, costs, and efficiency of electric cooking in institutional settings has shown that not only can these foods be prepared using electric cooking appliances, but they can also be done at a lower cost and in less time compared to traditional cooking solutions (IESR, 2023). Furthermore, most social institutions already have access to electricity, which provides a solid foundation for transitioning to eCooking. However, this transition must address several challenges identified in institutional studies. First, it is essential to ensure availability of eCooking appliances that match the typical capacities of institutions, which range from 100 to 300 litres. Additionally, addressing the cost barrier through financing options tailored for institutions is crucial. Finally, concerns about intermittent power outages can be mitigated by combining electric cooking solutions with alternative sources like LPG, ensuring uninterrupted cooking experience. By addressing these challenges, transitioning to electric cooking in institutions presents a viable pathway towards achieving Kenya's emissions reduction targets while improving cooking efficiency and reducing costs in social institutions.

Business and food industry access to eCooking

The structure of the food industry, coupled with the emerging evidence on the potential for eCooking in the food vending business in Kenya, paints a promising picture for the adoption of eCooking. Specifically, the food industry has formal and informal segments, with micro and small enterprises accounting for over 80 percent of both segments (KNBS, 2017, 2020). Women entrepreneurs play a pivotal role in the informal segment, constituting 67.4 percent of ownership (KNBS, 2020). Emerging evidence from cooking diaries in urban informal settlements and displacement settings show that foods prepared by food businesses are compatible with eCooking appliances, and that significant cost savings on fuel expenses would accrue to the businesses (Groen et al, 2023; Nayema et al, 2023). Further, although there is limited evidence on the eCooking transition among large food enterprises in Kenya, insights from comparable contexts, such as Nepal, suggest that larger businesses like hotels and restaurants may find transitioning relatively easier due to existing familiarity with eCooking technologies.

Despite these promising prospects, several barriers must be addressed to facilitate widespread adoption of eCooking: affordability and availability of higher-volume eCooking solutions, simultaneous preparation of multiple dishes, and access to financing.

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The supply chain for eCooking appliances

eCooking appliances are imported from various countries. Key source countries include China, India, Vietnam and Taiwan in Asia, France, The Netherlands, Germany, Turkey, Czech Republic, United Kingdom and Italy in Europe, United Arab Emirates and the United States. The supply chain for electric appliance imports is complex and involves multiple stages, from raw material extraction to the end consumer as illustrated in Figure 2.8. Lead times for importing eCooking appliances can range from a few weeks to several months, depending on factors such as the source country, shipping method, and customs clearance. Retailers highlights some challenges in the international supply chain for eCooking appliances, among them, high upfront costs, fluctuating prices, rapidly changing appliance models, the risk of importing poor quality appliances, and the lack of customization for local cuisines and languages.

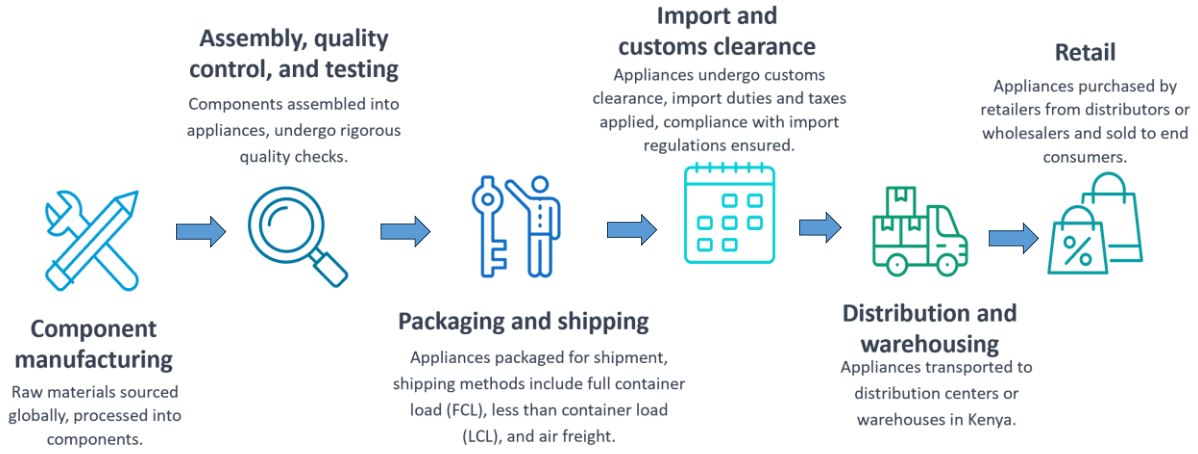


Figure 2.7. Stages in the supply chain for imported eCooking appliances

Manufacturing of eCooking appliances in Kenya is still nascent, but recent developments have shown that there is potential to further develop local manufacturing. Key among them are BURN Manufacturing's ECOA product line, informal sector manufacturing of electric coils, and solar PV eCooking system assembly capabilities. However, to fully realize this potential, targeted investments in infrastructure, human capital, policy framework, and logistics will be necessary.

With regard to delivery models for eCooking, retailers and distributors have adapted their business models to cater to the emerging market segments. They offer a variety of eCooking appliances through physical retail outlets, authorized dealers and distributors, online shops, door-to-door sales, agency models, and revolving funds (Chamas). Brick-and-mortar outlets remain the most popular point of purchase, with 42.1 percent of households purchased eCooking appliances from supermarkets, followed by wholesale/retail shops (18.5 percent), and small retail stores and specialist shops (9.3 percent), as shown in Figure 2.9.

Marketing efforts have evolved to include both traditional advertising methods such as radio, TV, print media, and innovative approaches such as social media campaigns, influencer marketing, and reality TV shows such as *Shamba ShapeUp* which reaches upwards of 11 million people across Kenya. Of the 92 percent of the population that knew about e-cooking in the household survey, traditional media is still king in marketing of appliances (31.2 percent), followed by social media (24.8 percent), given the high level of internet connectivity and smartphone access in Kenya. These strategies are achieving some success in increased awareness and demand for eCooking appliances. Regional eCooking hubs in Kakamega, Kisumu, Kitui, Makueni, and Nakuru, established through collaborative efforts between various stakeholders such as faith-based institutions, can further support retailers by promoting the eCooking agenda locally and fostering the development of context-relevant business models, financing mechanisms, and favourable

local policies. In this regard, Kenya Power has demo centres in Kisumu, Nakuru and Mombasa, and has developed of a mobile demonstration kitchen to showcase the benefits and practicality of eCooking (Wanjohi, 2023).

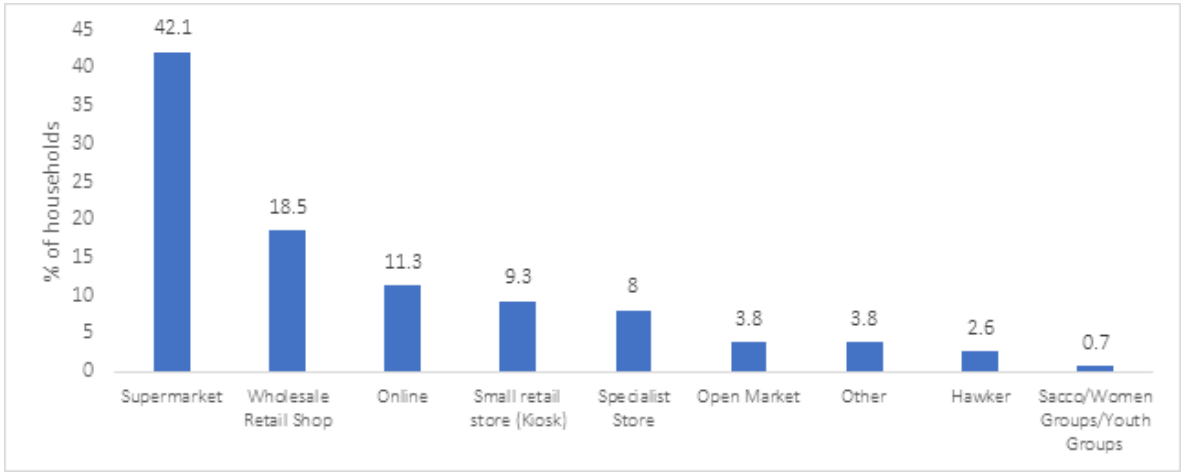


Figure 2.8 Point of purchase for most recent eCooking appliances by households

After sales service

The after-sales service landscape for eCooking appliances in Kenya is multifaceted, with authorized service centres, independent repair shops, and appliance retailers providing various services. The growing demand for these services in rural areas highlights the importance of expanding access and raising awareness about warranties. Figure 2.10 shows that majority of households seek appliance repair services from a local technician, trained or untrained. Continuous skill development and training for technicians are essential to keep pace with technological advancements and customer needs.

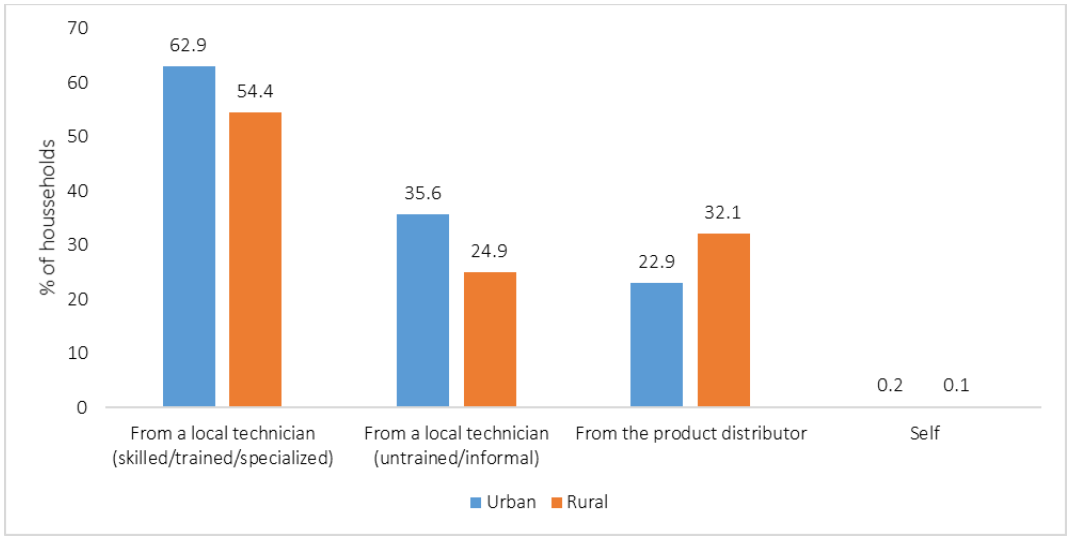


Figure 2.9 Source of support for eCooking appliance repair (urban/rural)

Financing eCooking

Financing eCooking comprises two key related components: demand-side or consumer financing, and supply-side financing.

Relative cost of eCooking: Cost considerations, both upfront and operational, are highlighted in two of the three binding constraints identified by the Kenya National Cooking Transition Strategy, confirmed in eCooking studies of households and food businesses. Thus, transitioning to eCooking appliances such as EPCs and induction cookers could result in significant savings in fuel expenditures due to their energy efficiency, as shown by Controlled Cooking Tests (CCTs) (Banda et al., 2024; EED Advisory, 2023). Further, energy efficiency has an inverse relation to upfront costs (Nayema et al., 2023). Consequently, the evidence on energy efficiency-cost nexus suggests that innovative financing solutions and awareness creation, particularly regarding long-term operational cost savings, could influence the transition to eCooking.

The Kenyan eCooking appliance market is diverse and highly competitive, with a variety of products catering to different income levels and preferences. Consumers have numerous options to choose from, with brands ranging from expensive (>100k KES) to more affordable (<5k KES) alternatives (see Table 2.4). As the market continues to evolve, it is expected that more innovative and cost-effective solutions will emerge, further promoting the adoption of eCooking appliances.

Table 2.4 Typical retail prices for selected eCooking appliances in Kenya.

Cooking Appliance	**Approximate Min Price**		**Approximate Max Price**	
	KES	***USD***	***KES***	***USD***
Mixed LPG/electric standalone cooker	22,995	177	204,995	1577
Microwave	6,499	50	222,600	1712
Air fryer	5,999	46	42,219	325
EPC	5,663	44	25,995	200
Induction/infrared cooker	4,469	34	162,300	1248
Rice Cooker	2,999	23	19,500	150
Electric Hotplate	945	7	11,850	91
Electric Kettle	759	6	7,995	62

In early 2023, after public consultation on the electricity tariff review, EPRA introduced an intermediate tariff band (Domestic Ordinary 1) to balance the costs. However, this intermediate tariff was still higher than the 2022 tariffs. We analysed multiple studies that explored the relative costs of cooking with electricity versus other fuels like LPG, charcoal, and kerosene as illustrated in Figure 2.11. These studies used different methodologies and came up with varied energy consumption figures, ranging from 19.2 to 85 kWh/month for different appliances and cooking habits, thus their findings are indicative. On applying the intermediate tariff, eCooking was found to be cost-effective before new tariffs were introduced. However, the revised tariffs made eCooking more expensive than some other options like LPG and firewood, as per several other studies as illustrated in Figure 2.11.

For eCooking to be a competitive option, a tariff reduction in line with pre-review levels is necessary, particularly to make it cost-effective compared to LPG.

