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Ministry of Energy

Malawi eCooking Roadmap

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MECS
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as part of a consortium with
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SUSTAINABLE ENERGY FOR ALL

Global Energy Alliance for People and Planet
GEAPP

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Acronyms

AfDB	Africa Development Bank
CAP	Country Activation Plan
DDS	Direct Drive Solar
EGENCO	Electricity Generation Company
EnDev	GIZ Energising Development
EPC	Electric Pressure Cooker
ESCOM	Electricity Supply Corporation of Malawi
GEAPP	Global Alliance for People and Planet
GeCCo	Global eCooking Coalition
GETF	Green Economic Transition Facility
GMA	Global Market Assessment for Electric Cooking
GoM	Government of Malawi
HLDE	United Nations High Level Dialogue on Energy
IEP	Integrated Energy Planning
IPP	Independent Power Producer
KPLC	Kenya Power and Lighting Company
LDC	Least Developed Country
MAREP	Malawi Rural Electrification Programme
MBS	Malawi Bureau of Standards
MCFA	Modern Cooking Facility for Africa
MCHF	Modern Cooking for Healthy Forests Programme
MCMI	Malawi Carbon Markets Initiative
MDA	Ministry, Department and Agency
MEAP	Malawi Energy Access Project
MECS	Modern Energy Cooking Services Programme
MEGA	Mulanje Electricity Generation Agency
MERA	Malawi Energy Regulatory Authority
MoE	Ministry of Energy
MoF	Ministry of Finance
MoGCDSW	Ministry of Gender, Children, Disabilities and Social Welfare
MoNRCC	Ministry of Natural Resources and Climate Change
MRA	Malawi Revenue Authority
MTF	Multi-Tier Framework
NCSC	National Cookstove Steering Committee
PPA	Power Purchase Agreement
SDG	Sustainable Development Goal
SEforALL	Sustainable Energy for All
UNDP	United Nations Development Programme
WFP	World Food Programme

Foreword

Engineer Alfonso Chikuni

Principal Secretary in the Ministry of Energy

Cooking with unsustainably harvested biomass is having multi-dimensional, negative impacts on Malawi's population, and the local and global environment. Through inefficient cooking on biomass, families are subjected to health-damaging smoke, spend increasing amounts of time and/or money sourcing fuel, the impacts of which are felt most by women and girls. Meanwhile, forest resources are depleting, soil fertility is reducing, and flooding and extreme weather are increasing in frequency and severity. Unchecked, these impacts are set to only worsen.

Addressing these issues requires a range of solutions suitable for different contexts and different timescales. Without viable alternatives, the country's majority rural, unelectrified population will rely on freely or cheaply sourced biomass (primarily firewood) as their main cooking and heating fuel in the short to medium term. However, there are also many who pay for unsustainable biomass (particularly charcoal) who have, or will in the near future have, access to electricity. If the status quo continues, this affordable and clean cooking solution will remain underutilised. This document, developed in collaboration between the Government of Malawi, the UKAid funded Modern Cooking Services programme (MECS), Sustainable Energy for All (SEforALL) and a cross-cutting group of key energy sector stakeholders, outlines a roadmap to foster an accelerated transition from unsustainably harvested biomass to eCooking in Malawi.

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Executive Summary

There is an important need and opportunity to accelerate Malawi's transition to clean cooking through increasing the adoption of electric cooking (eCooking) in the country.

Malawi's national grid has one of the world's highest shares of renewable energy but, despite over 550,000 households (14%) having a national grid connection, less than 2% of the population are primarily cooking with electricity. The majority of connections are in urban areas where, according to data collected in 2022, as many as 360,000 urban households (42%) have a connection to the national grid but are not cooking with electricity at all. Instead, they heavily rely on unsustainably sourced charcoal (82% use charcoal as part of their cooking stack) despite it being illegal in Malawi, damaging to health and the environment, and increasingly expensive. According to detailed research in neighbouring countries and preliminary analysis for Malawi, cooking with electricity may now cost as little as a quarter of cooking with charcoal.

In fact, over 90% of all domestic energy in Malawi comes from unsustainably sourced biomass to support cooking needs. This contributes to the negative global impacts of climate change including increasing the severity and frequency of extreme weather events, as well as negative local impacts, particularly droughts, floods and landslides. This combination of factors exacerbates humanitarian crises which are increasingly frequent in the country and disrupts the national grid's large share of hydroelectric generation, in turn harming consumer confidence in electricity as a reliable source of cooking energy; a key barrier to Malawi's transition to eCooking. Other barriers include low awareness and availability of eCooking devices (particularly those with high quality and efficiency), and the perception that it is expensive in both the short (to purchase devices), and long term (to purchase electricity units).

As of April 2023, the grid is once again stable, and its resilience will benefit from the Malawi-Mozambique interconnector scheduled to come online in 2024 and other power generation initiatives currently being undertaken with the goal to increase Malawi's generation capacity to 1000 MW by 2025. Assuming that future interconnections, planned additional generation capacity and infrastructure upgrades lead to a sustained reliability and increased resilience of the grid, there is a real opportunity to clean up Malawi's cooking fuel mix through increasing the adoption of eCooking. This roadmap has been developed as the first step in that journey specifically focussing on eCooking, laying out key future steps to aid in Malawi's clean cooking transition.

Malawi's cooking sector has been neglected by global and national stakeholders, but this is changing. Interest in the sector can catalyse an accelerated transition to eCooking and clean cooking in general.

In 2019, it was estimated that Malawi's cooking sector required USD600million of investment by 2030 to reduce biomass consumption to sustainable levels. Approximately just USD20million has so far been realised. Internationally and locally funded interventions, as well as Government spending towards cooking, have overall been negligible in comparison to those applied to electrification and other development outcomes.

However, there are an increasing number of funders taking an interest in Malawi's clean cooking transition. These include the already active Green Economic Transition Facility (GETF) and Modern Cooking Facility for Africa (MCFA), as well as the World Bank, the African Development Bank (AfDB) and the newly formed Global Electric Cooking Coalition (GeCCo) all engaging with the Ministry of Energy and wider cooking sector in 2023. Since COP26, there has also been increased interest in Malawi from carbon financiers (notably the Swiss Klik Foundation) and movements to develop a more robust regulatory framework including the launch of the Malawi Carbon Markets Initiative (MCMI). eCooking carbon finance projects in particular have the potential to generate high-integrity carbon credits through the use of remote metering technologies (see Box 3 for details of a pilot in Malawi); Malawi's nascent market and renewable national grid mean there is considerable potential for growth.

Off-grid eCooking is in its infancy, particularly in Malawi which has an underdeveloped off-grid energy sector for systems with the required capacity to support eCooking appliances. However, as technologies develop (the distribution of one has already started – see section 2.3.1) and as the sector grows, this may present an opportunity in the medium to long term with the right financial incentives.

Malawi has a strong policy environment in support of a transition to eCooking and at an international level has made clear its intentions to transition to clean cooking. For example, the Government of Malawi, the only least-developed country championing Sustainable Development Goal (SDG) 7, has set the goal of phasing out open fires by 2030 in its Cleaner Cooking Energy Compact, announced at the United Nations High-Level Dialogue on Energy in 2021. However, detailed strategies required to deliver a meaningful and widespread transition to clean cooking are lacking. A number of data collection and analysis initiatives are providing enhanced opportunities for evidence-based decision making, including Malawi's Integrated Energy Planning (IEP) tool, the biennial Modern Cooking for Healthy Forests (MCHF) programme's urban cooking evaluations, and soon to be published Multi-Tier Framework (MTF) assessment. Other countries in the East African region have been making great strides towards eCooking transitions. For example, Kenya and Uganda are both developing eCooking strategies, have experience rolling out eCooking awareness campaigns and have implemented eCooking tariffs; lessons from which Malawi can learn and apply.

This roadmap is Malawi's first eCooking-specific step and lays out a series of future steps for all sector stakeholders, towards accelerating the transition to clean cooking in Malawi.

Through a capacity building and consultative process, this roadmap has brought together input from more than 20 public and private sector, civil society, and academic organisations. The roadmap aligns with Malawi 2063 which recognises the need to "diversify our cooking away from using biomass towards cleaner and environmentally sustainable means". This will be achieved through supply-side (Pillar 1) and demand-side (Pillar 2) interventions, coupled with enhancing the enabling environment (Pillar 3) for increasing adoption of eCooking. Each pillar is split into sub-pillars and actions which are detailed in full in section 3.2 of the roadmap.