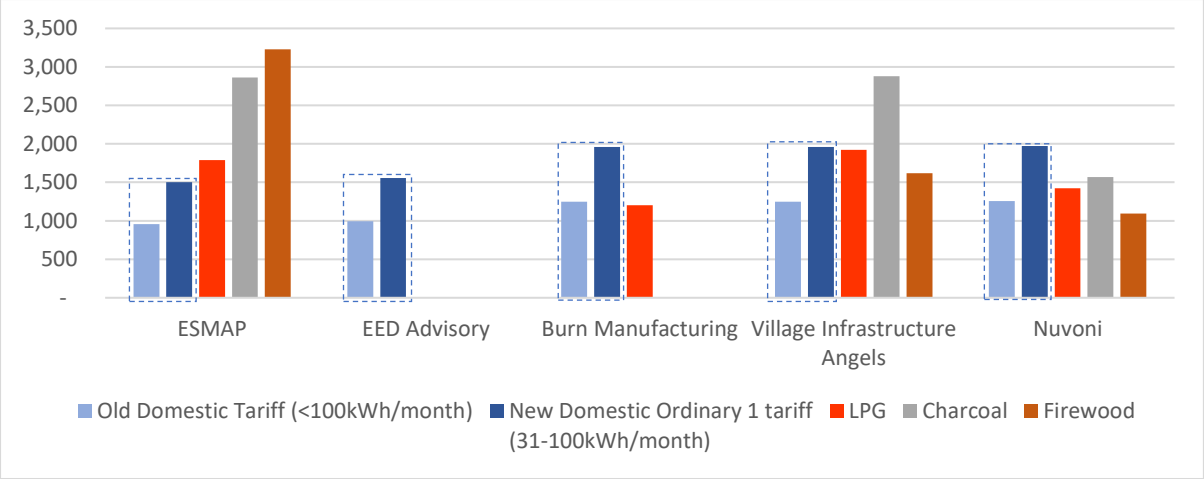


Figure 2.10 The cost of eCooking relative to other fuels across various studies

Consumer financing: To address the affordability constraints related to the upfront costs of eCooking appliances and costs of appliance ownership, innovative consumer financing models are being introduced into the market. Models include cash and carry, asset financing loans, PayGo, layaway savings, chamas and microfinance, summarized in Table 2.5. 96.1 percent of appliance owners in the survey report that they paid full upfront cash when purchasing their electric appliances. 5.8 percent of the households indicate to have secured the loan to purchase a big household item. Many asset financing loans came from Chama/ROSCA at 32 percent. Whilst still in its infancy in Kenya, utility-enabled financing offers new opportunities for consumer financing of clean cooking devices, as energy service companies are uniquely placed to facilitate the sale of eCooking appliances to their customers. Mini-grid developers such as PowerHive and the national utility, Kenya Power, are already offering financed appliances to their customers under ongoing pilot projects, with the potential to scale going forward.

Table 2.5 Consumer financing models for eCooking appliances in Kenya

Consumer financing mechanism	Description
Cash and Carry Model:	Upfront cash payments are the most common method for purchasing electric appliances. Many households save up or use existing cash reserves to make one-time payments. Preferred payment method across income levels.
Asset Financing Loans	Kenya's microfinance sector offers formal and informal institutions for loans. Savings and Credit Cooperatives (SACCOs) provide savings and borrowing options. There is limited adoption of loans for household electric appliances. Rural households more reliant on microfinance institutions and commercial banks.
PayGo Models	Pay-as-you-go models allow consumers to pay for appliances in instalments. Initial deposit is followed by regular payments until full cost is covered. Mobile money payments, like M-Pesa, support these models. Entities like Powerhive, BURN Manufacturing, and Bidhaa Sasa have successfully used these models to extend access to eCooking appliances.
Layaway Savings	Customers make a deposit and regular instalments over a fixed period. Once full payment is made, the customer owns the appliance. Offered by supermarkets like Naivas and Carrefour. Etc. Limited adoption, preferred by middle-class households.
Chamas/ROSCA (Self-Help Groups)	Social networks like chamas and merry-go-rounds facilitate appliance ownership. Group liability eliminates the need for individual credit checks.

	Members finance each other and support acquiring appliances. Dominant source of borrowing for both rural and urban households.
Gifts	Some households receive electric appliances as gifts from friends and family. Particularly common among poor households. Financing structures and business models can be tailored to address financial constraints of these households.

Many of these consumer financing mechanisms leverage Kenya's advanced mobile money payments infrastructure. There is great potential in models such as Pay-As-You-Go (PAYGO), Pay-As-You-Cook (PAYC), and Carbon Cashbacks in driving the adoption of eCooking appliances by making them more affordable. PAYGO and PAYC models offer flexible payment terms and address affordability, reducing default risks through remote appliance control (Kumaraswamy et al, 2020). Carbon cashbacks, which can also leverage Kenya's mobile money system, directly incentivize eCooking use by offering micro-payments linked to cooking activity as shown in pilot projects in Bangladesh and Cambodia (ATEC and MECS, 2023), making eCooking more cost-effective and appealing. Additionally, carbon cashbacks can serve as a cross-subsidy on electricity costs, rendering eCooking cost-competitive. These benefits are particularly empowering for women who are often responsible for cooking, and thus, would stimulate eCooking adoption.

Kenya's microfinance sector stands as one of the most developed globally, serving over six million customers (AMFI-K, 2021). Leveraging microfinance could address the financial barriers associated with the upfront appliance costs by spreading the cost over time. Furthermore, households could use savings on fuel expenditures upon by switching to eCooking to repay microfinance loans, reducing the risk of defaults. This presents a compelling business case for microfinance institutions to finance eCooking appliances[2]. However, according to the Central Bank (2023), the financial stability of the microfinance sector has come into question in recent times, as microfinance banks remain weak, thinly capitalised, and loss making. Therefore, eCooking interventions leveraging this sector should explore more viable microfinance-based business models. There is a stronger business case for microfinance institutions to finance food businesses. This is supported by the potential for savings in fuel expenditure, the willingness of businesses to make instalment payments, and microfinance institutions' preference for financing productive use ventures (Groen et al, 2023; Nayema et al, 2023). Overall, the clean cooking sector should explore further opportunities to leverage the microfinance sector to support both households and food businesses transition to eCooking.

Supply side financing helps to address the financial and operational challenges faced by businesses in the sector. Mechanisms that have been tested in the Kenyan eCooking sector include equity investments, grants, subsidy programmes using results-based financing mechanisms, and carbon credits, as seen in Table 2.6. Carbon financing is already a strong driver for the clean cooking sector in Kenya. The increasing adoption of smart meters and PayGo business models in eCooking offers considerable potential to simplify the process of securing carbon finance for the sector. This is further supported by the Gold Standard's recent endorsement of a new methodology that makes verifying carbon finance data more efficient by utilizing smart meter data (MECS & ClimateCare, 2022).

Utility enabled financing offers the potential to rapidly scale access to energy-efficient appliances amongst utility customers. Kenya Power is proactively promoting eCooking, with plans to convert 500,000 of their over nine million customers to eCooking. To facilitate this transition, Kenya Power is drawing upon its expertise from initiatives such as the Stima Loan and Last Mile Connectivity projects (LMCP) (Kimiti & Kibe, 2023). Recognizing the financial barrier posed by upfront costs, Kenya Power piloted a loan product inspired by its Stima Loan model but enhanced

[2]

with PowerPay's IoT technology. This innovation enables precise monitoring and management of electricity usage specifically for cooking purposes (Mburu et al., 2023). The loan product operates on a PAYGO financing model and targets both the eCooking and eMobility sectors. Utility-led financing could also address some of the supply-side financing challenges by drawing upon the much more substantial investment going into the electricity access sector through programmes such as LMCP.

Table 2.6 Supplier financing models for eCooking appliances in Kenya

Supply-side financing models	Description
Grants	• These are funding mechanisms provided by development partners for research, development, and market expansion. • Grants support pilot projects and risky ventures with potential for significant impact. • Grants are disbursed through competitive processes or partnerships with local organizations. • Examples include MECS, EnDev, and Efficiency for Access Coalition.
Equity and Impact Investments:	• These are investments made by private investors, venture capitalists, and development finance institutions. • They provide patient capital for scaling operations and expanding reach. • Active investors in clean cooking enterprises include Acumen, Engie, Circle Gas, and FMO.
Results-Based Financing (RBF):	• RBFs link fund disbursement to predefined performance outcomes. • They lower market entry barriers and incentivizes clean cooking adoption. • Usage data from pay-as-you-go (PAYGO) or Pay-as-You-Cook (PAYC) models can inform impact metrics. • Examples include EnDev RBF, NEFCO, Kenya Higher Tier Cookstoves Market Acceleration project, and ABPP.
Smart-Meter-Enabled Carbon Financing	• Smart meters monitor energy consumption and calculates carbon emissions reductions. Carbon credits generated can then be used for various mitigation purposes such as to meet the NDCs and/or sold to offset third party carbon emissions. • KOKO Networks and BURN Manufacturing have implemented this model. • There is untapped potential for accessing global carbon finance and promoting energy-efficient appliances.
Utility-Led Financing	• This mechanism allows consumers to spread appliance costs over time through monthly instalments. • Options include on-bill financing, on-bill repayment, and co-marketing/data-sharing. • It may involve partnership between utility companies and third-party financiers. • Viability in Kenya needs stakeholder engagement and potential donor support.

Fostering Clean Cooking through Non-Market Approaches and Carbon Market Innovations

Kenya plans to adopt policies under Article 6.8 and 6.9 of the Paris Agreement, focusing on non-market approaches for cost-effective mitigation without market-based mechanisms. These policies include economic and fiscal instruments like carbon taxes, minimum feed-in tariffs for renewable energy, building and emissions regulations, voluntary agreements, and public awareness programs. The draft Green Fiscal Policy proposes carbon taxes, loan concessions, and subsidies, especially benefiting the clean cooking sector. Further, the Medium Term Revenue strategy contemplates a carbon tax on fossil fuels to implement the polluter pays principle, potentially enabling carbon trading for net emitters. Additionally, environmental excise taxes will

target emissions from fossil fuel usage, with proposals for increased taxes on fossil-fuelled vehicles and equipment, and a graduated motor vehicle circulation tax.

Kenya seeks to pursue various policies under Article 6.8 and 6.9 of the Paris agreement, which define non-market approaches for cost-effective mitigation without relying on market-based mechanisms, such as transferable or tradable units. These proposed policies, which align with the United Nations Framework Convention on Climate Change 2014 technical paper, include economic and fiscal instruments such as carbon taxes and minimum feed-in tariffs for renewable energy, building and emissions regulations, voluntary agreements between industry and government, and public awareness programs (UNFCCC, 2014). Consequently, the draft Green Fiscal Policy proposes carbon taxes, loan concessions, and subsidies, especially benefiting the clean cooking sector (Republic of Kenya, 2022). Further, the Medium-Term Revenue strategy contemplates a carbon tax on fossil fuels to implement the polluter pays principle, potentially enabling carbon trading for net emitters (Republic of Kenya, 2023). Additionally, environmental excise taxes will target emissions from fossil fuel usage, with proposals for increased taxes on fossil-fuelled vehicles and equipment, and a graduated motor vehicle circulation tax.

The introduction of the Climate Change (Amendment) Act, 2023, alongside Kenya's commitment to align with the Paris Agreement's Articles 6.8 and 6.9, marks a significant milestone for the electric cooking sector in the country. By providing a legal framework for leveraging market and non-market approaches to carbon trading and imposing environmental management requirements, these policies pave the way for innovative financing and sustainable development strategies in the clean cooking sector.

Appliance Standards and Testing

The ecosystem for efficiency and quality assessment for eCooking appliances in Kenya is still at its infancy. Kenya currently has a safety and performance standard for eCooking appliances, both adapted from international standard, with a larger focus on safety. There is still no national test method requirement for eCooking appliances in Kenya. Thus, tests are done voluntarily at Kijani Testing Lab, Strathmore University and University of Nairobi. There is a need for support and capacity building for eCooking testing in these facilities, including KIRDI which is currently focused on ICS testing.

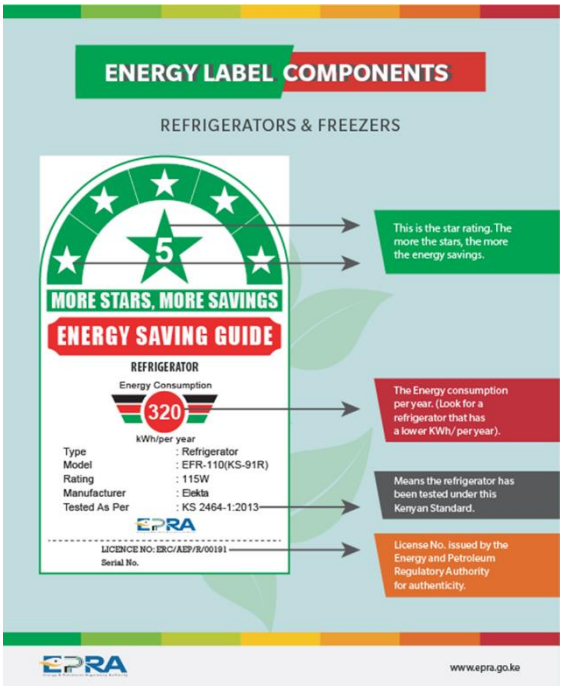


Figure 2.11 The Kenya Energy Label used on refrigerators. The more stars on the label, the more energy efficient an appliance is. Source: Energy Petroleum Regulatory Authority.

Only one kitchen appliance—refrigerators—has the Kenya Energy Label which is specific to Kenyan national standards issued by EPRA (See Figure 2.12). Other appliances may have labels from other jurisdictions, but there's no requirement for labels on these products. KEBS also has mandatory standardization marks for all manufactured products, whether local or imported, which are also applied to eCooking appliances.

The growth of the Kenyan ecosystem for eCooking appliances brings to the fore the urgent need for comprehensive standards, testing, and certification protocols. With a broad consumer base increasingly relying on these appliances, ensuring their quality, safety, and efficiency has become

paramount. This not only boosts consumer confidence but also paves the way for a more robust and standardized market, fostering local industry growth.

The policy environment

International policies, strategies and initiatives such as the Sustainable Development Goals (SDGs), Sustainable Energy for All (SE4All), the Paris Agreement and the Clean Cooking Alliance (CCA) and the World Bank's African Development Bank's (AfDB) New Deal on Energy for Africa play a critical role in driving electrification and clean cooking by providing financial, technical, and policy support. Kenya has a raft of legislation, policies, strategies and plans in the energy sector that support electrification, but need more explicit formulation for clean cooking, and eCooking by extension.

In conclusion, the eCooking sector in Kenya has significant potential to address not just cleaner cooking and electrification, but broader issues like public health, environmental conservation, and economic development. However, this potential can only be realized by tackling various challenges, including electricity access, socio-cultural factors, and economic constraints. A multi-faceted approach is needed that goes beyond just technology adoption and includes addressing cultural and socio-economic nuances, streamlining supply chains, introducing innovative financing models, and implementing robust standards and certifications. A supportive and adaptive policy environment is crucial for scaling eCooking and must align with broader objectives like public health and environmental conservation. Emphasizing the needs and roles of women in this transition is also vital. The key takeaway is the need for proactivity; setting clear, ambitious targets and revisiting policies and strategies as the market evolves will be crucial for the success of eCooking initiatives electric in Kenya, with broader implications for the country's sustainable development goals.

2.3 eCooking sector SWOT analysis

The eCooking sector in Kenya offers substantial opportunities to impact the nation's energy, health, and environmental landscapes. However, it also faces unique challenges that need to be navigated carefully. Below is a SWOT analysis – examining the sector's Strengths, Weaknesses, Opportunities, and Threats – that provides a comprehensive overview of the current state of eCooking in Kenya.