Pillar 1 – Improved supply: Integrate eCooking into grid extension and densification efforts

- Sub-pillar 1)a) Fully integrate eCooking into electricity access planning and delivery
- Sub-pillar 1)b) Strengthen the resilience and capacity of the national grid

Pillar 2 – Increased demand: Increase proportion of grid-connected households and institutions using electricity as their primary cooking fuel

- Sub-pillar 2)a) Increase affordability of eCooking (and other clean cooking solutions)
- Sub-pillar 2)b) Increase awareness of eCooking as an attractive alternative for grid connected households, businesses, and institutions

Pillar 3 – Enhanced enabling environment: Build capacity within key ministries, departments, agencies (MDAs) and key stakeholders around cooking and eCooking in particular

- Sub-pillar 3)a) Continue to build capacity with key MDAs and stakeholders on clean cooking and eCooking
- Sub-pillar 3)b) Strengthen tracking of progress towards Malawi's cooking sector commitments
- Sub-pillar 3)c) Encourage research and development of innovations in the eCooking and clean cooking sector

Recommendations

The roadmap's proposed actions are presented and summarised as a two phased approach to highlight those which should be more immediately prioritised. Phase 1 focusses on laying a strong foundation to foster a scaled transition to eCooking through capitalising on immediate opportunities to build capacity, develop evidence and strategy, and create a more enabling environment. International funders such as the World Bank and AfDB have committed to supporting Malawi's transition to clean cooking; this should be most immediately leveraged towards Phase 1 actions. The second phase focuses on scaling up an eCooking transition through marketing, incentives, and continued electricity infrastructure expansion and strengthening.

Phase 1: Build a strong foundation for eCooking

Timeline: by end June 2025 (see detailed roadmap for action-specific proposed timelines)

Develop a strong understanding of supply-side limitations and eCooking demand requirements on the national grid.
Actions: 1)a)i) / 1)a)ii)

The potential for a scaled transition to eCooking is contingent on the capacity of the national grid to generate and transmit a sufficient quantity and quality of electricity to support it. This is essential not only to satisfy existing eCooking users but also build confidence in potential new ones. Baseline analyses and regular updates should be conducted to understand electricity generation and distribution capacity to support demand growth in eCooking (as well as industry and high-demand sectors), to highlight the opportunity for scale-up and ensure that it does not destabilise the grid. This should be supported by contextually accurate load profiles for eCooking device use in Malawi.

Develop a comprehensive, evidence-based, clean cooking strategy which includes eCooking and a comprehensive monitoring system.
Actions: 1)a)iii) / 2)a)i) / 2)a)iii) / 2)b)i) / 3)b)i) / 3)b)ii)

GoM should lead a process of developing a clean cooking strategy, which integrates all relevant sub-sectors including eCooking and electrification in collaboration with all other relevant non-governmental stakeholders. The process should be supported by the best available evidence (e.g. MTF, MCHF data, IEP) and studies to fill knowledge gaps including a fiscal incentive impact assessment, development of efficiency standards for all electrical devices, technical studies into the interface between the national grid and eCooking (see next recommendation), and studies on the comparative cost of using different cooking solutions. A process of regularly and robustly tracking progress against targets should be established based on a revised Cleaner Cooking Energy Compact and regularly updated IEP tool with strengthened cooking component.

Build capacity of, and foster coordination and shared learning between, key clean cooking, eCooking and electrification stakeholders.
Actions: 3)a)i) / 3)a)ii) / 3)c)i)

Capacity of key clean cooking, eCooking and electrification stakeholders needs to be strengthened and clean cooking focal points and/or champions in all relevant GoM and non-governmental institutions should be established to coordinate and advocate on clean cooking issues. The creation of an eCooking working group within the NCSC which reports to the National Planning Commission's Economic Infrastructure Enabler Coordination Group should encourage coordination and monitoring of progress. Those piloting innovative eCooking technologies and approaches should also be encouraged to use the NCSC as a platform to share learning to inform and inspire new entrants into the sector.

Implement and enforce existing legal and policy instruments to create a more enabling environment for growth in the eCooking and clean cooking sector in general.
Actions: 1)a)iii)

Malawi already has several policy and regulatory instruments which are relevant to a scale-up of eCooking. These include the Forestry Act's ban on unlicensed charcoal and National Energy Policy commitment to remove tax and duty for energy-efficient eCooking and water heating devices. If effectively implemented, these would significantly improve the enabling environment for the eCooking and clean cooking sector and boost private sector investment. Malawi should immediately begin developing efficiency standards for all electrical devices, drawing on existing standards from more developed markets such as Kenya or South Africa. To kick-start an eCooking transition GoM should, in the short term, remove tax and duty on all eCooking devices. The finalisation of Malawi's carbon framework will also give investors and implementors in the space more confidence to develop eCooking and clean cooking carbon finance projects at scale. Relevant stakeholders should begin to develop on-bill financing capabilities in preparation for phase 2 initiatives.

Phase 2: Scale up eCooking

Timeline: following phase 1 actions

Encourage adoption of eCooking and clean cooking through cohesive marketing and awareness raising
Actions: 2)b)ii)

Leveraging the strengthened capacity, coordination and strategies built under the first pillar, targeted marketing campaigns should seek to transition an appropriate segment of households onto eCooking and other clean cooking solutions as recommended by phase 1 analyses. This should include endorsement from all relevant GoM departments and bust common myths on topics such as cost and safety.

Incentivise households and the private sector to accelerate the scale-up of efficient eCooking devices
Actions: 2)a)iv)

The recommendations of the fiscal impact assessment from phase 1, should be implemented and work hand in hand with efficiency standards to incentivise growth in the eCooking market for higher efficiency devices in particular and make them more affordable to consumers. On-bill financing, the development of a framework for which is recommended as part of phase 1, would enable consumer incentives such as appliance financing to be offered in a targeted and scalable manner. An instituted carbon framework should provide investors with more confidence towards entering the sector, and project developers should focus on generating high-quality offsets using the Gold Standard metered fuels methodology to which many eCooking technologies are well suited.

Continuously upgrade, grow and diversify electricity generation and distribution infrastructure
Actions: 1)b)i) / 1)b)ii) / 1)b)iii) / 1)b)iv)

Malawi will need orders of magnitude more electricity generation and requisite distribution infrastructure to support a transition to eCooking at scale, particularly in the context of urbanisation, rural electrification and industrialisation. Planned interconnection and generation increases should be realised and, drawing on the analyses conducted under phase 1, targeted distribution infrastructure upgrades should be made where recommended, to facilitate growth in the adoption of eCooking and avoid destabilisation of the grid. The grid must also become more resilient through diversifying its sources of generation and better protecting its vulnerabilities (e.g. strong catchment area management around key hydro-electric sites).

1 Introduction

There is an important need and opportunity to accelerate Malawi's transition to clean cooking through increasing the adoption of electric cooking (eCooking) in the country. This roadmap has been developed as the first eCooking-specific step in this process and lays out a series of future steps for all sector stakeholders, including the Government of Malawi (GoM), civil society, private sector, academia, and funders/investors towards accelerating universal access to clean cooking in Malawi.

1.1 Malawi's energy access and cooking context

Malawi's national grid has a high renewable energy share (78%[1], in the top 25 countries globally), being supported 71% by hydroelectric generation[2] but less than 2% of households are cooking primarily with electricity despite 14% having access[3]. Access to electricity is very low in rural areas (6%) where over 80% of the population live. However, 550,000 households have national grid connections, the majority of which are in urban areas where over half have access to electricity (54%[4] - 72%[5]). Despite this, usage of eCooking as the main source of household cooking energy within their cooking stack[6] is low (6% - 27%); in fact, as many as 360,000 urban households (42%) have a connection to the national grid but are not cooking with electricity at all. According to census data, urban access to electricity has increased from 30% in 2004 to 46% in 2019 but cooking primarily with electricity decreased from 10% to 6%[7] (Figure 2). The main reasons for the decrease in eCooking rates have been found to be that eCooking is perceived to be expensive in both the short and long term, and a lack of confidence in the reliability of the national grid[8]. Data on institutional cooking energies is scarce, however, it is likely similar to household trends.