Table 2.7 eCooking sector SWOT analysis

	STRENGTHS	WEAKNESSES	OPPORTUNITIES	THREATS
Electrification	▪ There is significant potential for eCooking adoption, with 68.9% of grid-connected households having Tier 3+ electricity access. ▪ A diverse range of eCooking appliances is available in the market, catering to various cooking styles and energy efficiency needs.	▪ Inadequate grid capacity in some regions could hinder the adoption of eCooking solutions. ▪ There is limited access to higher-tier off-grid solutions for rural households. ▪ High electricity tariffs make eCooking less affordable particularly for poor and low-income households. ▪ Informal electricity connections undermine the reliability and safety of the electricity supply, particularly in informal settlements. ▪ Lack of electricity safety awareness can hinder the safe adoption of eCooking.	▪ Government plans for grid intensification, densification, and expansion will enable more households to access and adopt eCooking. ▪ Integrating eCooking into broader electrification programs, like the Last Mile Connectivity Programme could lower barriers to eCooking access. ▪ To manage increased electricity demand from eCooking, households could adopt Time-of-Use Tariffs that encourage cooking during off-peak hours. ▪ Expanding access to off-grid solutions (solar eCooking, battery-supported eCooking) can open up new markets for eCooking. ▪ Residential smart energy meters and integrated meters in appliances can lead to more tailored electricity tariffs and efficient usage tracking.	▪ Grid instability from widespread eCooking Adoption, especially during peak hours, can challenge electricity supply system. ▪ Continuing informality in electricity connections poses risks to the stability and safety of power supply for eCooking. ▪ High energy costs could deter potential users from switching to or continuing to use eCooking appliances. ▪ If new eCooking energy demand is met through non-renewable sources, the environmental benefits of eCooking could be undermined.
Cooking practices and appliance use	▪ There is already a pronounced ownership of electric cooking appliances, indicating a foundation for further expansion.	▪ There is low usage of eCooking appliances despite high ownership rates.	▪ There is potential to integrate eCooking into existing cooking practices, tapping into the market for	▪ Despite efforts, the cost of appliances may still be prohibitive for many households.

	▪ Mass eCooking adoption offers significant potential for revenue growth for utilities like Kenya Power and mini-grid companies. ▪ Many Kenyan cooking techniques and dishes are compatible with modern eCooking appliances. ▪ There is a latent willingness among households to pay for eCooking appliances within the KES 3,000 – 15,500 price range, and the market currently offers appliances within that price range.	▪ Some eCooking appliances lack compatibility with Kenyan cooking practices and languages, posing challenges in adoption. ▪ There is a gap in knowledge and attitudes about using eCooking appliances effectively among the general population.	households currently using traditional or improved cooking solutions. ▪ Promotion of energy-efficient cooking appliances can enhance the adoption of eCooking in households with lower-capacity electricity systems. ▪ Offering eCooking appliances within affordable price ranges can accelerate adoption. ▪ Behaviour change communication focusing on the benefits of eCooking can improve knowledge and familiarity among the population. ▪ Development of localized eCooking Solutions, e.g., by including preset cooking programs for local dishes and instructions in local languages can boost acceptance and usage, of appliance features. ▪ Focusing on urban areas for initial eCooking promotion can leverage existing infrastructure and consumer readiness.	▪ Deeply ingrained cooking habits and preferences for traditional methods can persist as a significant barrier, especially if eCooking is perceived as less suitable for preparing certain dishes.
Financing	▪ Availability of diverse consumer financing mechanisms like asset financing loans, PayGo, and layaway savings offer consumers flexibility and choice.	▪ There is a lack of awareness and accessibility to diverse consumer financing options for eCooking appliances. ▪ Financial and operational constraints for businesses limit their capacity to offer eCooking appliances on favourable terms. ▪ Current monitoring systems for some results-based financing (RBF) and carbon financing schemes lack transparency and effectiveness.	▪ Strengthening the role of microfinance, especially in rural areas, can enhance access to eCooking appliances. ▪ Empowering women through self-help groups could help overcome credit access challenges. ▪ Increasing the range of digitally-enabled consumer financing mechanisms, including smart appliances with PayGo functionality could lower financing barriers.	▪ Existing eCooking financing programs may be too rigid to adapt to changing market conditions, such as economic shocks or currency devaluation. ▪ Persistent difficulties faced by women in accessing credit can hinder their participation in adopting eCooking solutions.

			▪ Flexible financing programs adapted to market realities (e.g., inflation, currency fluctuations) would build resilience and sustained progress in scaling eCooking.	
Supply chain	▪ There is significant potential for local appliance assembly, which can lead to more affordable and customized eCooking appliances suitable for local needs. ▪ There are exemplars of energy service companies marketing and distributing of eCooking appliances, offering bundled packages and financing plans. ▪ Current marketing efforts, including traditional and social media, are increasing awareness and demand for eCooking appliances. ▪ A variety of delivery models are available in cities and large towns, including physical retail outlets and online shops, that cater to different market segments. ▪ There is an existing after-sales service infrastructure serving cities and large towns that could be expanded.	▪ Currently, there is limited local manufacturing capacity for eCooking appliances in Kenya. ▪ Some importers and distributors face difficulties in procuring high-quality eCooking appliances at affordable prices from international markets. ▪ There is still limited engagement of energy service companies in appliance distribution. ▪ Distribution channels in rural areas are underdeveloped. ▪ Concerns about the durability, repair needs, and maintenance costs of eCooking appliances could also deter potential users. ▪ Inefficient warranty claims processes could lead to customer dissatisfaction and hinder the adoption of eCooking appliances. ▪ The existing skill gap among technicians in keeping up with the latest technological advancements and evolving customer needs is a significant threat.	▪ There is potential for further development of local manufacturing, reducing reliance on appliance imports. ▪ Expansion of innovative consumer financing models would make eCooking appliances more affordable. ▪ There is potential for carbon markets to address financing challenges on the supply side and demand side in the eCooking sector. ▪ Utility-led financing, especially on-bill repayment and data sharing/co-marketing schemes could be explored further to lower barriers for grid-connected households, ▪ There are opportunities for investments in education, technical training, and capacity building to support the eCooking supply chain. ▪ There is an opportunity to expand service centres, especially in rural and semi-urban areas, to cater to the growing demand for eCooking appliances.	▪ There is a risk that over-reliance on appliance importation may stifle the development of local manufacturing capabilities. ▪ There is a threat of reliance on counterfeit or substandard components due to the inaccessibility or unavailability of quality spare parts. ▪ A lack of consumer awareness regarding the importance of warranties and after-sales services could negatively impact the adoption and satisfaction with eCooking appliances. ▪ Global and local supply chain issues can affect the availability and cost of eCooking appliances, making them less accessible or more expensive. ▪ The availability and promotion of alternative cooking energy sources, such as LPG, which might be subsidized or marketed more aggressively, could compete directly with eCooking.
Standards	▪ The current policy and industry focus on standards and testing protocols paves the way for more	▪ Lack of national testing standards for eCooking appliances leads to inconsistent product quality. Current	▪ Establishing a standardized national test method, and implementing mandatory testing and labelling for	▪ There may be resistance or slow adaptation to new standards and

	robust and standardized market development, fostering local industry growth.	testing practices are voluntary and based on retailer demand, not mandatory, which can compromise appliance safety and quality. ▪ Limited testing capacity in existing testing facilities hinders comprehensive standardization and quality assurance processes. ▪ Difficulty in defining and contextualizing performance requirements for eCooking appliances affects the standardization process.	eCooking appliances can ensure consistent product quality across the board, improved safety standards and informed consumer choices. ▪ Investing in infrastructure, equipment, and training for testing facilities could enhance their capabilities. ▪ Working with industry experts to set clear efficiency parameters and benchmarks can improve the quality of eCooking products in the market.	mandatory testing within the industry. ▪ Consumers might perceive labelled and more efficient products as more expensive, which could hinder market growth. ▪ Limited resources for standardization bodies like KEBS could impede the development and enforcement of new standards and labels.
Policy	▪ There is political will to scale up clean cooking efforts, with growing interest in eCooking as an important clean cooking option.	▪ Targets and objectives related to clean cooking and electrification are not harmoniously integrated and aligned across different frameworks, hindering cohesive policy implementation. ▪ eCooking is not adequately aligned with policies related to climate change, environment, health, and innovation, resulting in missed opportunities.	▪ The possibility of aligning eCooking with key national policies related to climate change, environment, health, and innovation, enhancing cross-sectoral benefits. ▪ Developing and implementing a comprehensive policy framework that effectively connects eCooking with broader national goals. ▪ Aligning eCooking with other critical areas like climate change, health, and innovation to leverage multiple benefits.	▪ Possible resistance or slow adaptation to new, integrated policy frameworks from existing bureaucratic structures could impede the enabling environment. ▪ Failure to align eCooking with broader policies might result in missed opportunities to optimize benefits across multiple sectors. ▪ Persistent economic challenges, among them, inflation and currency devaluation, can limit the ability of households to invest in eCooking appliances or pay for electricity.

6

3 The Strategic Approach

3.1 Vision, Mission and Objectives

Vision

Transforming the cooking and electrification landscape in Kenya through increasing adoption of energy-efficient eCooking solutions by 2028.

Mission

To accelerate the widespread adoption of eCooking technologies across Kenya by enhancing access and affordability, fostering innovation and behaviour change while also contributing to better health outcomes, job creation, gender equity and lowering CO2 emission, achieving our NDC and improving environmental sustainability. Through targeted interventions, we aim to transition from traditional cooking methods to eCooking methods in a way that is inclusive, sustainable, and aligned with Kenya's broader energy and economic aspirations.

Strategic objectives

- Promote eCooking in Kenya to stimulate electricity demand, thereby linking clean cooking with broader electrification goals.
- To foster a widespread acceptance and sustainable use of eCooking solutions across Kenyan households, by overcoming cultural, financial, and informational barriers.
- To cultivate a robust, integrated, and consumer-centric supply chain for eCooking, focusing on promoting local manufacturing, enhancing distribution mechanisms, ensuring user-friendly product localization, and strengthening after-sale services.
- To enhance the financing ecosystem that empowers both consumers and suppliers to actively participate in the eCooking market.
- To establish a rigorous, transparent, and consumer-friendly appliance standards ecosystem for eCooking.
- To establish a harmonized policy environment that robustly aligns eCooking with national clean cooking, electrification, climate change, health, and innovation objectives.

3.2 The Strategic Roadmap

3.2.1 Scenario analysis

According to the KNeCS baseline study, a considerable 64.9 percent of Kenyan households are ready to transition to eCooking immediately, given their current Tier 3+ electricity access (see Figure 3.1). This readiness, when added to the existing 3.88 percent of households that are already *cooking, reheating foods and preparing beverages* ***primarily*** with eCooking appliances, implies that as much as 68.7 percent of Kenyan households could potentially adopt eCooking, demonstrating a significant opportunity for interventions aimed at scaling up eCooking technologies.

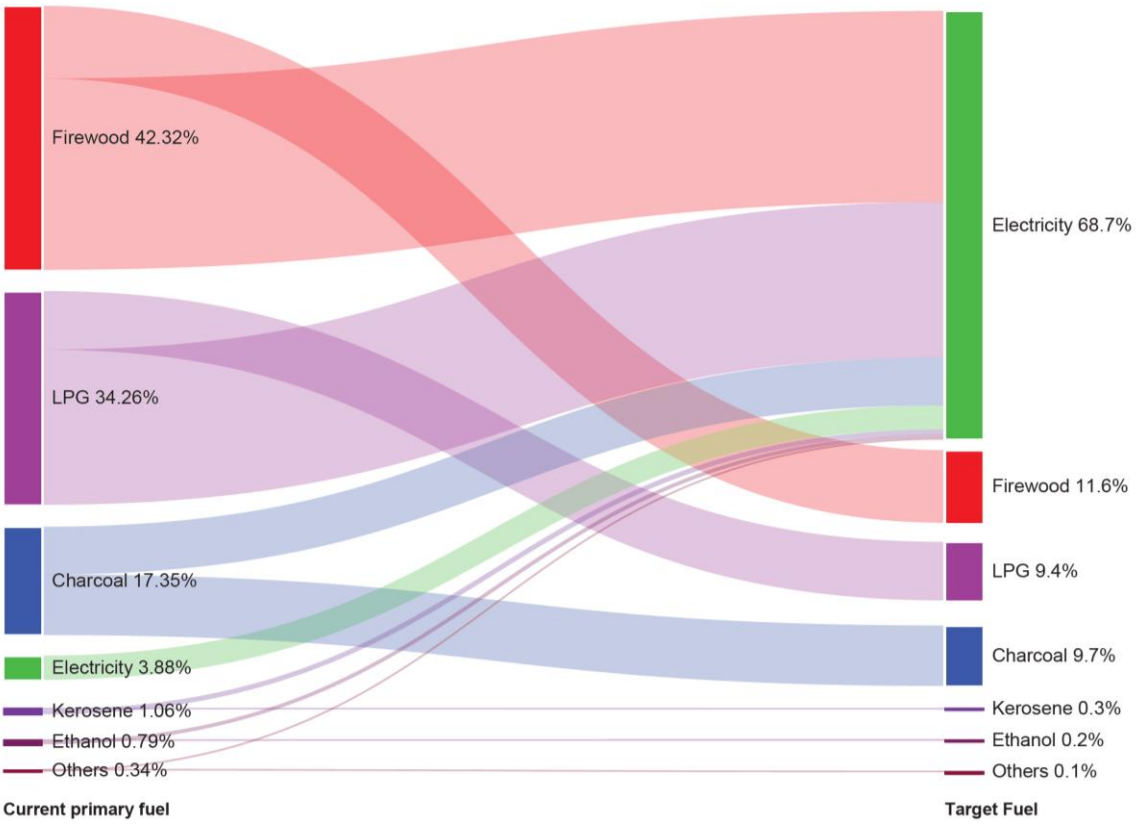


Figure 3.1 Transition to eCooking based on Tier 3+ Electricity Access

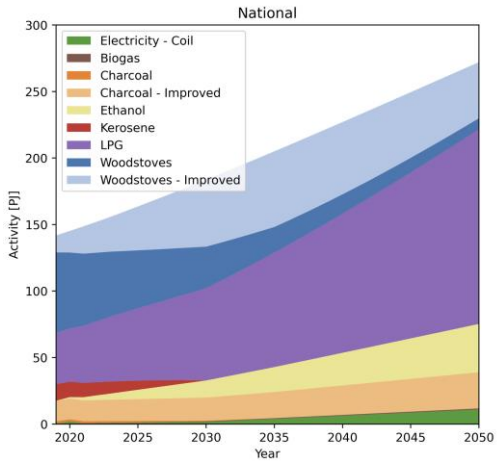
However, an immediate transition of this magnitude is not feasible due to risks of grid overload, supply chain disruption, and inequality in access, potentially causing frequent power outages, quality compromises, and customer dissatisfaction. To explore feasible transition options, ***four*** initial scenarios were analysed:

- the **Business-as-Usual Scenario** where current trends and policies continue without any significant changes,
- the **Stated Policies Scenario** which explores the effects of the current policy framework should it be implemented as planned. This scenario takes into account the government's pre-existing commitments as outlined in policy documents such as the Bioenergy Strategy, Kenya's Updated Nationally Determined Contribution (NDC) targets and the Long-Term Low Emission Development Strategy (2022-2050).
- the **Net Zero Scenario** as the best-case scenario which emphasizes a robust electrification and eCooking drive and seeks to comprehensively eradicate emissions from the cooking sector by 2050.
    - A ***simulated*** **Net Zero Scenario** explores eCooking acceleration, but under current policy constraints that promote LPG, ethanol and improved woodstoves.
    - An ***optimised or unconstrained*** **Net Zero Scenario** models clean cooking transitions with the sole target of alleviating CO2 emitted by the sector after 2025 at the least cost, assuming no policy or capacity constraints.