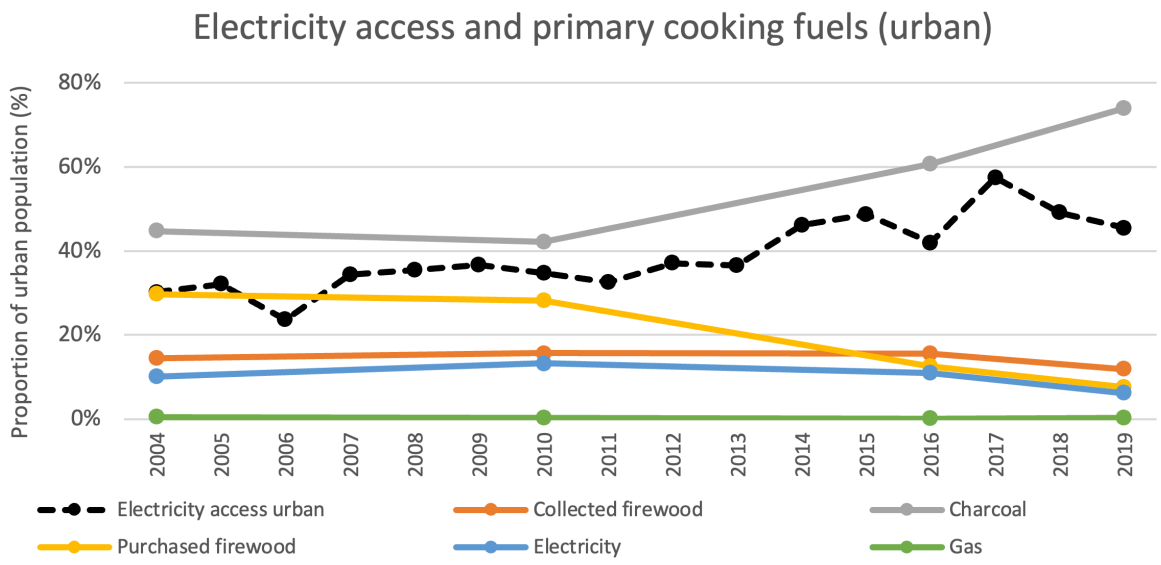

Figure 1 - Electricity access and primary cooking fuels in urban Malawi (national census data 2019[4])

[1] According to data available (2021), since then Malawi has removed 78MW of diesel generators from the grid (https://mwnation.com/poor-timing-of-aggreko-decommissioning-now-hurting/) and is therefore likely to have a renewable energy share of approximately 90%.

[2] https://www.irena.org/IRENADocuments/IRENA_Stats_Tool.xlsb

[3] https://data.worldbank.org/

[4] http://www.nsomalawi.mw/index.php?option=com_content&view=article&id=230&Itemid=111

[5] https://pdf.usaid.gov/pdf_docs/PA0211C8.pdf

[6] "The use of multiple cooking devices and fuels is commonly referred to as stove 'stacking'… given access to a portfolio of options and a diverse set of household needs, everybody stacks." https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7259482/

[7] Urban population almost doubled (2004: 1.8m, 2019: 3.2m), cooking with electricity barely changed (2004: 0.18m, 2019: 0.19m). Access to electricity but not cooking with it grew significantly (2004: 0.4m, 2019: 1.3m)

[8] https://ieeexplore.ieee.org/document/9342930

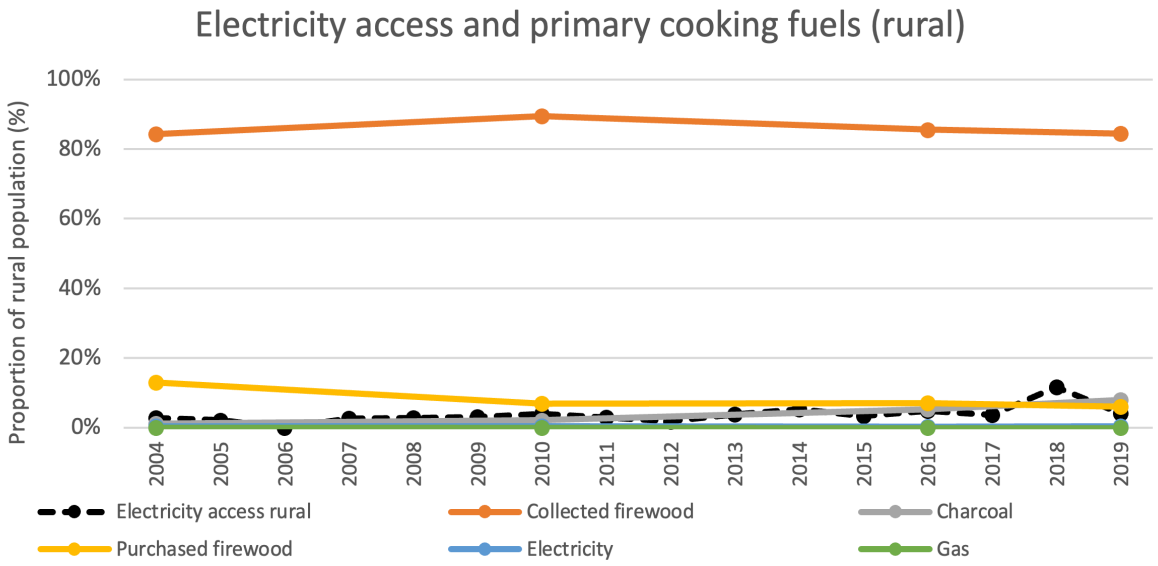

Figure 2 - Electricity access and primary cooking fuels in rural Malawi (national census data 2019[4])

By contrast, over 90% of all domestic energy comes from biomass[2] and supports cooking needs. Much of this biomass is unsustainably sourced [9] [10]. Urban households in particular rely heavily on illegal[11], unsustainably sourced charcoal (58% - 82%) – a trend which has been increasing over the last 10 years. The census data from 2010 – 2019[4] shows that the share of urban households primarily using charcoal for cooking increased from 46% to 78%, with detrimental effects on forest degradation[12] [13]. By 2021, forest cover had decreased by 37% relative to its level in 1990. If this trend continues, Malawi will lose its entire forest cover within the next 50 years[14] (see Figure 3). Demand for biomass for household cooking and heating is thought to constitute 90% of all demand for biomass in Malawi[15], with all other applications (e.g. construction, manufacturing, agricultural processing etc.) constituting just 10%[13].

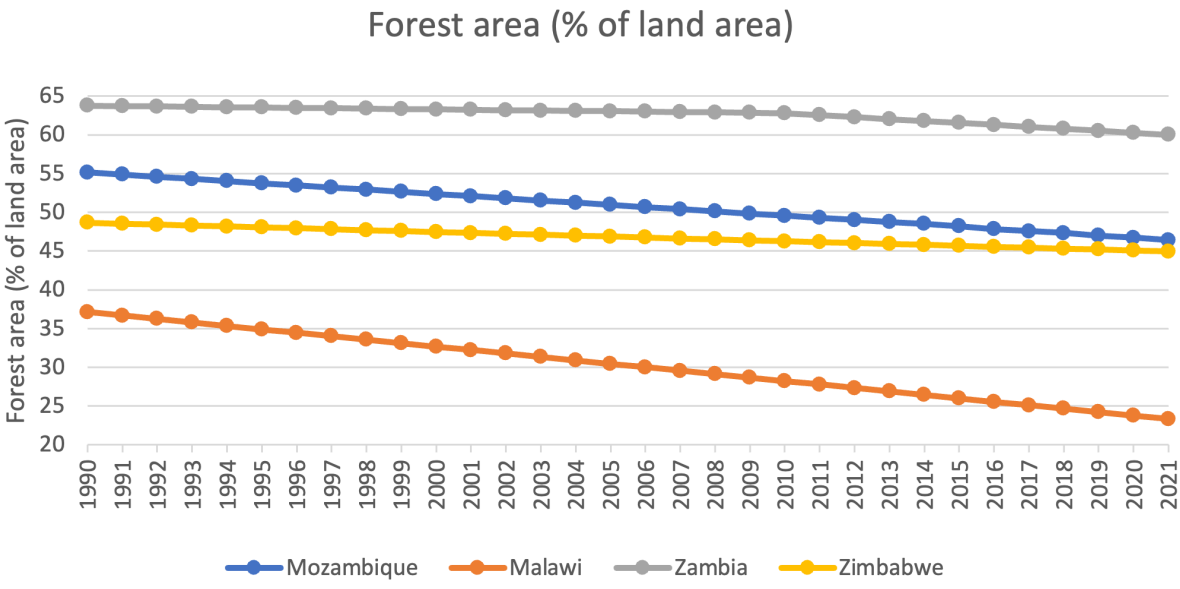

Figure 3 - Forest area as a percentage of land area for Malawi and neighbouring countries

[9] Charcoal and firewood is often sourced from forests without efforts to regenerate or replant.