The development of these scenarios is partially based on the assumptions and hypotheses derived from the modelling in the Kenya National Cooking Transition Strategy, with adjustments made based on the findings of the eCooking Baseline Study, changes in the policy environment, and framing of the scenarios run. The modelling exercise for this strategy concentrated on primary eCooking, largely due to current limitations of clean cooking modelling tools to effectively capture fuel and appliance stacking. Further research is needed in this regard.

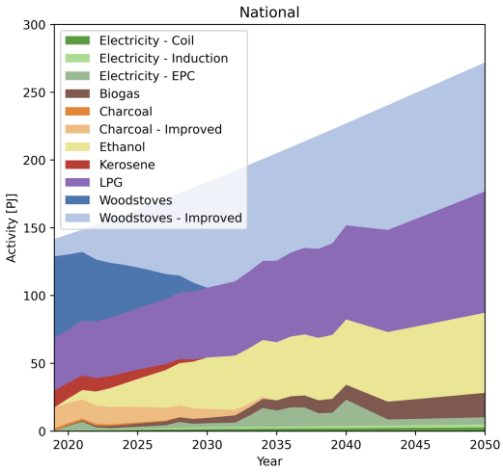
Figure 3.2 below illustrates the findings of each scenario, each focusing on the expected national outcome. ***For details on the hypotheses made for these scenarios, see the Modelling Report.***

Business-as-Usual



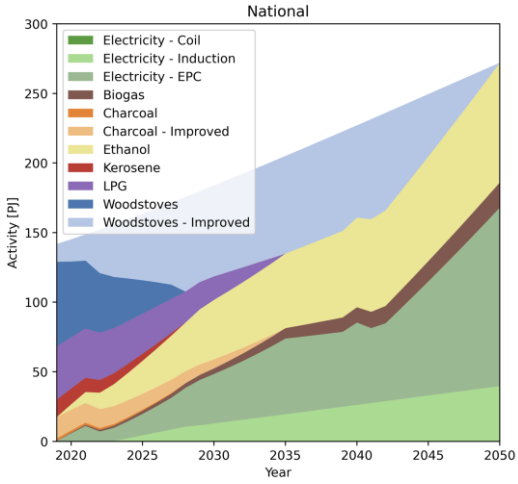
- LPG emerges as the primary fuel.
- biomass retains its significance, especially in rural areas
- there is a shift from traditional woodstoves to improved woodstoves and LPG
- kerosene is phased out by 2030.

Stated Policies



- There's a clear shift from traditional fuel sources to more sustainable and cleaner sources.
- LPG, improved woodstoves and ethanol become key fuels.

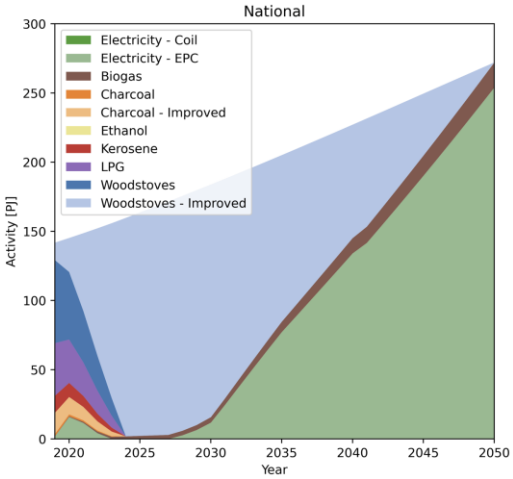
Net Zero (Simulated)



The model is quite tightly constrained before 2030 and in 2050, but in between it is free enough to identify a cost optimal pathway toward NZ.

- eCooking and ethanol grow significantly.
- biogas grows significantly in rural areas.
- LPG and improved woodstoves are transitional fuels.

Net Zero (Optimized)



No policy constraints, with the exception of the amount of CO2 emitted by the sector after 2025.

- Improved wood is a transitional fuel, as it is cheaper or free.
- LPG, charcoal, kerosene and traditional woodstoves disappear rapidly from the system.
- Subsequently improved woodstoves are substituted with eCooking from 2025, particularly EPCs, to meet the net zero target in 2050.

Figure 3.2 Business-as-Usual, Stated Policies and Net-Zero scenario model results

As expected, the 'Business as Usual' scenario offers a pessimistic outlook without significant eCooking contributions. The 'Stated Policies' scenario assumes no targeted interventions for scaling eCooking. The 'Net Zero' scenarios are aspirational pathways, and may be feasible in the long term but difficult to achieve in the short term. Nevertheless, if there were no power sector limitations in terms of generation and transmission capacity, the simulated Net Zero scenario would be more feasible, as it is an optimistic version of the eCooking Transition scenario. In broad terms, the Business as Usual and simulated Net Zero scenarios in this strategy align with those in the Kenya National Cooking Transition Strategy.

A different pathway that harmonizes the Stated Policies scenario and the simulated Net Zero Scenario—dubbed "the eCooking transition scenario"—is modelled to create a pragmatic roadmap for Kenya's cooking sector transformation. Figure 3.3 below visualises the eCooking Transition Scenario, showing the national, urban and rural trajectories.

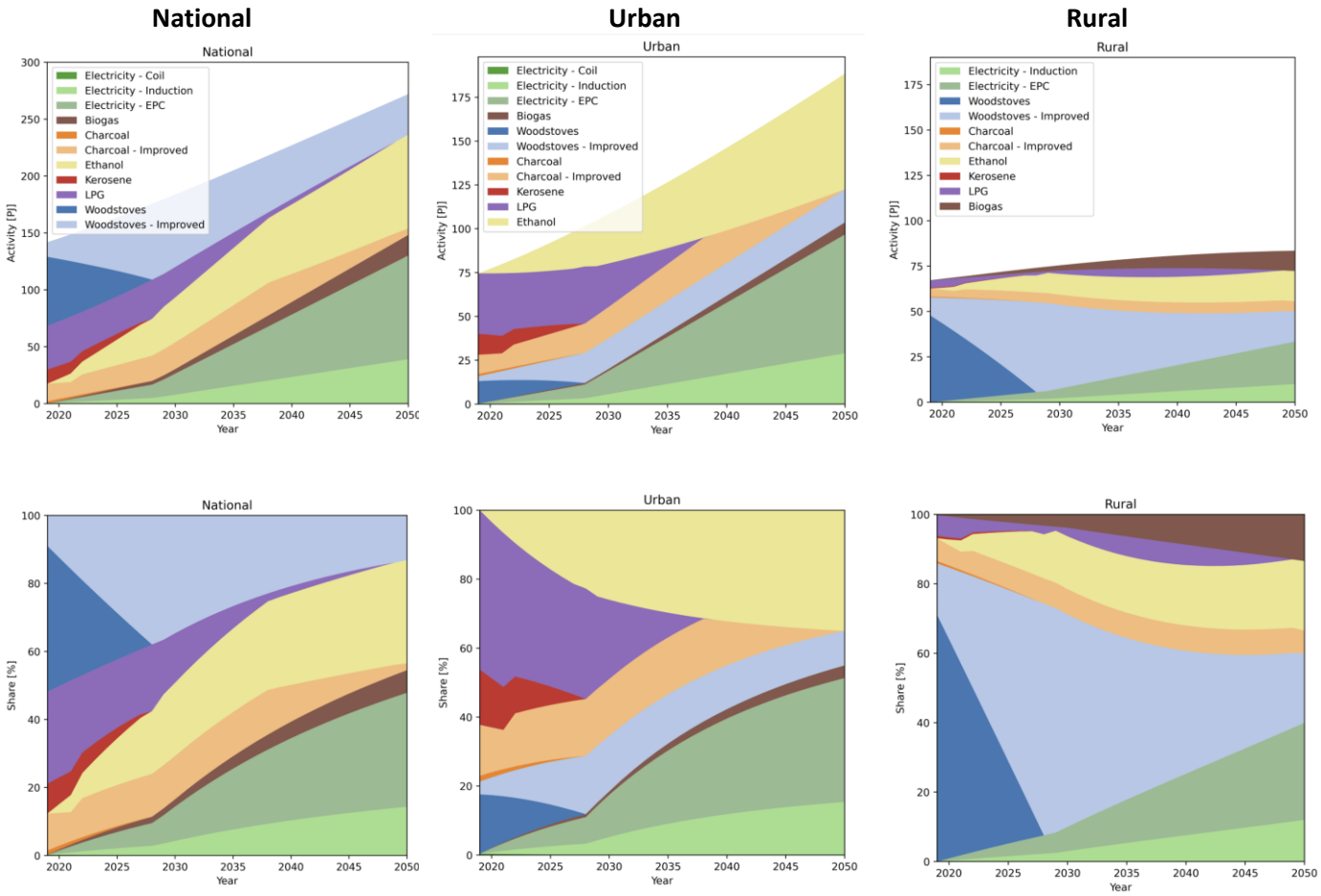


Figure 3.3 eCooking Transition Scenario model results

In the eCooking Transition Scenario, ***eCooking solutions such as EPC and induction cookers witness a steady growth as primary cooking solutions, more so in urban areas, accounting for approximately 9.5 percent in 2028 and increasing to 47.9 percent by 2050. With secondary eCooking incorporated, the expected prevalence rate of eCooking in 2028 rises to 10.8 percent.*** Ethanol rises significantly, also in urban areas, while biogas makes notable inroads in rural settings. Conversely, traditional fuels (firewood and charcoal) and LPG see a marked decline, with LPG acting as a transitional fuel in urban areas. By 2028, kerosene, traditional firewood and charcoal are phased out.

The eCooking Transition Scenario is quite similar to the simulated Net Zero Scenario, with the main difference being that the simulated Net Zero doubles eCooking adoption rate in 2028 of the eCooking Transition Scenario[3]. The scale of the interventions outlined in the next section would determine which scenario is achieved. For instance, the simulated Net Zero eCooking adoption rate could be achieved if revenue from carbon markets are used to implement a cheaper eCooking tariff, an import duty exemption on eCooking appliances (in addition to a VAT exemption) is applied, or strong subsidies on LPG that could undermine eCooking adoption are lowered.

3.2.2 Impact of new eCooking Demand on the Grid

This modelling endeavour aims to understand whether and how Kenya has, or has planned, for the capacity to meet the new electricity demand for eCooking as illustrated in the proposed eCooking Transition scenario model (primary eCooking only), while continuing to prioritize a renewable energy mix. The scenario analysis builds upon both the Medium-Term Plan and the most recent version of the LCPDP (2022-2041), specifically the LCPDP's reference scenario (whereby additional renewable sources potential starts to be available after 2025, and nuclear energy is available from 2036) (Kihara et al., 2024).

Current installed generation capacity (commercial, industrial and residential) is roughly 3.6 GW, and the LCPDP projects an installed capacity of 4.2 GW by 2028. According to this power sector model, additional eCooking demand in 2030 under the eCooking Transition Scenario will reach 13.5 PJ, requiring about 1.3 GW of new capacity from various energy sources, and rising to 9 GW in 2050. Thus, in the short term, the existing and planned renewable energy capacity falls short, necessitating reliance on diesel generators or imports. Nevertheless, projections indicate that starting from 2025-26, there will be an increase in geothermal, hydro, electricity imports, and more significantly, wind capacities. For more details on the grid impact, ***see the Modelling Report***.

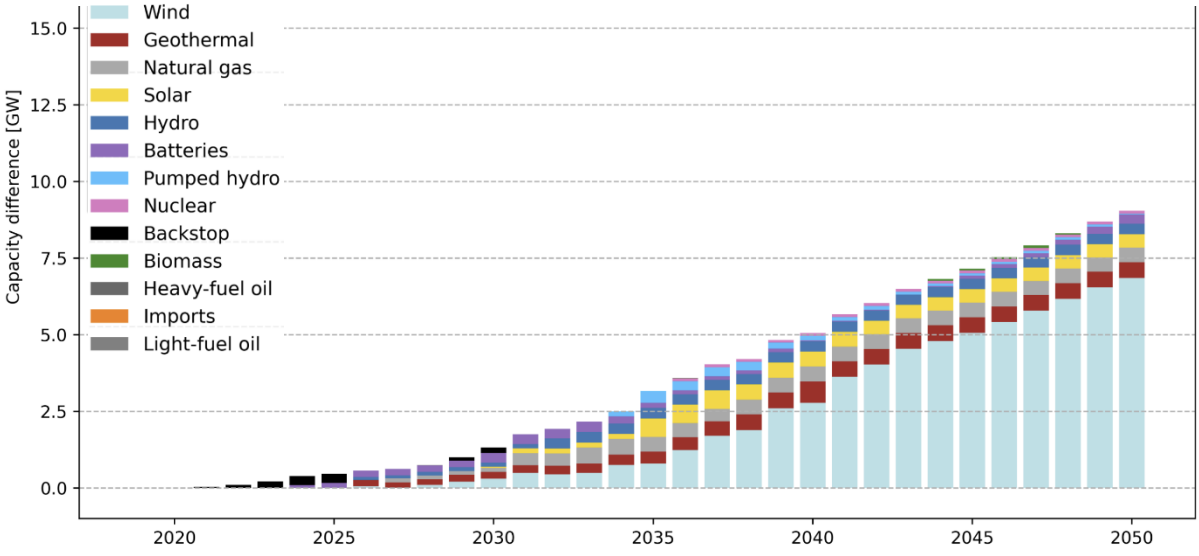


Figure 3.4 The evolution in the energy mix in the power sector both in terms of installed capacity for the eCooking Transition scenario

[3] We note here that stakeholders should agree on whether the strategy should substitute NZ Simulation for the ECooking scenario, given their similarities. Stakeholders can also agree on whether 4 or 5 scenarios should be presented.