[10] https://www.nature.com/articles/nclimate2491

[11] https://malawilii.org/akn/mw/act/1997/11/eng@2017-12-31#part_XII__sec_81

[12] https://www.fao.org/forestry/energy/catalogue/search/detail/en/c/1305657/

[13] http://www.wisdomprojects.net/global/csdetail.asp?id=38#

[14] https://data.worldbank.org/indicator/AG.LND.FRST.ZS?locations=MW

[15] The illegal charcoal market is thought to be worth 200 million USD per year in Lilongwe alone according to data shared by MCHF at Malawi's Cleaner Cooking Conference 2023. Enforcement of law around illegal charcoal production is very weak and irregular.

The increase in charcoal consumption has been largely driven by urban households, who previously primarily used purchased firewood or electricity for cooking (see Figure 4), switching to charcoal. This is despite increases in the cost of charcoal which is accelerating - more than doubling between 2020 and 2022 and showing no signs of slowing[5]. In fact, today cooking with electricity may cost as little as a quarter of cooking with charcoal[16]. Reasons for not switching to more sustainable alternatives include their perceived higher cost both upfront (to purchase the cooking device) and in the long term (the ongoing cost of the energy source), a lack of awareness and availability of alternatives and cultural barriers to behaviour change[8]. Reduced (even if still harmful) exposure to air pollution from charcoal compared to wood (and reduced health impacts) could also be a factor in the growth of charcoal demand relative to wood[17].

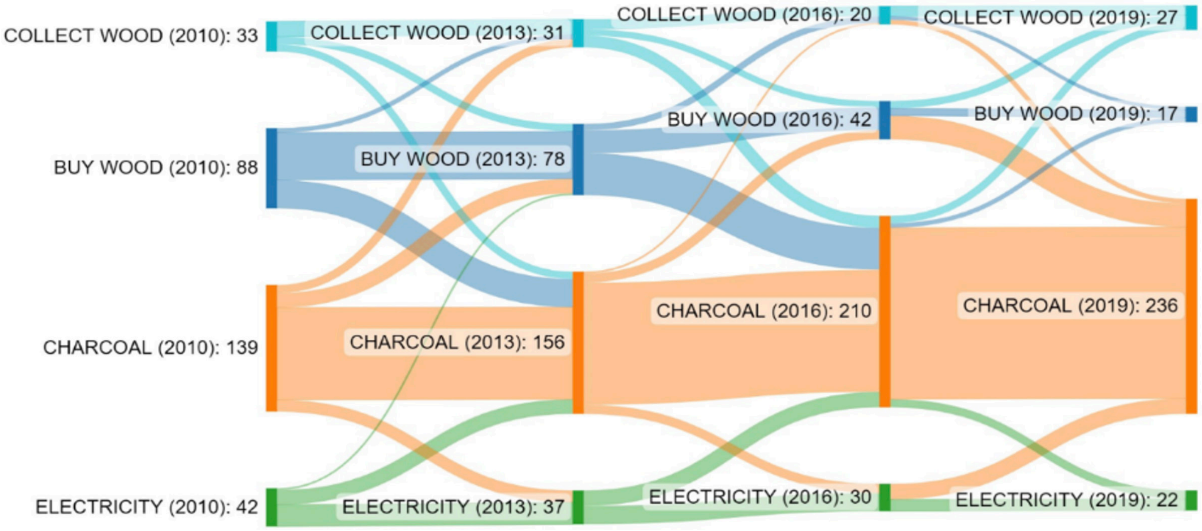

Figure 4 – Cooking fuel trends for the same 302 urban households between 2010 and 2019. Units are number of households using the fuel as their "primary cooking fuel" according to that year's census[18]

The reliance on unsustainable biomass, particularly charcoal, contributes to the negative global impacts of climate change, which are increasing the severity and frequency of extreme weather events, as well as negative local impacts of such weather (particularly droughts, flooding and landslides), causing humanitarian crises in the country on a yearly basis and disrupting the national grid's large share of hydroelectric generation. This irregular supply has been a challenge especially between January, 2022 and April, 2023 when customers across the country were experiencing regular blackouts for an average of 10 hours per day[19]. The grid is now once again stable, and its resilience will benefit from the Malawi-Mozambique interconnector scheduled to come online in 2024 and other power generation initiatives currently being undertaken targeting to increase Malawi's generation capacity to 1000 MW by 2025.

Assuming that future interconnections, planned additional generation capacity and infrastructure upgrades lead to a sustained reliability and increased resilience of the grid, there is a real opportunity to clean up Malawi's cooking fuel mix through increasing the adoption of eCooking. This roadmap has been developed as the first step in that journey specifically focussing on eCooking, laying out key future steps to aid in Malawi's clean cooking transition.

[16] https://mecs.org.uk/wp-content/uploads/2023/06/Malawi.pdf
[17] https://www.mdpi.com/1660-4601/18/17/9305
[18] http://www.nsomalawi.mw/index.php?option=com_content&view=article&id=230&Itemid=111
[19] 30% of Malawi's electricity generation capacity was lost due to damage to hydro-power plants from Cyclone Ana in January 2022 with repairs completed in April 2023.

1.2 The case for eCooking

1.2.1 An affordable, renewable source of cooking energy

In the context of Malawi with its national grid largely relying on renewable power generation, electricity is the cleanest source of cooking energy available to those with a grid connection. eCooking releases no harmful gases at point of use, so cooks (usually women and/or girls) are not exposed to harmful smoke from burning biomass[20]. Malawi's high renewables share of grid electricity also means that greenhouse gas emission levels are low.

In addition, in the long term, eCooking on the national grid is likely to be cost competitive to consumers relative to other commonly available, paid-for, cooking energy in Malawi. Figure 5 shows the relative cost of cooking with electricity compared with LPG and charcoal based on local prices of appliances and estimations of the energy required to cook from studies in neighbouring countries. Furthermore, Malawi is a relatively highly densely populated country, with the majority of the population living within close proximity of the existing grid, making grid expansion cheaper than in other African countries and eCooking a potential option for rural households in the longer term.

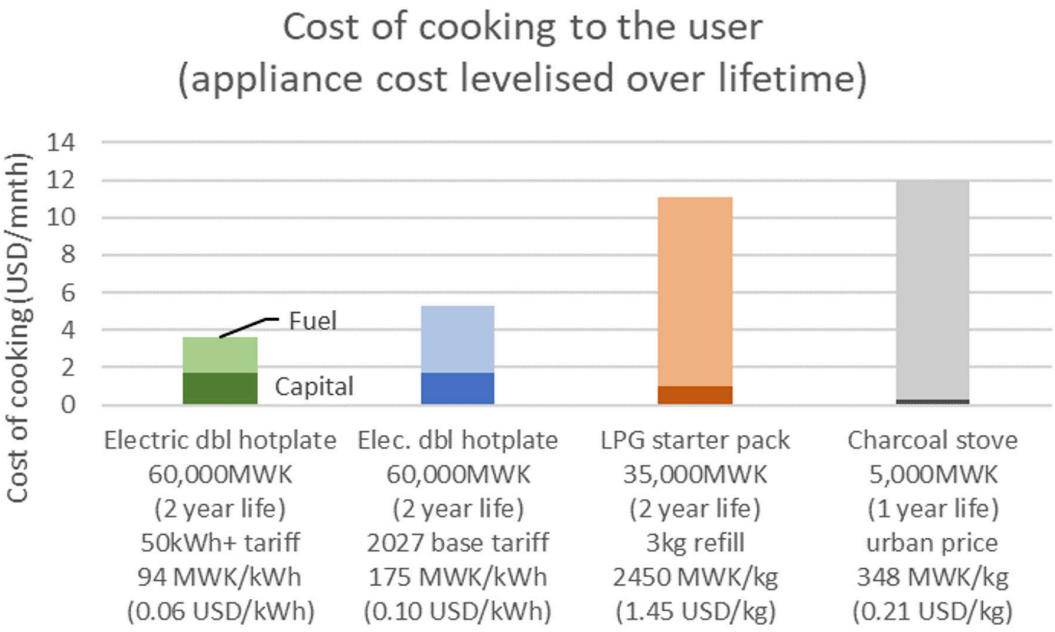

Figure 5 – Preliminary analysis of comparative cost of cooking to the user in Malawi with different technologies[21]

1.2.2 Locally generated, convenient cooking energy source

Malawi's electricity is almost entirely locally generated and centrally managed, insulating it more from price fluctuations than LPG which is imported and subjected to international oil and gas price volatility. Charcoal, which despite being locally produced, is also prone to significant changes in price due to seasonal scarcity, transport costs and policy/ regulatory changes and levels of enforcement; all impacting the final cost to the end-user.