Consequently, as will be seen in Section 4, this strategy proposes that interventions such as eCooking appliance subsidies and the VAT waiver for appliances be lagged until 2026 when the grid can accommodate additional eCooking demand.

Building on the increased electricity demand anticipated from the eCooking Transition Scenario, the model forecasts additional revenue through 2050, using the average tariffs of the past year[4], for the domestic 30-100 kWh band[5]. The outcomes are illustrated in Figure 3.5 presented below.

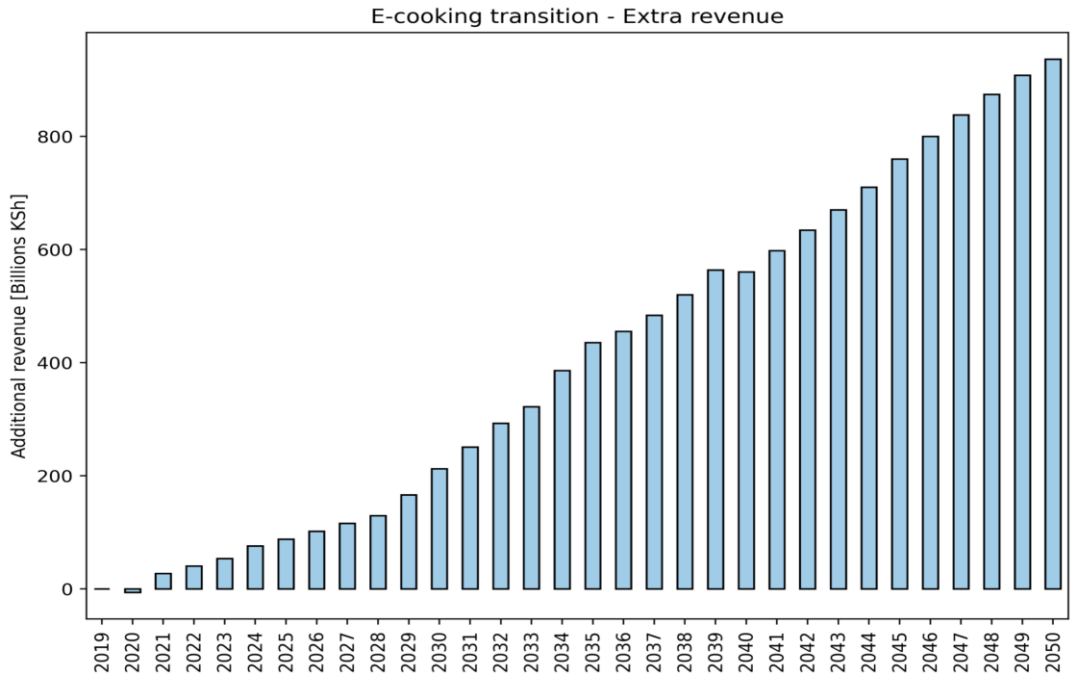


Figure 3.5 Projected additional revenue from the power sector on implementing the eCooking transition scenario

The model indicates that the eCooking Transition Scenario, with its progressively increasing demand for electricity, is projected to yield an estimated 175 billion shillings in additional revenue for Kenya Power by 2028, and approach one trillion shillings by 2050 based on the current tariff rates. Consequently, eCooking serves as a potent demand stimulation tool, potentially yielding considerable revenue that could further strengthen the grid infrastructure.

The eCooking Transition Scenario, identified as the most feasible intervention, serves as the blueprint for the Kenya National eCooking Strategy. The subsequent sections of the strategy considers a variety of interventions outlined in Section **Error! Reference source not found.** and **Error! Reference source not found.**, among them, system enablers to address bottlenecks in the enabling environment, eCooking pilots, capacity building initiatives, electrification initiatives and market development activities that lower barriers for households to adopt eCooking between 2024 and 2028.

[4] This analysis has not factored inflationary effects, thus further studies could better establish projected tariff rates.

[5] It is assumed that households cooking primarily with electricity will be categorized in the "Domestic Customer Category 2' tariff band introduced in April 2023 by the Energy and Petroleum Regulatory Authority to promote the uptake of eCooking.

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5 Strategic Initiatives

As the SWOT analysis in Section 2.3 showed, the eCooking sector in Kenya has strengths and opportunities that can be leveraged and expanded upon, and weaknesses and threats that need improvement and risk mitigation. This comprehensive understanding has aided in designing four major targeted initiatives. Figure 1.1 below presents a summary of interventions for scaling eCooking in Kenya that cut across the objectives of the strategy. These interventions will be systematically phased over a five-year period from 2024 to 2028.

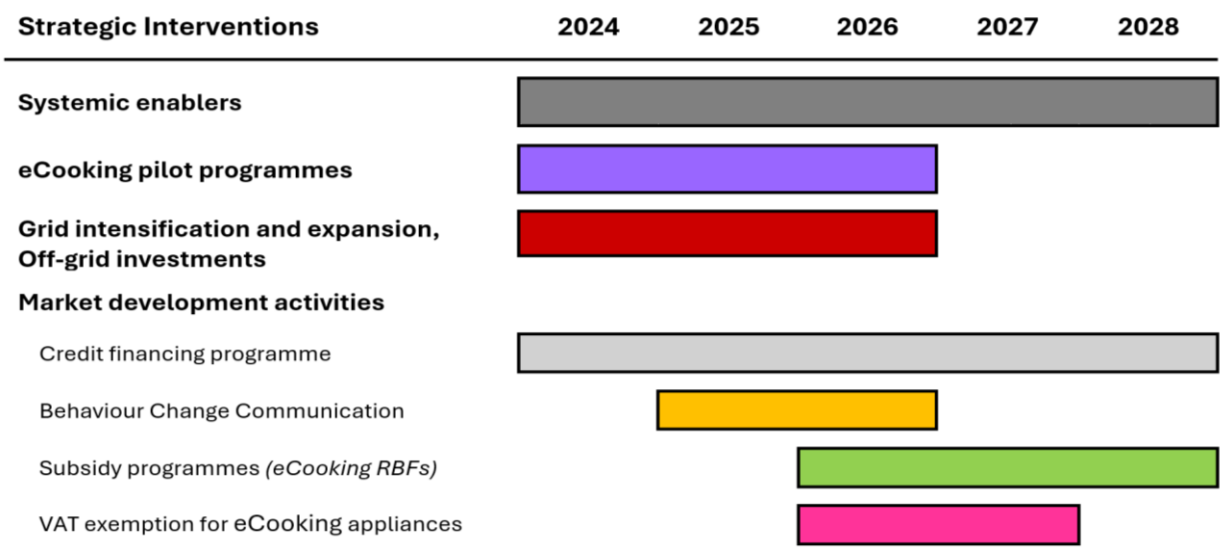

Figure 5.1 Cross cutting strategic interventions for scaling eCooking in Kenya

Kenya must first lay a solid foundation to enable widespread adoption of eCooking. This involves leveraging recent advancements in the enabling environment and tackling existing challenges that could hinder the adoption of eCooking by:

- deploying "system enablers" that holistically support the entire eCooking value chain, fostering market growth. Such enablers involve coordinated financing mechanisms, boosting local manufacturing, enhancing appliance quality standards, and investing in training and capacity building.
- pilot programmes to support further innovation, and to test and refine a variety of strategies, among them, the development of a suitable eCooking Tariff and requisite infrastructure to deploy it, and carbon financing projects.
- grid intensification, densification, and expansion, and targeted off-grid investments to strengthen household electrification systems to support mass scaleup of eCooking.

As these interventions are being implemented, market development activities would subsequently be implemented to facilitate widespread adoption and safe usage of eCooking, with a focus on the following programmes:

- Behaviour Change Communication
- financial relief measures, specifically VAT exemptions, subsidies and dedicated credit financing programmes will be rolled out for specific groups.

These interventions are designed to work synergistically, rolled out in a logical sequence for maximum efficiency and impact.

The section below tackles each of these interventions in detail, highlighting the programme structure, target beneficiaries, a cost-benefit analysis and expected outcomes. ***The Action Plan offers more details on the key activities related to each strategic intervention, along with the monitoring and evaluation framework, and stakeholder engagement plan.***

5.1 Systemic enablers

This section delineates critical ecosystem activities aimed at creating an enabling environment for the eCooking sector. By facilitating a unified funding mechanism, boosting local manufacturing capabilities, and ensuring the importation of quality products, these activities collectively address key obstacles and gaps that have traditionally hindered the development of the sector. The interventions aim to garner the financial, human, and technological resources required for a widespread adoption of sustainable cooking solutions in the country.

5.1.1 A National eCooking Consortium

A national eCooking Financing Consortium will be established as a centralized, well-coordinated mechanism that aligns the interests and resources of multiple stakeholders in the eCooking sector. Initiatives of the consortium will be aimed at overcoming the capital constraints that have traditionally hindered the growth and scalability of clean cooking and eCooking solutions in Kenya. The consortium will mobilise the much-needed financial resources while ensuring their effective and equitable utilization.

The consortium will be domiciled at and chaired by the Ministry of Energy and Petroleum, and will bring together selected members of the eCooking Technical Working Group[6], along with the Global eCooking Coalition (GeCCo) and other development partners, and civil society. The role of the consortium will be to:

- Coordinate funding sources to avoid duplication and ensure maximum impact.
- Allocate resources to various eCooking projects, taking into account their feasibility, potential for impact, and alignment with national priorities.
- Organise eCooking investment summits to spotlight innovation in the eCooking sector and attract investment from both local and international financiers.

The consortium will have quarterly meetings for performance reviews, updates on upcoming projects, and reallocation of resources based on the achieved milestones.

Implementation Timeline: 5 years, from 2024 – 2028, and onwards

5.1.2 Boost research and development (R&D) and local manufacturing/assembly of eCooking products.

Kenya has emerged as a hub for various eCooking innovations, evidenced by developments around local assembly of eCooking appliances e.g., at BURN Manufacturing, local embedding of IoT systems for smart metering, innovations in battery-supported eCooking systems, innovative business models such as PayGo and digitally enabled finance, and a number of localised eCooking appliances. Kenya has a vibrant entrepreneurial ecosystem has given rise to startups and companies dedicated to eCooking. These niche activities will be coalesced through an 'eCooking

[6] The eCooking Technical Working Group, which is composed of eCooking sector stakeholders spanning government agencies and development partners, provided oversight over the eCooking strategy development.

Innovation Platform' to further catalyse and support research and development efforts in the eCooking sector. Key activities of the platform include:

- Actively seek funding from diverse sources to support R&D efforts in eCooking technology and solutions.
- Host innovation challenges to encourage creative solutions in the eCooking sector, providing incentives for inventors and innovators.
- Facilitate strategic partnerships between eCooking innovators, research institutes, incubators and accelerators, and industrial parks.

The eCooking Innovation Platform activities can pave way for the development of local assembly capabilities with the view of building capacity for local manufacturing of components. As envisioned in the overarching strategy—the Kenya National Cooking Transition Strategy (KNCTS), industrial parks within Special Economic Zones can become catalysts for the growth of the eCooking appliance manufacturing sector in Kenya (see Figure 4.1 for a map of existing and proposed SEZs). By capitalizing on the SEZs' tax and regulatory incentives, robust infrastructure, and trade-enabling environment, manufacturers can benefit from reduced operational costs and streamlined processes. The SEZ model will not only attract foreign direct investment (FDI) from established eCooking appliance manufacturers to set up production units in these parks, but also lower entry barriers for local smaller scale appliance assemblers and manufacturers that need additional support.

Over and above the interventions put forth in the KNCTS, this strategy proposes to leverage industrial parks for eCooking in the following ways:

- Develop or upgrade infrastructure in selected industrial parks to cater specifically to eCooking appliance manufacturing and assembly. This includes ensuring reliable power supply, water, waste management, and internet connectivity. Additionally, provide or facilitate access to specialized facilities like testing labs and R&D centres.
- Offer incentives to attract businesses to these parks, such as tax exemptions, reduced utility rates, or subsidized land leases. These incentives can lower the entry barriers for new companies and make operations more cost-effective.
- Offer innovation challenge funds and results-based financing incentives linked to utilizing manufacturing/assembly opportunities in industrial parks. R&D related to local assembly and/or manufacturing should also focus on technology enablers for eCooking, among them, integration of smart meters into appliances, and assembling solar and battery-supported eCooking systems, among others.
- Encourage joint ventures or partnerships between local enterprises doing related activities and international manufacturers to facilitate technology transfer and skill development.
- Collaborate with Technical and Vocational Education and Training (TVET) institutions to develop a skilled workforce for eCooking appliance manufacturing, repair and maintenance.
- Establish and enforce stringent quality standards for locally manufactured eCooking appliances. This ensures that products meet safety and efficiency benchmarks, boosting consumer confidence and market competitiveness.

Careful governance and regulatory oversight are key to creating a sustainable and competitive manufacturing hub for eCooking appliances within these zones.