For those who have an electricity connection, eCooking is also more convenient than other batch-purchased fuels (e.g. charcoal, firewood, pellets, LPG), with electricity being instantly delivered to the point of use at the flick of a switch. For this reason, eCooking – particularly supported by renewable sources of electricity – is considered by many to be the ultimate destination for the global cooking energy transition . More relevantly, provided that the national grid remains reliable, eCooking is already a viable alternative for households in Malawi with a grid connection (approximately 550,000) and enough capital to purchase energy-efficient cooking devices.

[20] In Malawi 46% of lower respiratory infections, 23% of neonatal disorders, 49% of Chronic Obstructive Pulmonary Disease, 38% of strokes, and 34% of ischemic heart disease is caused by smoke exposure from dirty cooking. https://vizhub.healthdata.org/gbd-compare/

[21] Adapted from market assessment[16] with updated exchange rates, prices and tariffs. Electricity tariff from https://www.escom.mw/downloads/Revised%20Electricity%20Tariff%20September%202023-Press.pdf

[22] https://cooksafecoalition.org/wp-content/uploads/2022/11/23098-GCR-Cooksafe-Report-D10.pdf

However, the up-front cost of efficient eCooking devices[23] in particular is higher than those of other alternatives. Despite this, but largely as a result of the acute load shedding throughout 2022, LPG has received more focus from the GoM and development programmes alike.

According to data collected by the Modern Cooking for Healthy Forests programme (MCHF), the proportion of urban households using LPG increased almost three-fold between 2020 and 2022 (2.1% to 6.1%). This is likely due to a combination of factors including: load shedding discouraging households from using, or transitioning to, eCooking; increased marketing and availability of LPG cylinders and refilling stations; and a more enabling environment for the private sector. This rapid growth is likely to have persisted with the introduction of affordable 3kg LPG starter packs[24] in December 2023 at just MWK35,000 (then approximately USD32) and continued expansion of the LPG distribution network. However, LPG use remains significantly lower than the urban use of electricity for cooking which, according to MCHF, increased slightly during the same period (from 26% in 2020 to 27% in 2022). During the current situation of reliable electricity supply, LPG is less convenient than electricity – Malawi relies solely on refillable cylinders and has a weak (but strengthening) refilling network; less clean – it is a fossil fuel; and likely more expensive than eCooking over an appliance's lifetime. However, increased uptake of LPG is likely to continue with consumer confidence in Malawi's national grid low and as a backup for when electricity is unavailable.

1.3 Key barriers and opportunities

1.3.1 A neglected sector with increasing opportunities

In 2019 it was estimated that Malawi's cooking sector required USD600million of investment[25] of which approximately just USD20million has so far been realised. International and locally funded interventions, as well as GoM spending towards cooking, have overall been negligible in comparison to those applied to electrification and other development outcomes.

The most significant eCooking focused support to date has been the creation of Malawi's Integrated Energy Planning (IEP) tool (see section 2.2.1). This involved capacity building of key Ministry of Energy (MoE) personnel, an initiative which continues to be supported. However, outside of a relatively small group of individuals within relevant Ministries, Departments and Agencies (MDAs) as well as the wider private and non-governmental sector, capacity regarding cooking, clean cooking and eCooking in particular is low. Reasons for this include the overall neglect of Malawi's cooking sector in terms of attention and funding relative to other sectors, and staff turnover and subsequent gaps in continuity of personnel.

There are an increasing number of funders taking an interest in Malawi's clean cooking sector, including the already active Green Economic Transition Facility (GETF)[26] and Modern Cooking Facility for Africa (MCFA)[27]. In addition, the World Bank through their Clean Cooking Fund and the African Development Bank (AfDB) through their African Climate Window have both held consultations and intend to support the GoM with technical assistance and follow-on investment starting in early 2024. During the consultations, lack of a clear cooking strategy was a barrier to quickly offering larger investment opportunities, highlighting the preliminary need for technical assistance and the development of documents such as this, not only for eCooking, but clean cooking in general.

Since COP26, there has been increased interest in Malawi from carbon financiers (most notably the Swiss Klik Foundation) and movements to develop a more robust regulatory framework including the launch of the Malawi Carbon Markets Initiative (MCMI). Malawi has a nascent carbon finance market for cooking which has a considerable potential for growth. Particularly relevant for eCooking is that, relative to rural areas, urban areas have been invested in less by carbon finance projects and no initiatives have yet successfully issued carbon credits from eCooking (or LPG) projects in the country (see Box 3 for more information on Malawi's first project launched in this area)

[23] This document refers to eCooking devices/appliances as any device which solely uses electricity for cooking including: electric hotplates, ovens, microwaves, kettles, pressure cookers, rice cookers, slow cookers etc.
[24] https://265energy.com/
[25] https://rmi.org/wp-content/uploads/2018/10/RMI_SEED_Demand_Stimulation_2018.pdf
[25] https://www.getfmw.org/
[26] https://www.moderncooking.africa/

This is despite a switch from charcoal to eCooking likely yielding the greatest carbon dividend of any transition[28]. In fact, eCooking carbon finance projects have the potential to generate high integrity carbon credits through the use of remote metering technologies.

Off-grid eCooking, whether on minigrids or standalone systems, is in its infancy, particularly in Malawi which has a nascent off-grid sector for systems with the required capacity to support eCooking appliances[29]. However, as technologies develop and the sector grows (see section 2.3 for some ongoing pilots), this may present an opportunity in the medium to long term with the right financial incentives.

1.3.2 Differences between the real and perceived cost of eCooking appliances

Although eCooking is a desirable and aspirational method of cooking for Malawian households, and likely cost competitive to consumers relative to other commonly available, paid-for, cooking energies in Malawi, it is often perceived as an expensive way to cook[8]. The upfront cost for energy-efficient cooking devices in particular[30] can be very prohibitive. The most efficient electric cooking device, an electric pressure cooker (EPC), is typically priced at more than MWK150,000 (USD89) in 2023. In the absence of access to consumer finance, this is higher than for other cooking devices, such as LPG (starting from MWK35,000 / 21USD), charcoal (starting from MWK5000 / USD3) and biomass cookstoves (starting from MWK1500 / USD1). Some appliance retailers and department stores already offer consumers the option to purchase all or some products on 'lay-by' (buying on credit) but do not specifically target efficient devices which are rarer on the market and unknown to most customers. The LPG market has made significant progress in recent years to overcome low awareness and negative customer perceptions and may provide learnings for the eCooking sector, especially when encouraging a transition to efficient eCooking devices.

On-bill financing[31] by the national utility could provide a targeted and scalable solution, allowing all grid-connected customers to pay for efficient eCooking devices as they pay for their electricity units, while benefiting the utility through increased consumption[32]. On-bill financing schemes have been successfully implemented in several countries including Colombia (for LPG) and Hawaii (for energy efficiency and solar home systems). Kenya is now piloting a scheme for eCooking (and eBikes). Through the national utility with support from a digital solutions provider (PowerPay) and innovation funding (UK PACT), Kenya's eCooking & eMobility Stima Loan project is allowing efficient eCooking devices (and eBikes) to be sold at an initial investment of around 10% of their retail price with the remainder paid back through utility bills. The implementation of such a scheme in Malawi would require an unprecedented collaboration between financiers, technology providers and the Electricity Supply Corporation of Malawi Limited (ESCOM, the national utility), as well as others.