Implementation Timeline: 5 years, from 2024 – 2028, and onwards

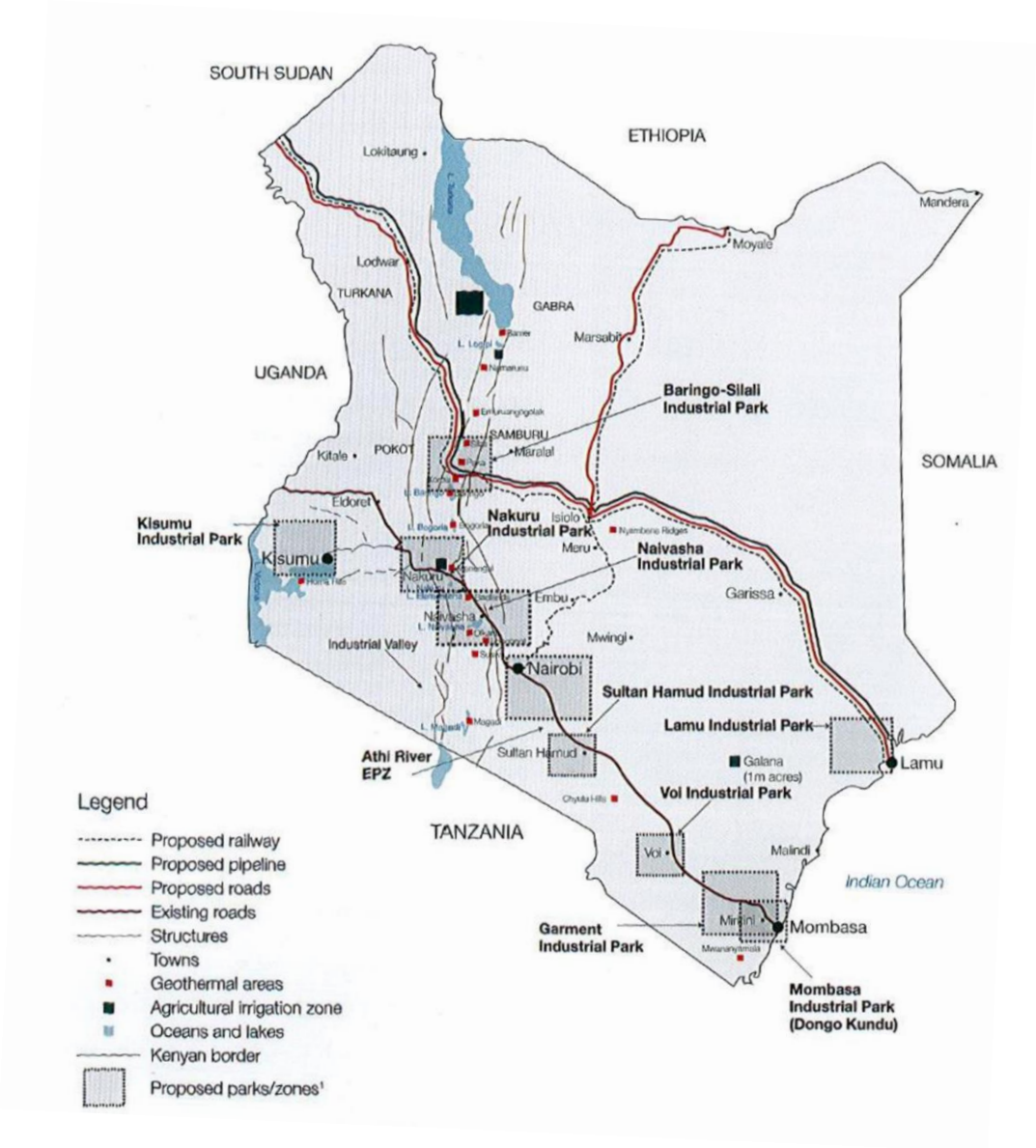

Figure 5.2 Potential industrial parks and special economic zones. Source: Khisa (2016)

5.1.3 Training and capacity building programmes

The eCooking Training and Capacity Building Programme for Kenya serves as a critical pillar in the country's broader strategy to accelerate the adoption of eco-friendly cooking solutions. With a dual focus on individual training and institutional capacity building, the program aims to create a comprehensive support ecosystem for eCooking. By educating women in financial literacy specific to eCooking adoption, training technicians in Technical and Vocational Education and Training institutions (TVETs), and supporting women entrepreneurs in the eCooking supply chain, the program anticipates a multi-dimensional impact. On the institutional level, the program will invest in upgrading the testing facilities of local entities and support eCooking hubs in providing efficient after-sales services. Expected outcomes include an increased understanding among women about the cost-effectiveness of eCooking, a skilled workforce proficient in eCooking appliance assembly and maintenance, enhanced institutional capabilities for quality testing, and a network of entrepreneurs and hubs that can distribute and support eCooking solutions effectively. This program aims to build a self-sustaining eCooking ecosystem that can contribute to both environmental conservation and economic empowerment.

Programme structure

Training

- *Vocational Training in TVETs*: TVETs will incorporate specialized modules related to eCooking appliance assembly, manufacturing, repair, maintenance, and quality assurance into their curriculum. This initiative aims to create a skilled workforce in collaboration with industry experts and manufacturers. The programme could build on the *Pika na Power* Academy.
- *Women Entrepreneurship in eCooking*: A 3-month accelerator program will be established specifically for women entrepreneurs to enhance their distribution strategies, sales skills, and after-sales support for eCooking appliances. Industry mentors will guide them in various aspects of business management, fostering a network of capable women entrepreneurs.
- *Financial Literacy Programs for Women*: eCooking will be integrated into financial literacy programs conducted by microfinance institutions and non-governmental organizations. These workshops will educate women on budgeting, credit management, and savings while also providing insights into the economics of transitioning to eCooking, empowering women to make informed financial decisions.

These three targeted training programmes create a comprehensive environment that enables the widespread adoption of eCooking technologies, all while empowering women and building institutional capacities.

Institutional Capacity Building

- *Infrastructure Upgrades for Testing Facilities*: This facet involves providing financial and technical support to key local institutions, such as KEBS, KIRDI, the University of Nairobi, Strathmore Energy Research Centre, and Kijani Testing Lab, to enhance their testing facilities for eCooking appliances. Upgrades will include acquiring advanced equipment, hiring specialized staff, and potentially establishing dedicated eCooking testing labs. The goal is to ensure accurate and thorough assessments of eCooking appliances to improve their quality and safety.
- *Kenya Power eCooking capacity and skill enhancement:* Kenya Power is in need of new skills and expertise to effectively engage with the eCooking market, beyond selling power. Capacity building programmes could focus on Results-Based Financing (RBF) and carbon finance. A needs assessment should be conducted to identify which other capacity gaps exist, and to design a tailored program of activities can be developed, aligning with the identified needs.
- *eCooking Hubs*: The initiative aims to strengthen the role of eCooking Hubs as crucial intermediaries between consumers and the eCooking ecosystem. Support will be extended to existing and new hubs including those linked to faith-based organisations, including financial assistance, training, and provision of repair tools and spare parts. The focus is on enabling hubs to offer comprehensive customer training and after-sales services, fostering consumer trust and enhancing the long-term sustainability of eCooking technologies.

In summary, these two pillars of institutional capacity building aim to create an enabling environment to accelerate the adoption and sustained use of eCooking solutions in Kenya.

Implementation Timeline: 5 years, from 2024 – 2028, and onwards

5.1.4 Strengthen eCooking appliance quality standards: Testing, certification and labelling.

The ecosystem for efficiency and quality assessment for electric cooking appliances in Kenya is still at its infancy. As the demand for eCooking appliances gradually begins to grow, there is need to develop capabilities around appliance testing and quality assurance for eCooking. In this regard, the strategic intervention will focus on the following key areas:

- Initially, adopt voluntary standards for eCooking equipment as a foundation for national-level market development programs such as the credit financing programme or RBFs. This approach can help stimulate market growth and consumer acceptance before implementing stricter regulations.
- Establish standardized national test methods for eCooking appliances to ensure consistent quality and performance across the market. This would involve developing test protocols that consider local cooking practices and environmental conditions.
- Implement mandatory testing and labelling for eCooking appliances to ensure safety and quality. Introduce mandatory labelling for these appliances, highlighting energy efficiency, safety, and performance to guide consumer choices.
- Develop a quality verification portal for eCooking appliances to provide a reliable mechanism for verifying the authenticity and quality of imported eCooking products, including spare parts. This portal—which will be domiciled at the Kenya Bureau of Standards—will feature a database of certified products and Scannable QR codes for instant verification. Such a portal would facilitate easier identification of quality products, reducing the risks associated with importing low-quality goods.
- Anti-Counterfeit Measures should be implemented to prevent the entry of counterfeit spare parts into the country. These measures include implementing stringent scanning and checks at ports of entry and collaborating with international partners to trace the origin of counterfeit goods.
- Increase consumer awareness about the benefits of energy-efficient appliances and the importance of labelling. Educate consumers on how to interpret labels and make informed purchasing decisions.

Some of these activities link directly to capacity building in testing facilities addressed in Section 5.1.3. By implementing these strategies, Kenya can create a more robust and reliable ecosystem for eCooking appliances, ensuring that products meet high safety and efficiency standards while also being adaptable to local needs and preferences.

Implementation Timeline: 5 years, from 2024 – 2028, and onwards

5.2 eCooking pilot programmes

5.2.1 Carbon Financing Pilot

Utilizing carbon markets to finance and develop eCooking in Kenya presents a groundbreaking opportunity to simultaneously address economic, social, and environmental challenges. Integrating carbon financing into electrification and eCooking initiatives offers a multi-faceted solution that harmonizes with Kenya's broader goals of sustainable development, climate action, and energy efficiency. Carbon credits from eCooking can serve as a lucrative export commodity, thus unlocking additional financial resources.

Programme Structure

- Leverage the potential of carbon financing by rolling out an eCooking pilot using smart-meter-enabled eCooking appliances, or smart electricity meters at the household level

that monitor energy consumption and calculate the subsequent carbon emissions reductions. Utilize smart meter data[7] to generate carbon credits, leveraging existing methodologies like the one endorsed by Gold Standard.

- The government could partner with local and international experts on carbon finance, e.g., Verst Carbon, Climate Impact Partners, Global Electric Cooking Coalition, etc to design appropriate carbon projects for eCooking.
- The accumulated carbon credits from these reductions will be sold to companies and other investors in the voluntary market, or to governments through ITMO carbon markets.
- Under the eCooking Financing Consortium, MoEP can establish an eCooking Development Fund with the revenue from carbon credit sales. This fund will be dedicated to enhancing eCooking supply chain development, providing financing for infrastructure development, research and development, capacity building for local manufacturing and assembly, further subsidies for the appliances, and lowering electricity tariffs for eCooking, among other market development needs. Additionally, carbon revenue can be taxed to support broader national initiatives.
- Introduce cash back opportunities for households, incentivizing them to adopt eCooking. The cash back can be sourced from the savings made from carbon credits, giving households a direct financial benefit from their reduced carbon footprint. This not only motivates increased adoption of eCooking but also educates households on the environmental benefits of their actions.
- Learnings from implementing eCooking carbon projects could be used to develop, publish and regularly update a set of resources that can support carbon project development, among them, KPT and CCT results for different appliances, local fNRB values, eCooking market assessments or a database of key distributors.

In conclusion, the potential of carbon financing in the eCooking sector in Kenya is immense. With the right framework and partnerships, the program can bring about both economic and environmental benefits, truly making carbon credits Kenya's "next significant export."

Implementation Timeline

Within 3 years, from 2024 – 2026, with scale up to be determined based on pilot outcomes.

The sizing, scope and cost-benefit analysis of the carbon project can be done as part of follow-up strategy implementation activities.

5.2.2 eCooking Tariff Pilot

The objective of this pilot programme is to test the viability and impact of a specialized eCooking tariff for Tier 3+ connected households in Kenya. The tariff would utilize smart meter technology to accurately measure electrical consumption associated with eCooking, focusing primarily on electric pressure cookers and induction cookers.

Programme Structure

- Implement smart metering systems for Tier 3+ connected households. These advanced meters will facilitate real-time monitoring of electricity consumption, ensuring accurate billing and providing households with consumption insights to manage their energy usage effectively.

[7] While smart meters offer valuable insights and benefits, it's crucial to acknowledge the need for robust data protection measures. Safeguarding the personal usage data collected by these meters is essential to protect individuals' privacy and prevent potential misuse or breaches of sensitive information.

- The programme will prioritize the use of smart metered electric pressure cookers and induction cookers. The chosen appliances will be integrated with IoT (Internet of Things) capabilities, enabling remote monitoring, electricity usage patterns, tariff effectiveness, compliance and efficient maintenance.
- The utility could opt to test either/both a Time-of-Use (ToU) tariff or a Subsidized eCooking Tariff.
    - Time of Use Tariff (ToU): This tariff is designed to provide households with variable rates depending on the time of the day. During off-peak hours, when the grid has excess capacity, households will be incentivized with lower rates to use their eCooking appliances. Conversely, during peak times, the tariff will be higher to dissuade excessive energy consumption.
    - Subsidized eCooking Tariff: This offers a fixed, reduced rate for electricity consumed by the smart-metered eCooking appliances, aiming to make the transition to eCooking more financially appealing for households.
- The programme will explore the potential of carbon markets to further lower or subsidize tariffs for eCooking in the short term.

Eligibility criteria

Target households:	Households with Tier 3+ electricity access
Technologies:	Electric Pressure Cookers (EPCs) and induction cookers are that meet predefined energy-efficiency standards[8]
Vendors:	Must be registered and offer smart-metered eligible appliances

This pilot programme aligns with the dual objective of promoting clean cooking and ensuring optimal grid utilization. By offering enticing tariff structures, households are encouraged to adopt eCooking, leading to increased electricity consumption. For Kenya Power, this equates to a win-win scenario: while the per-unit revenue might decrease due to the subsidized tariff, the total consumption surge will ensure overall revenue growth. Moreover, making use of the excess capacity on the grid, especially during off-peak hours, ensures better resource allocation and grid efficiency. By monetizing this latent capacity, Kenya Power can offset some of the costs associated with maintaining an expansive, sometimes underutilized grid. Such innovative tariff structures can be instrumental in guiding user behaviour and optimizing national energy consumption patterns.

Implementation Timeline

Within 2 years, from 2024 – 2025 in order to inform the design of a dedicated eCooking tariff at the next tariff control period.

5.3 Electrification

Kenya has made significant strides in increasing electricity access, with rates jumping from 32 percent in 2014 to 75 percent in the most recently reported statistics. This has been achieved through multiple government initiatives like the Last Mile Connectivity Programme,

[8] Must meet or exceed Tier 3 standards for emissions as set by the World Health Organization. Must meet national safety standards. Cooking Efficiency should be above 80%. Preferred smart features like energy monitoring and auto shut-off for safety and efficiency. Estimated Annual Operating Cost (at USD$0.20/kWh) of < $50

electrification of public primary schools, the Rural Electrification Programme, and Kenya off-Grid Solar Access (KOSAP) programme implemented in collaboration with development partners and agencies like KPLC and REREC. However, challenges remain, including high connection charges, elevated costs of rural and peri-urban electrification, lack of private sector incentives, and operational hurdles like delays in obtaining way leaves. To address these, the government has incorporated off-grid solutions into its energy strategy and initiated programs targeting underserved counties.

5.3.1 On-grid electrification and eCooking

The Kenya National Electrification Strategy (KNES) addresses the broad spectrum of the necessary policy direction, investments and collaborative environment required to achieve universal access to electricity in Kenya. To reach universal electrification by 2022, KNES had projected that public investment of $2.3 billion is required. This assumed a cost per grid connection of $1,000. At a cost per connection of up to $1,500, the investment requirement increased to $3.5 billion and decreased demand for solar photovoltaic home systems from 2.2 million to 1.2 million.

With regard to grid expansion, densification and intensification, KNES envisaged that 2.7 million grid connections will be made through grid densification and intensification. Further 270,000 connections will be made through grid expansion within 15 km of the KPLC distribution system.