[28] https://cleancooking.org/news/engie-atec-sign-landmark-multi-country-digital-mrv-carbon-credit-agreement/

[29] eCooking requires access to electricity equivalent to at least Tier 4 of the World Bank's Multi-Tier Framework. Availability of such technologies for off-grid contexts in Malawi is negligible. https://www.usaid.gov/energy/mini-grids/economics/cost-effectiveness/tiers-of-service

[30] For more detailed information on appliance costs see https://mecs.org.uk/wp-content/uploads/2020/12/market-assessment-for-modern-energy-cooking-services-in-malawi-3.pdf Annex F, applying 100% inflation for indicative 2023/24 prices.

[31] On-bill financing allows instalments to be repaid automatically when topping up electricity units on prepaid meters or adding to the monthly bill on post-paid meters. https://documents1.worldbank.org/curated/en/920661600750772102/pdf/Cooking-with-Electricity-A-Cost-Perspective.pdf

[32] https://www.cgap.org/sites/default/files/publications/2020_05_Working_Paper_Electric_Bankers.pdf

Box 1: Lessons from a neighbouring country - Kenya

Since 2019 when the UKaid Modern Energy Cooking Services (MECS) programme identified Kenya as well suited for a transition to eCooking[33] Kenya has made significant progress in creating an enabling environment and fostering innovation.

In many ways, Kenya has a similar context to Malawi, the country is highly reliant on firewood and charcoal for its cooking energy and historically the limited resources allocated to cooking projects have focussed on improved biomass cookstoves over more modern alternatives. A key difference is that now over 75% of the population have access to electriciy (almost 100% access in urban areas) and there is a surplus generation capacity. However, less than 1% use it for cooking[34].

The relative cost of cooking energy from electricity, LPG and charcoal in Kenya is similar to Malawi's and staple dishes are also similar: predominantly ugali (similar to nsima), vegetable relishes, rice, beans, and meat stews. Extensive research has shown that electricity can cook local food with grid electricity at a lower cost than LPG, kerosene and charcoal[35]and efficiently cook local food using EPCs for as much as five times cheaper[36]. Similarly to ESCOM, Kenya's national utility (Kenya Power and Lighting Company (KPLC)), struggles to make new connections financially viable due to low usage of electricity.

By focussing on advocacy and awareness efforts on eCooking and related issues, the Government of Kenya in partnership with KPLC, MECS, EnDev and others, has fostered a number of initiatives to increase adoption of eCooking including:

- an electric cooking tariff[37] to reduce the ongoing cost of eCooking
- an on-bill consumer financing scheme for eCooking appliances (and eMobility) to reduce the upfront cost of efficient eCooking devices and increase rural demand for electricity[38]
- development of local manufacturing capacity for improved/clean cookstoves (e.g. Burn is designing an EPC specifically for African cooks for manufacture in their modern cooking device factory in Nairobi)
- long-standing partnership with social media influencers Jikoni Magic; marketing efficient electric cooking devices via social media, live TV demonstrations and developing partnerships with financial institutions
- "Pika na Power" electric cooking campaign to reach 500,000 users of eCooking through bi-weekly cooking classes, social media and national TV
- National eCooking Strategy including baseline study and strategic plan by a local consulting firm (in progress)
- Various pilot projects testing approaches with a view to scale including with SNV, SunCulture, MKopa, Fosera, Bidhaa Sasa, SCODE, Perybere Energy, Caritas Kitui, RVE Sol, PowerHive, Biolite and others)

Kenya's commitment to eCooking over the course of the last 5 years or more has led to a vibrant, innovative eCooking sector which continues to grow. Although Malawi's electrification rate is far below that of Kenya, Malawi could benefit from adopting some of these key interventions.

Figure 6 - Kenya's demonstration kitchen at Electricity House showing eCooking to a variety of stakeholders and on TV

[33] https://elstove.com/tag/global-market-assessment/

[34] https://mecs.org.uk/wp-content/uploads/2022/02/MECS-EnDev-Kenya-eCooking-Market-Assessment.pdf

[35] https://www.esmap.org/cooking_with_electricity_a_cost_perspective

[36] https://mecs.org.uk/wp-content/uploads/2021/01/The-Kenya-eCookbook-Beans-Cereals-edition-3-July-FULL-RECREATED-WEB-1-4mb.pdf

[37] https://www.kplc.co.ke/img/full/Osia.Mwanje_2023-03-24_21-00-19-1.pdf

[38] https://mecs.org.uk/blog/driving-kenyas-ecooking-and-emobility-revolutions-with-digital-utility-enabled-financing/

2 Relevant Policies, Resources, and Initiatives

Malawi has a strong policy environment in support of a transition to eCooking and at an international level has made clear its intentions to transition to clean cooking. For example, the GoM, the only least-developed country (LDC) championing Sustainable Development Goal (SDG) 7, has set the goal of phasing out open fires by 2030 in its Cleaner Cooking Energy Compact[39], which was announced at the United Nations High-Level Dialogue on Energy in 2021[40]. A draft of this roadmap was also presented by the MoE at the National Energy Conference and Cleaner Cooking Conference in November and December 2023 respectively. Key policies and resources are summarised in the following sub-sections.

2.1 Policies, Strategies and Frameworks

2.1.1 National Charcoal Strategy 2017-2027

The National Charcoal Strategy's[41] vision is to create "a more climate-resilient Malawi with sufficient supply of affordable, safe and reliable sources of energy for cooking and heating, where deforestation has been reversed and a larger share of cooking and heating energy comes from modern sources of energy." The strategy is structured around 7 inter-related pillars[42], of which Pillar 1, Promote Alternative Household Cooking Fuels, is most relevant to this roadmap. It supports an enabling environment for eCooking in Malawi (also LPG, briquettes/pellets, biogas, sustainable charcoal and wood production, and fuel efficient cookstoves), aiming to strengthen the electricity supply industry and make it more efficient and capable of providing adequate, affordable, and reliable electricity. This includes actions such as promoting adoption of energy efficient technologies and behaviours, providing fiscal incentives to reduce the cost of electricity connections, and cooking devices and expanding rural electrification under the Malawi Rural Electrification Program. The National Charcoal Strategy is a "holistic, government-wide approach that addresses the linked problem from both supply and demand" and is the closest Malawi has to a cooking strategy acknowledging the importance of a variety of solutions including biomass, LPG, electricity, and other alternatives.

2.1.2 National Energy Policy 2018

The National Energy Policy 2018[43] aims to increase access to affordable, reliable, sustainable, efficient, and modern energy for every person in the country and has eight policy priority areas[44], including (1) Electricity and (8) Demand Side Management. Priority Area 1 (Electricity) includes plans to incentivize distribution licensees to devise schemes that will enable consumers to connect electricity to their homes and afford basic energy efficient electrical appliances. Two strategies are put forward to achieve this, which include, removing duty and VAT on energy efficient domestic electric cooking and water heating appliances, as well as introducing lifeline tariffs to enable low-income households to access electricity. Furthermore, under this priority area the GoM pledges to intensify electrification of rural trading centres as well as villages by providing funding from the Rural Electrification Fund to off-grid rural electrification schemes. Priority Area 8 (Demand Side Management) outlines the intention to institute appliance testing, labelling and standards, which will include A energy performance standards; reducing or eliminating import duty and taxes on energy efficient products; conducting public information campaigns to raise awareness amongst consumers; the provision of financing for energy efficiency measures, allowing consumers to repay loans as part of their utility bills; and, promoting energy saving electrical and biomass-fuelled devices.

[39] https://www.un.org/sites/un2.un.org/files/2021/09/2021-09-20_malawi_cleaner_cooking_energy_compact.pdf

[40] https://enb.iisd.org/energy/UNHLDE/summary

[41] https://www.fao.org/forestry/energy/catalogue/search/detail/en/c/1305657/

[42] Pillar 1: Promote Alternative Household Cooking Fuels, Pillar 2: Promote Adoption of Fuel-Efficient Cookstove Technologies, Pillar 3: Promote Sustainable Wood Production, Pillar 4: Strengthen Law Enforcement, Pillar 5: Regulate Sustainable Charcoal Production, Pillar 6: Enhance Livelihoods, Pillar 7: Promote Information, Awareness and Behaviour-Change Communications.