Against this background, interventions to intensify, densify and expand the grid should focus on the following aspects to facilitate eCooking:

- Enhance grid electricity capacity, reliability and availability, especially in regions like Western and North Rift, to ensure consistent power supply for electric cooking. Address voltage instability and improve overall electricity quality to minimize damage to electric appliances and build consumer trust.
- Implement behaviour change campaigns, and introduce price signalling mechanisms like Time-of-Use tariffs to encourage households to shift cooking to off-peak hours, reducing peak loads. Introduce battery-supported eCooking for Tier 0 – 3 households to enable cooking during load shedding, blackouts or voltage instability.
- Integrate eCooking objectives and targets into grid expansion programs like LMCP and KOSAP, and more explicitly into KNECS as a way to stimulate electricity demand and generate a viable return on investment for the off taker. Such programmes could bundle eCooking appliances with new electricity connections, along with user education.
- Address informal electricity connections by incentivizing formal connections and enforcing regulations to help alleviate system losses and improve stability in supply. To complement these efforts, the sector should explore business models bundling eCooking appliances with household wiring assessments and formalization efforts in informal settlements.
- EPRA and KPLC should collaborate with research institutes to pilot experimental tariffs for affordable on-grid cooking. Kenya Power should experiment with a and scale household smart meter installation to enable usage tracking and implementation of a dedicated eCooking tariff. Implement time-of-use tariffs to encourage off-peak cooking.

5.3.2 Off-grid electrification and eCooking

Beyond grid expansion, KNES prioritises off-grid electrification expansion through mini-grids and standalone Solar Home Systems (SHS). In this regard, KNES projected that some 34,000 connections will be made through 121 new solar mini-grids to serve housing clusters too far away from the network or too small to be connected to the national grid. In addition, about 1.9 million connections will be made through standalone SHS.

Further, the government has initiated the Kenya Off-grid Solar Access Project (KOSAP) for electrification of institutions far from grid using SHS. An estimated 200,000 rural households in Kenya have SHS and annual PV sales in Kenya are between 25,000-30,000 PV modules. In comparison, the Kenya's Rural Electrification Fund, which costs all electricity consumers 5 percent of the value of their monthly electricity consumption (currently an estimated 16 million US$ annually), is responsible for 70,000 connections. With access to loans and fee-for-service arrangements, estimates suggest that the Solar Home Systems (SHS) market could reach up to 50 percent or more of un-electrified rural homes[9]. There are about 4 million households in rural Kenya alone which present a vast potential for this virtually untapped technology[10]. It is clear therefore that eCooking from SHS has significant potential in Kenya. However, most SHS are below Tier 3, as they are designed to support services such as lighting and mobile phone-charging and thus, cannot support eCooking. However, these systems can support energy-efficient eCooking appliances if they are upgraded with a high-performance battery and a suitably sized solar panel. The upfront cost of such upgrades remains high for most low-income households.

Strategic interventions to in relation to off-grid eCooking are as follows:

- To leverage declining costs of PV, batteries, and the emergence of energy-efficient eCooking appliances, the use of stand-alone SHS for eCooking can be mainstreamed into national electrification efforts alongside grid expansion to lower acquisition costs for households.
- Generate demand for eCooking services among SHS households to encourage them to upgrade from systems designed for lighting to higher-capacity systems and other off-grid solutions, particularly in rural areas where grid access is limited.
- Provide incentives and support for research and development, e.g., through challenge funds, to design and manufacture affordable off-grid solutions suitable for eCooking.
- Design viable subsidy and financing programmes to enable households procure SHSs and related accessories to facilitate eCooking while meeting other low-power energy services, such as lighting, at no additional cost.

[9] Economic Project Appraisal Manual for Kenya (2021). https://www.treasury.go.ke/wp-content/uploads/2021/08/Case-Study-for-CBA-42.5-MW-SOLAR-PROJECT.pdf

[1010] INFORSE (2021). Plan for 100% Renewable Energy Scenario in Kenya by 2050. https://www.inforse.org/africa/pdfs/Pub_100-Renewable-Energy-Plan-for-Kenya-by-2050-12-08-2020.pdf

5.4 Market development activities

Market development interventions are designed to boost household adoption of eCooking solutions and directly impact the use of eCooking technologies. These interventions include behavior change communication (BCC), stove subsidies, fuel subsidies, stove financing, and fuel bans. However, due to evidence indicating that fuel bans disproportionately affect the poor, disrupt livelihoods, and foster illegal trading, they are excluded as a viable market development intervention[11]. Instead, the interventions considered are behavior change communication (BCC), stove subsidy, fuel subsidy, and financing.

5.4.1 Behaviour change communication

Programme objectives

The Ministry of Energy and Petroleum is currently implementing a Behaviour Change Communication (BCC) strategy to increase awareness of the benefits of clean cooking and encourage the uptake of improved cooking solutions. The rallying call of this BCC campaign is ***"Upishi Bora, Afya Bora."*** The messages focus on the benefits of using improved cooking solutions, such as saving money and time, improving health, and positive environmental impacts. Other behaviour change communication interventions include the Pika na Power conducted at the Kenya Power demonstration centres, and activities under the eCooking hubs in Kakamega, Kisumu, Kitui, Makueni, and Nakuru.

Programme structure.

The existing BCC strategy offers a strong foundation upon which efforts to scale eCooking in Kenya can build on. eCooking can be integrated into Phase II of the current BCC. Subsequently, an eCooking-specific BCC will be implemented for 2 years between 2025 and 2026:

- *Ideation, branding, and rallying call:* Adapt the rallying call of "*Upishi Bora, Afya Bora*" to include messages about eCooking. Showcase the added benefits such as energy efficiency, safety, and sustainability alongside planned clean cooking messages.
- *Execution of an awareness and behaviour change strategy:* Use both above-the-line (ATL) methods such as media advertising, broadcast SMSs, social media adverts, and below-the-line (BTL) methods that employ existing institutional; and community networks to execute an eCooking-specific awareness campaign[12].
- *Focus on elements of behaviour change*: Align the focus on elements of behaviour change in the existing strategy with the specific behaviours needed for the adoption of eCooking, such as the use of efficient eCooking appliances, safety precautions, time-shifting cooking times to off-peak hours, and efficient cooking techniques.
- *Media advocacy to enhance public awareness and understanding of clean cooking:* Extend existing media advocacy plans to feature stories and testimonials about the successful transition to eCooking. Highlight these in public service announcements and editorial pieces.
- *Special events to promote clean cooking:* Host events like cooking demonstrations, workshops, and exhibitions specifically focusing on eCooking technologies. Utilize these platforms to educate the public on safety, efficiency, and the range of eCooking options available.

[11] See Das, et al.,(2021) for a discusion on fuel ban.

[12] These networks include Community Health Volunteers (CHVs), Community Forest Associations (CFAs), Agricultural Extension Officers (AEOs), Water Users Associations (WUAs) and women's groups

- *Engaging the private sector/ industry players in promoting clean cooking:* Forge partnerships with electric appliance companies and financial institutions offering consumer-friendly financing options for appliance purchases. Use these platforms to educate people about warranties and quality assurance, highlighting the longevity and safety of quality eCooking appliances.

Target beneficiaries

The strategy aims to target a specific population subset for a behaviour change communication intervention, primarily focusing on those who have Tier 3+ electricity access, predominantly rely on various fuel sources, but are less inclined to shift their consumption behaviour.

Implementation Timeline

- 2 years, from 2025 to 2026

5.4.2 Appliance subsidies through RBF programmes

The Result-Based Financing (RBF) programme aims to serve as a catalyst for market transformation in the eCooking sector. This intervention is strategically timed to capitalize on both the supply-side demand for last-mile promotional support and the latent demand-side potential for higher-tier cooking solutions among households and MSMEs in Kenya. It is designed to overcome market entry and development hurdles by providing targeted financial support to manufacturers, distributors, and financial intermediaries. This subsidy programme leverages lessons from previous RBF programs and integrates a multi-faceted approach.

Programme structure

- A successful programme requires both ex-ante and ex-post incentives for both supply chain development and inventory.
    - Upfront financial awards will be made to supply chain actors for procuring eCooking appliances from eligible manufacturers. This aims to ensure sufficient product availability in the market and reduce stock-out situations. Further, upfront financial support will be provided for activities that aim to generate market awareness, establish sales distribution networks, and develop women-led sales agents. Training programs will be organized to boost the competence of sales agents, especially focusing on empowering women to take active roles.
    - Ex-post incentives will be disbursed on a per eCooking appliance basis once sales are independently verified. Companies and vendors will pre-finance activities to lower market entry barriers. Upon verified sales to end-users, these companies will receive incentives. These incentives will cover 30-50percent of the appliance retail price depending on socio-economic class of targeted households.
    - The RBF payment schedule will be linked to the measured use of the appliances to encourage companies to invest in training and after-sales support for users. To support this, the programme should incorporate smart metered appliances.
    - Incentives will be tiered, considering market realities like currency fluctuations and external disruptions.
- A gender-inclusive approach will be incorporated whereby additional financial incentives for enterprises that effectively include women in the supply chain, either through employment or women-led distributorships.
- A collaboration with mini-grid developers will be encouraged to enable bundled offers and new market opportunities.

- To provide further consumer financing options, partnerships will be established with digital finance institutions and microfinance institutions to enable Pay-As-You-Go (PAYGO) or Pay-As-You-Cook (PAYC) financing schemes for consumers.
- Monitoring and independent verification will be facilitated by regular tracking of supply chain metrics and consumer adoption rates. Independent Verification Agents (IVAs) will be employed to verify the results on which financial disbursements are based.

Eligibility criteria

Target households:	All poor households with Tier 3+ electricity access.
Technologies:	Electric Pressure Cookers (EPCs) and induction cookers that meet predefined energy-efficiency standards
Vendors:	Retailers, distributors, manufacturers

Implementation Timeline

- 3 years, from 2026 to 2028

5.4.3 Credit Financing programme

The credit financing programme aims to facilitate adoption of eCooking solutions across Kenyan households by significantly reducing initial appliance acquisition costs. This programme will capitalize on the existing PayGo infrastructure and foster robust collaborations with key financial stakeholders, including commercial banks and microfinance institutions. The programme could stimulate further developments within Kenya Power's plans to implement utility-led financing schemes such as data sharing/co-marketing and on-bill repayment, and on-bill financing in minigrids. Recognizing the economic challenges faced by many Kenyans, this initiative is designed to offer credit solutions that are both affordable and flexible. The programme would provide households with preferential interest rates, extended repayment periods, and tailored financial education.

Programme structure

- The programme will engage with financial intermediaries: commercial banks, microfinance institutions, digital finance institutions, PayGo technology providers, and relevant government agencies to solicit interest and commitment. A suite of tailored credit products specifically for eCooking appliance purchases will be co-developed with partnering financial institutions, considering competitive interest rates, flexible repayment terms, and minimal processing fees. These credit products will be integrated with PayGo platforms, ensuring seamless purchase-to-payment experiences for consumers.
- A simplified credit assessment mechanism tailored to eCooking appliance acquisition will be developed, factoring in both formal and informal income sources, to ensure quick turnaround times for loan approvals to enhance customer experience. The terms may also be defined around the predicted savings from switching to eCooking.
- Flexible financing models would be considered such as traditional monthly repayments with competitive interest rates, tiered financing targeting different interest rates or repayment periods based on appliance type or household income. Leveraging PayGo technologies, customers can make flexible payments based on their usage or as they can afford.

- Building on the BCC intervention, widespread campaigns would be conducted to create awareness about the availability of credit financing for eCooking. In addition, the programme will incorporate financial literacy and customer education on understanding credit, responsible borrowing, and financial planning tailored to eCooking appliance purchase and use. Educational materials will be distributed with each appliance sale, providing tips on efficient use and maintenance.
- Smart metered eCooking appliances would aid in monitoring the usage patterns, which can be crucial for remote shut-off in PayGo models, credit assessment and setting up customised loan terms.
- The programme will incorporate continuous monitoring of credit repayments and periodic check-ins with beneficiaries to ensure smooth repayment processes. Periodic assessments will be incorporated to measure the number of households transitioning to eCooking, carbon emissions saved, and overall impact on community well-being.

Eligibility criteria

Target households:	The target demographic has Tier 3+ electricity access, and falls in the lower middle & middle income brackets, that are willing to transition to eCooking.
Technologies:	Electric Pressure Cookers (EPCs), and induction cookers that meet predefined energy-efficiency standards
Vendors:	Microfinance institutions, commercial banks, digital finance companies, other financial intermediaries

Implementation Timeline

- 5 years, from 2024 to 2028

5.4.4 Value Added Tax waiver

High upfront costs are often cited as a significant barrier to embracing cleaner, more efficient eCooking appliances. Reducing the financial burden through tax incentives would pave the way for greater public acceptance and usage.

Programme objectives

A VAT tax waiver on energy-efficient eCooking appliances like the EPC, induction cooker, and rice cooker serves multiple beneficial purposes. The most immediate effects would be to make these energy-saving appliances more affordable for consumers, thereby encouraging widespread adoption. Such a tax waiver would create economic ripple effects. The increased demand for energy-efficient cooking appliances can stimulate economic growth, providing impetus to the retail and manufacturing sectors related to these appliances, and yielding opportunities for more tax revenue collection in the future. Moreover, as the market for these products grows, it can spur further innovation and research and development in the sector.

Programme structure

- Eligible appliances are the Electric Pressure Cooker (EPC), induction cooker, as they balance energy-efficiency standards with versatility.
- The waiver would apply for purchases made between July 1, 2025, and June 30, 2027.

- An awareness campaign to inform consumers about the VAT waiver, highlighting the benefits of energy-efficient eCooking. This can be integrated into existing Behaviour Change Communication strategy.
- Manufacturers and retailers must register for the VAT waiver to offer tax-free sales, ensuring only qualified, energy-efficient products are sold under the waiver.
- Retail point-of-sale systems will be updated to automatically apply the VAT waiver on eligible products during the promotion period.
- Mechanisms for vendors and consumers to document purchases of tax-free items will be implemented to monitor the program's impact and ensuring compliance.

Eligibility Criteria:

Target households:	This is a market wide intervention. For costing purposes, we assume that all households benefiting from the BCC intervention, appliance subsidies, and the financing programme will also enjoy a VAT waiver. Moreover, the upper middle income and wealthy households, who primarily benefit only from the BCC, will also gain from the tax waiver.
Technologies:	Locally manufactured/assembled and imported Electric Pressure Cookers (EPCs) and induction cookers that meet predefined energy-efficiency standards

Implementation Timeline

- 2 years, from mid-2024 to mid-2026

5.4.5 Impact of market development activities

As discussed in the preceding section, the market interventions create awareness, address the cost aspects of eCooking solutions through lowering prices, and financing challenges through instalment payment. The impact of the market development interventions is assessed using the Benefit of Action to Reduce Household Air Pollution (BAR-HAP) tool[13]. The BAR-HAP tool is an excel based tool developed by the World Health Organization (WHO) to assist stakeholders in the cooking energy sector to calculate the costs and benefits of transitioning to various cleaner cooking options. The tool allows users to examine the baseline fuel use situation, analyze one or multiple transition(s) to cleaner cooking fuels or technologies, as well as policy interventions to apply to the transition scenario(s). The tool incorporates evidence on the effectiveness of different interventions and on the demand for improved cooking solutions, for prediction of impacts from different interventions. The tool uses cost-benefit analysis following WHO advice on health economic analysis and evaluation[14].

In analysis and evaluation of the potential cost and benefits, eCooking adoption is determined by factors like households' access to Tier 3+ electricity, willingness to switch to eCooking, and economic status. Accordingly, interventions are customized for specific household profiles. These profiles have been utilized to calculate the target households for cost estimation. Nonetheless, it

[13] For comprehensive introduction to BAR-HAP tool see BAR-HAP user manual, journal article, and the references therein.

[14] Lauer, J.A., Morton, A., Culyer, A.J. and Chalkidou, K., 2020. What Counts in Economic Evaluations in Health? Benefit-cost Analysis Compared to Other Forms of Economic Evaluations

is anticipated that spillover effects will occur, where non-targeted households also gain from the interventions. ***See Appendix 4 for a more detailed methodological note on intervention targeting, along with the rationale for stove stacking.***

It is on this backdrop that the BAR-HAP tool is used to assess the potential costs and benefits of the following interventions:

- **Behaviour Change Communication (BCC)-**targets households with Tier 3+ electricity access but reluctant to switch. Assumed to run for 2 years, BCC is projected to be 10% effective.
- **Stove Subsidy** aims at poorer households willing to adopt eCooking, offering an 80% subsidy on stove costs for 3 years.
- **Credit financing** focuses on lower and middle-income groups willing to transition, allowing stove purchases in instalments over the strategy's 5-year span, potentially increasing demand by 60%.
- **Tax Waiver**, targeting upper-middle and wealthy households ready to switch, offers VAT exemptions for 2 years.

Below is a breakdown of the expected impact of each market development intervention which we denote as the baseline scenario. It takes into the empirical effectiveness of each intervention, the number of targeted households, stove stacking, and the overall prevalence of eCooking post intervention.

Table 5.1 Outcomes of market development activities

Interventions	No. of Targeted Households	Proportion of the Population	Transition to eCooking			Prevalence
			One Solution	Primary Solution	Secondary Solution	
Behaviour Change Communication (BCC)	2,897,862	21.0%	0.70%	0.80%	0.10%	1.60%
Stove Subsidy	1,049,833	7.6%	0.50%	0.30%	0.00%	0.80%
Financing program	2,471,754	17.9%	0.60%	2.90%	0.00%	3.50%
Tax Waiver	3,087,451	22.3%	1.20%	2.30%	0.10%	3.60%
Baseline Prevalence			0.13%	0.11%	1.02%	1.26%
Total Prevalence	**9,506,900**	**68.8%**	**3.13%**	**6.41%**	**1.22%**	**10.76%**

The market development interventions have a potential to transition a total of **10.76 percent** of households from other cooking solutions into primary and secondary eCooking. The analysis shows that the largest contribution comes from the VAT waiver and the credit financing program (3.6 percent and 3.5 percent new eCooking households respectively). BCC contributes 1.6% new eCooking households, and the stove subsidy (RBF programmes) 0.8 percent. The expected number of eCooking households in 2028 will be 1,484,880. To achieve this, the Total Strategy Implementation Costs estimated are **USD 58,009,440** (equivalent to **KES 9,281,510,400**). The overall monetized benefits are projected to be **$241,698,449**. (see the Action Plan for a detailed investment overview).

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Sensitivity Analysis on the Expected Impact of Market Development Interventions

The BAR-HAP tool is used to assess the sensitivity of the potential eCooking transition to both the planned development in the sector and an experimental eCooking tariff as outlined below (see the Modelling Report for detailed exposition on the sensitivity scenarios):

- **Sensitivity to planned sector interventions:** This scenario assumes all the anticipated developments within the cooking sector are implemented as planned. This includes Kenya Power's initiative to transition 500,000 households to primary eCooking within three years, Burn Manufacturing's strategy to distribute 3 million appliances across East Africa by 2026, a Carbon financing project aimed at subsidizing distributing 1 million appliances, and an EnDev's Result-Based Financing (RBF) program targeting 20,000 appliances. The scenario assumes BCC, credit financing, RBFs and a VAT waiver are implemented, with an outcome of 16.46% eCooking prevalence by end of 2028.
- **Sensitivity to an experimental eCooking Tariff:** This scenario assumes that a 50% reduction in household electricity tariff is implemented, with an outcome of 17.06% eCooking prevalence by end of 2028.

The potential impact is summarized in the table below:

Benefit	Measure	Unit of Measure	Baseline Scenario (10.76% eCooking)	Speculative/ Planned Activities Scenario (16.46% eCooking)	Experimental Tariff (17.06% eCooking)
Health Benefits	Health Impact	DALYS avoided	40,096	85,804	86,404
	Mortality Reduction	YLL	23,875	59,428	60,250
	Mortality Reduction	Lives	1,438	3,578	3,625
	Morbidity Reduction	YLD	10,167	25,324	25,673
	Morbidity Reduction	Cases	53,449	103,136	134,211
Impact on Drudgery	Total Time savings	HOURS	126,152,393	282,276,403	285,934,508
	Average time savings (adopting household)	HOURS	3,607	3,625	3,691
Environmental Benefit	CO2-equivalent reduction (CO2, N2O, CH4, CO, OC, BC)	TONNES	12,106,055	23,857,043	24,170,715
	Unsustainable wood harvest avoided	KGS	1,566,078,001	4,895,797,985	4,967,441,728
	Net Present Value of Social Benefits (Full Program)	**USD**	**241,698,448**	**297,284,891**	**163,901,305**

Here are some implications of the findings for each scenario:

- The baseline scenario provides a conservative prediction of the transition to eCooking, acting as a benchmark for more ambitious initiatives within the cooking sector.
- The experimental tariff scenario demonstrates the highest benefits across all metrics except for net present value (NPV).

- The lower NPV in the experimental tariff scenario is attributed to the substantial cost of subsidizing electricity, estimated at $488,094,193 for the strategy period (see Modelling Report).
- The speculative/planned activities scenario, based on planned cooking sector activities, could yield the highest NPV.
- The speculative/planned scenario suggests that if sector plans are fully implemented, there could be higher eCooking prevalence, the highest NPV and relatively high benefits.

Summary of the Implications:

- If maximizing health benefits while achieving a balance with time savings and environmental benefits is the primary goal, both planned interventions and the experimental tariff scenario are comparable. However, implementing planned interventions might be more feasible due to the complexity of the experimental tariff implementation.
- If cost-effectiveness and a gradual approach are prioritised, the planned interventions scenario offers a good option, closely aligned with the experimental tariff scenario.
- The baseline eCooking scenario is a conservative option with lower costs and relatively lower impact on health, time savings, and the environment.

Ultimately, budget availability and potential grid impact (assuming no solar eCooking or battery-supported eCooking) would influence the choice of a transition option.

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6 Towards a Coordinated Policy Approach to eCooking in Kenya

Embedding eCooking within broader national strategies and related policy instruments is crucial for achieving integrated energy planning. By aligning the eCooking initiative with existing policies on energy, environment and climate action, health, and industrialization and innovation, we can ensure a more harmonious and effective rollout. This approach creates synergies across sectors, maximizes resource utilisation, and fosters a coherent and comprehensive framework for energy planning that can better attract investment and facilitate easier monitoring and evaluation. This section explores opportunities to embed eCooking with other national strategies.

6.1 Opportunities to integrate clean cooking and electrification policy

To create a more integrated policy framework for eCooking in Kenya, connections can be made across various policies and national strategies in the energy sector. Clean cooking and electrification goals need to be better aligned within existing energy policy and planning frameworks, among them, Kenya's National Energy Policy, the Kenya National Electrification Strategy (KNES), the Integrated National Energy Plan (INEP) under development, the Least Cost Power Development Plan (LCPDP) and County Energy Plans. Table 5.1 outlines areas for synergies and opportunities to embed eCooking within broader policies.

Table 6.1 Potential areas for synergies between clean cooking and electrification policy

Potential Areas for Synergies	Actions and Recommendations
Develop a coherent policy framework	- Create a clear narrative linking eCooking with broader objectives such as public health, deforestation reduction, and climate change targets in all energy policies, plans and strategies. - Harmonize targets and objectives by integrating clean cooking and electrification goals across energy policy and planning frameworks.
Foster coordination and collaboration among stakeholders	- Foster information sharing, joint planning, and resource mobilization among established mechanisms like Integrated National Energy Planning Committee, County Energy Planning Committees, and LCPDP oversight committee, and the Clean Cooking Delivery Unit.
	- Include diverse stakeholders such as civil society and organizations like CCAK and ELCOS in coordination bodies to ensure inclusivity and diverse perspectives.
	- Strengthen capacity of relevant stakeholders through technical assistance, training, and capacity-building support from international partners like the GeCCo coalition.
Integrate clean cooking and electrification goals into County Energy Plans	- Engage local stakeholders in the process and conduct local assessments to tailor strategies and interventions to specific county needs and opportunities.
Leverage existing monitoring and evaluation systems in energy policy processes	- Utilize existing monitoring and evaluation systems to track progress towards eCooking goals and inform future policy decisions.

6.2 Opportunities to embed eCooking within other national strategies.

eCooking can further be embedded within other policy domains and national strategies can help create a more integrated and supportive environment for promoting clean cooking solutions. Table 5.2 outlines ways that eCooking can be integrated in climate change and environmental policies, health policies and innovation and industrial policies.

Table 6.2 Opportunities to embed eCooking within other national strategies

Policy Area	Policies	Opportunities for Embedding eCooking
Climate Change and Environmental Policies	• National Climate Change Action Plan (NCCAP) (2023 - 2027), • The Climate Change Act (2016), • The Environmental Management and Coordination Act (EMCA) (1999, amended in 2015), • The Forest Conservation and Management Act (2016), • the National Adaptation Plan (NAP) (2015-2030) • the Green Economy Strategy and Implementation Plan (GESIP) (2016-2030) • the new Nationally Determined Contribution (NDC) targets	• Ensure consistent inclusion of eCooking across relevant climate change and environmental policies, strategies, and plans. • Incorporate targets and strategies for promoting eCooking in the National Climate Change Action Plan (NCCAP) and the Climate Change Act. • Integrate eCooking into pollution control measures, waste management strategies, and natural resource conservation efforts outlined in the Environmental Management and Coordination Act (EMCA). • Leverage the Forest Conservation and Management Act to promote eCooking as a means to reduce deforestation and forest degradation. • Establish inter-agency working groups or committees for coordinated target setting, messaging, implementation, and monitoring of clean cooking and electrification initiatives.
Health Policies	• The Kenya Health Policy (2014-2030) • Kenya National Strategy for Maternal and Child Health (2018-2022)	• Incorporate specific health targets related to implementing clean cooking and electrification strategies into health policies and strategies. • Strengthen collaboration between the Ministry of Health, the Ministry of Energy, and respective county departments to develop a coordinated approach for target setting, implementation, and messaging. The Air Pollution Centre of Excellence at KEMRI can play a role through joint awareness campaigns, policy formulation, and research to promote electric and clean cooking to reduce household air pollution. • Develop capacity-building programs for healthcare providers, policymakers, and stakeholders to raise awareness of the health benefits of eCooking. This could be achieved by for instance, connecting with the Clean Air Africa programme to integrate eCooking into their Community Health Volunteer capacity building programme. • Establish financial mechanisms and incentives to encourage adoption in areas with high rates of indoor air pollution and related health issues.

Innovation and Industrial Policies	• Kenya's Vision 2030, • Science, Technology, and Innovation (STI) Act (2013) and draft STI policy, • Kenya's Industrial Transformation Programme (2015), • Micro, Small, and Medium Enterprises (MSMEs) Development Policy, • The Startup Bill (2020), • The draft Intellectual Property Bill 2020, • The Big Four Agenda)	• Intensify research and innovation in eCooking technologies by supporting collaboration between academia, research institutions, and the private sector. • Enhance technical and entrepreneurial skills in the clean cooking and electrification sectors through targeted training programs. • Provide access to financing, grants, loans, and investment incentives for businesses and entrepreneurs involved in clean cooking and eCooking projects. • Support market development for eCooking technologies through targeted interventions and a comprehensive regulatory framework. • Align policies with Kenya's Vision 2030, Science, Technology, and Innovation (STI) Act, Industrial Transformation Programme, and the Big Four Agenda.

In conclusion, embedding eCooking within various policy domains and national strategies can create a more integrated and supportive environment for promoting clean cooking solutions in Kenya. By aligning eCooking with climate change and environmental policies, health policies, innovation and industrial policies, the country can optimize the benefits of eCooking in multiple areas, such as reducing mitigating climate impacts, improving health outcomes, and stimulating innovation. A coordinated approach that fosters collaboration between relevant government agencies and stakeholders, leverages resources and expertise, supports development of the innovation system, and raises public awareness will be instrumental in driving the widespread adoption of eCooking in Kenya.

7 Conclusion

The eCooking strategy presents a comprehensive roadmap towards scaling electric eCooking access and adoption across Kenya. However, some gaps in the strategy, and in knowledge still persist, and thus, a medium-term review complemented by additional studies is imperative. Suggested studies to be commissioned include, but are not limited, to the following:

- Determine the current expenditures and frequency of payments for cooking fuels across different market segments, and assess their compatibility with existing and potential payment models for electric appliances and electricity, such as cash purchases versus consumer financing options.
- Produce a set of load profiles that represent the likely demand for electricity for cooking amongst key market segments.
- Identify underserved areas of the country, both in terms of appliance retail and after-sales service, and explore mechanisms to incentivise supply chain development and the establishment of repair and maintenance infrastructure.
- Identify any bottlenecks in the electricity supply infrastructure (e.g. poor-quality household wiring, overloaded transformers or load limited connections), evaluate the severity of fluctuations in the electricity supply (blackouts and voltage instability) in different parts of the country and for different market segments and explore potential mitigation strategies such as energy storage, wiring upgrades, fuel stacking, solar eCooking.
- Conduct an analysis on the effects of lowering or eliminating import duties and other charges to decrease the initial cost of energy-efficient appliances.
- Develop the investment prospectus further to attract funding into the eCooking sector by showing the costs/benefits of implementing the strategy for the power sector, in terms of increased revenue for the off taker and off-grid energy companies. Similarly expand the investment prospectus for banking sectors, e.g. in terms of specific products for e-cooking.

These studies will not only refine the strategy's effectiveness but also stimulate further investment in the electrification and clean cooking sectors.

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