[43] https://npc.mw/wp-content/uploads/2020/07/National-Energy-Policy-2018.pdf

[44] Priority Area 1: Electricity, Priority Area 2: Biomass, Priority Area 3: Petroleum Fuels, Priority Area 4: Bioethanol and Other Biofuels, Priority Area 5: Liquified Petroleum Gas, Biogas and Natural Gas, Priority Area 6: Coal, Priority Area 7: Nuclear Energy, Priority Area 8: Demand Side Management

2.1.3 Malawi Renewable Energy Strategy 2017

The Malawi Renewable Energy Strategy specifies actions required to deliver the objective of "universal access to renewable electricity and sustainable bioenergy sector" focusing on grid-scale power, clean mini-grids, off-grid power, clean cookstoves, solid biofuels, biogas and biofuels in transport. Actions impacting the opportunities and barriers to electric cooking include: continued delivery of Malawi's Rural Electrification Programme (MAREP) phased grid extensions into rural trading centres; the development of an Independent Power Producer (IPP) framework and Power Purchase Agreement (PPA) process to increase generation capacity; implementation of streamlined regulations that are proportionate to the scale of mini-grid developments; the adoption and enforcement of international standards for solar products; working with the National Cookstove Steering Committee (NCSC) to achieve its goal of 2 million stoves by 2020; develop efficiency standards for cleaner cookstoves; and the roll out of district energy officers across the country by 2022.

2.1.4 Tax and duty waivers

Based on a fiscal study into the advantage of implementing VAT and duty waivers on biomass cookstoves and solar products , and lobbying from civil society to do the same for LPG and efficient eCooking devices, the National Energy Policy recommended such waivers as previously mentioned[42]. This was followed by Malawi Revenue Authority (MRA) issuing amendments to the Customs and Excise Tariffs Order in 2019[46] waiving import duty on gas cylinders and VAT on LPG gas, cylinders and wood cookstoves. Import duty was finally also waived for LPG stoves in April 2023[47]. However, despite the same policy promising "removing duty and VAT on energy efficient domestic electric cooking and water heating appliances" a corresponding amendment of the legal framework has not yet been made. In fact, no framework exists for classifying the efficiency of electrical devices in Malawi.

Duty and VAT waivers can contribute to reducing the price of products by 35-50% depending on the specific tariffs applied, and they have proved to be an efficient instrument in Malawi in recent times. Although implementation and enforcement of LPG regulations has been imperfect, since 2019 waivers have been granted on a case-by-case basis to companies involved in the LPG market, leading to more LPG actors coming into the sector and adoption levels increasing. A parallel process of removing VAT and duty from solar products has taken place with similar results. As such, it is likely that the eCooking sector would benefit in a similar way if the promised policy waivers were implemented.

Box 2: eCooking tariff in Uganda

Uganda has made significant progress on propelling eCooking transitions. An important milestone has been the eCooking tariff introduced in 2021. The tariff is one of government's strategies to displace charcoal and other biomass-based cooking by making eCooking cheaper than charcoal. It is a declining block tariff structure, which allows for differentiated tariff levels based on the amount of energy consumed by households. Figure 7 shows the latest tariff schedule approved by the Uganda's Electricity Regulatory Authority[48], for domestic consumers.

However, while this tariff structure aims to encourage the uptake of eCooking, all households whose consumption falls within this bracket benefit from the eCooking tariff, irrespective of whether they are using electricity for cooking or other purposes. Promoting the use of smart eCooking appliances, where consumption can be monitored, would allow for a better understanding of who among the households in the eCooking bracket actually use electricity for cooking.

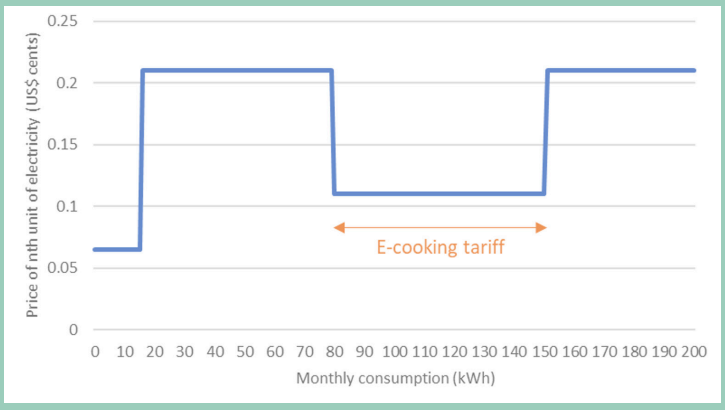

Figure 7 – Residential customer tariff structure in Kenya and Uganda

[45] http://conrema.org/wp-content/uploads/2018/01/Malawi-Clean-Energy-Fiscal-Stud-Elena-Adamopoulou.pdf

[46] https://www.mra.mw/press-releases/amendments-to-the-customs-and-excise-tariffs-order

[47] https://www.mra.mw/press-releases/new-measures-for-the-customs-excise-tariffs-order

[48] https://www.era.go.ug/index.php/tariffs/tariff-schedules https://www.era.go.ug/index.php/tariffs/tariff-schedules

2.1.3 Malawi Renewable Energy Strategy 2017

Malawi's Cleaner Cooking Energy Compact , developed through partnership between the NCSC and the GoM, has superseded the achieved goal of 2 million cookstoves (of any technology) by 2020 with a new goal starting fresh targeting 2 million by 2025 and 3 million more by 2030; ultimately seeking to phase out open fires in areas which are likely to continue to cook using firewood for the foreseeable future. The GIZ Energising Development (EnDev) Programme in Malawi supported the Ministry of Energy by steering the development of the Compact and continues to take a leading role in the operationalisation of commitments made in the Compact. Malawi's commitment to reaching the 2030 goals has been globally announced by the President of Malawi during the United Nations' High-Level Dialogue on Energy (HLDE) and the then Minister of Natural Resources and Climate Change alongside Scotland's First Minister during COP26. The Compact, which is in the process of being reviewed, in its current form lacks ambition outside of biomass cookstove targets seeking to have just 15% of urban households cooking on efficient eCooking devices in 2030 despite Malawi 2063[49] targeting 78% urban electrification by the same year[50].

2.2 Key resources

2.2.1 Malawi Integrated Energy Planning Tool

Integrated energy access planning takes a holistic look at a country's energy system when planning for household, institutional and industrial access to electricity and clean cooking. It moves beyond simply evaluating the least-cost electrification options (grid, mini-grid or standalone systems) in isolation from cooking energy demand, which has been a common approach in the energy sector. As opposed to independent electrification plans or a clean cooking plans, an IEP can provide policymakers, private sector and funders with valuable data and insights to make decisions about extending energy access that covers both electrification and access to clean cooking. As of 2023, Malawi is one of just two countries in sub-Saharan Africa with fully launched IEPs (the other being Nigeria; in Madagascar an IEP is underway)[51].

The Malawi IEP[52] was developed in 2022 through support from SEforALL. It includes an online interface and incorporates three components: electrification, clean cooking and medical cold chains, with a particular focus on COVID-19 vaccine distribution. As part of the IEP, data was also collected on the energy expenditure of both households and institutions across North, South and Central regions of Malawi. This data helped inform assumptions around ability and willingness to pay for, and adoption of, cooking technologies. Two scenarios for access to clean cooking were modelled:

1. The Malawi SDG7 Cleaner Cooking Energy Compact scenario, which assumes 100% electrification in the country by 2030 and sets a 2030 goal of 15% penetration of e-cooking (with a 2-burner induction stove) in urban locations. Under this hypothesis, more than 40% of urban households had undefined stove ownership. For these households, stove stacking with improved charcoal and eCooking was assumed.
2. The SEforALL scenario assumes 100% access to electricity and clean cooking by 2030. Under this scenario, grid-connected households are assumed to adopt eCooking (either as a sole solution or one used as part of a cooking stack).

So far, the IEP has been applied to some electrification planning activities by the MoE and ESCOM (e.g., identification of off-grid sites for feasibility studies and the Malawi Energy Access Project (MEAP)). Other uses include by the Global Energy Alliance for People and Planet (GEAPP) and EnDev to inform programme design and other civil society and private sector stakeholders to support planning and fundraising. However, its full potential has yet to be realised for reasons including that local expertise on the tool is limited to a small number of MoE officers, and pathways to accessing, and awareness of, this expertise by the sector is limited.

[49] https://www.un.org/sites/un2.un.org/files/2021/09/2021-09-20_malawi_cleaner_cooking_energy_compact.pdf
[50] https://npc.mw/wp-content/uploads/2021/02/MW2063-VISION-FINAL.pdf
[51] Two other IEPs are under development for Madagascar (with a unique component on agricultural cold chains) and Rwanda (dedicated to the development of an Integrated Clean Cooking Plan).
[52] https://malawi-iep.sdg7energyplanning.org/

There has been less usage of the IEP in the cooking sector for similar reasons to above, and also because nationwide and district plans for a clean cooking transition – towards which application of the IEP is well suited – are not routinely developed. In addition, the baseline data on which the IEP is based (although the best available at the time of its development) is inaccurate and out of date[53]. The Ministry of Energy, with support from the NCSC have expressed intentions to use more accurate and recent data to update the IEP's baseline, update the Cleaner Cooking Energy Compact targets and monitor progress towards them but this has yet to be operationalised.

2.2.2 National Cookstove Steering Committee

The NCSC, chaired by MoE, advocates to grow the cleaner cooking subsector in line with the country's policies and vision. The NCSC recognises that the country's "energy challenges are complex and no single solution exists" and the "reduction of dependence on biomass fuels is impractical without affordable, reliable, and readily available alternative energy sources"[41]. As such, the NCSC acknowledges the importance of both clean and "cleaner" cooking solutions (which includes those below Multi-Tier Framework tier 3) which are an improvement over baseline cooking practices and often the only viable intermediate solution in Malawi's transition towards "clean" cooking.

The NCSC is composed of government actors, development partners, implementing partners, the private sector, civil society, and academia, and is coordinated by the NCSC Coordination Group who lead sub-sector specific working groups (WGs), plus a secretariat (Self Help Africa):

WG 1:	Firewood and firewood cookstoves	(led by EnDev)
WG 2:	Charcoal and charcoal cookstoves	(led by MCHF)
WG 3:	LPG and LPG appliances	(led by 265 Energy[24])
WG 4:	Other alternative technologies and fuels	(led by MCHF)

The NCSC was instrumental in the setting and achievement of the target of 2,000,000 cleaner cookstoves distributed by 2020. The momentum of the sector continued into 2021 when the NCSC lobbied towards Malawi becoming Global Champion for energy access and pledging to phase out open fires by 2030 in the Cleaner Cooking Energy Compact. The NCSC also hosts annual Cleaner Cooking Conferences bringing cooking sector actors to share learning and take part in discussions.

Until recently, similarly to other initiatives in Malawi, the NCSC has not focussed significant attention on eCooking which has fallen into WG 4. In January 2024, a proposal to establish an additional working group specific to eCooking was accepted, and will be led by EnDev and feed into GeCCo (see section 2.2.6).

2.2.3 Modern Cooking for Healthy Forests urban evaluations

The Modern Cooking for Healthy Forests (MCHF) programme focusses primarily on reducing the consumption of illegal, unsustainably harvested charcoal which is mainly focussed in urban areas. The programme incorporates biennial surveys (a baseline (2020), midline (2022) and upcoming endline evaluation (2024)) which is the only repeated urban cooking specific data collection activity being undertaken in Malawi. The completed baseline and midline evaluations show that charcoal prices are significantly increasing, while adoption of alternative cooking technologies is moving in a positive direction although not sufficiently fast to adequately address the rate of deforestation. Given that the most immediate opportunity for eCooking in urban areas, these evaluations (particularly their high level of detail) are a crucial resource in informing and tracking eCooking interventions.

[53] The IEP's clean cooking baseline relies on data from the period 2013-2020 which was collected to monitor progress on the distribution of 2 million improved stoves by 2020 – a goal for the sector at the time.

[54] https://pdf.usaid.gov/pdf_docs/PA0211CP.pdf

2.2.4 Malawi Multi-Tier Framework Survey

The Modern Cooking for Healthy Forests (MCHF) programme focusses primarily on reducing the consumption of illegal, unsustainably harvested charcoal which is mainly focussed in urban areas. The programme incorporates biennial surveys (a baseline (2020), midline (2022) and upcoming endline evaluation (2024)) which is the only repeated urban cooking specific data collection activity being undertaken in Malawi. The completed baseline and midline evaluations show that charcoal prices are significantly increasing, while adoption of alternative cooking technologies is moving in a positive direction although not sufficiently fast to adequately address the rate of deforestation. Given that the most immediate opportunity for eCooking in urban areas, these evaluations (particularly their high level of detail) are a crucial resource in informing and tracking eCooking interventions.

2.2.5 Global and National Market Assessment for Electric Cooking

MECS, who funded Malawi's first market assessment for modern cooking8, have created a country brief[16] and dedicated factsheet drawing on the results of the Global Market Assessment for Electric Cooking (GMA)[55]. The GMA and factsheets provide an overview of the cooking context in Malawi, with key statistics and interactive infographics comparing Malawi with other countries in the Global South.

2.2.6 Global Electric Cooking Coalition

The Global Electric Cooking Coalition (GeCCo) with its anchor partners EnDev, GEAPP, MECS and SEforALL, are key actors to support Malawi's eCooking trajectory. GeCCo aligns with aforementioned policies and frameworks fostering transition to eCooking, in particular to integrate, share knowledge, guide planning and support fund raising for the rapid scaling of electric cooking in Malawi.

GeCCo activities in countries whose governments have expressed willingness to transition to eCooking and interest to collaborate with GeCCo partners are facilitated by Country Action Groups. Following the respective Expression of Interest, a readiness assessment details existing ambitions, policies, activities, primary and secondary data analysis and potential gaps and/or barriers to scale. The Country Activation Plan (CAP) aims at shifting the national energy systems to electric cooking with funds to be raised for implementation.

2.3 eCooking pilots

eCooking projects/activities in Malawi are limited, with few currently ongoing. These include a pilot of electric cooking on the Mulanje Electricity Generation Agency (MEGA) micro hydro mini-grid with a view to creating a carbon finance project (see Box 3) and two pilots using off-grid solar to power eCooking devices.

2.3.1 Kachione LLC's off-grid eCooking solution

Through funding from MECS's challenge fund, Kachione LLC has developed and piloted an eCooking appliance for off-grid contexts which relies on Direct DC Solar (DDS) electricity[56] [57]. A key focus of product development has been to provide access to a low-cost, off-grid, entry-level system. The result is an eCooking system through which solar electricity is delivered directly to the appliance with no battery or controls[58]. The simplest model, which prioritises being as low cost as possible, can cook meals on sunny days. Kachione LLC is also in the process of developing a specialized, long-life (lithium titanate) cooker battery that may last ten times longer than lead-acid or lithium-ion batteries. If successful, this battery should also enable power storage and cooking when there is no sun.

55 https://mecs.org.uk/resources/factsheets/factsheets-kenya-malawi-tanzania/

56 https://www.mecsplus.org/mecs-triid-challenge-fund-1/customising-malawi-made-solar-electric-cooking-technology-and-business-models-to-provide-access-to-very-low-income-villagers

57 https://www.researchgate.net/publication/369266881_Empowering_Efficiency_Distributing_off-grid_solar_electric_cooking_systems_using_women-_lead_organizing_in_rural_Malawi

58 https://www.mdpi.com/1996-1073/14/14/4293

The main impediment to adoption so far is the fact that cooking requires a lot of power compared to the solar panels that rural households can usually afford. As such, households must learn to use the cookers to cook more slowly and/or primarily use them for heating water until they can afford to buy larger solar panels that can allow them to cook faster. To enable access of the cooking system to low-income rural households, Kachione LLC is combining the solar eCooking offering with the distribution of solar pumping systems. The extra farm income generated by irrigation with solar pumping helps motivate customers to buy the solar panels that can also be used for the solar cookers. At the local level, distribution is organized by village shops operated by local women's collectives that earn a small commission from the solar products that are distributed through the shop.

Figure 8 - Tionge Jonas from Mbangombe, Lilongwe cooking nsima using Direct DC Solar electricity as part of Kachione LLC pilot

Kachione LLC has distributed more than 200 cookers so far and aims to reach 2,000 cookers distributed by the end of 2024. They have 1,800 more insulated DC EPCs scheduled to arrive in January 2024.

2.3.2 World Food Programme pilot of solar electric cooking in Dzaleka refugee cam

From August 2022, the World Food Programme (WFP) undertook the distribution of 65 ECOCA[59] cookstoves to households within Dzaleka Refugee Camp. The primary objective was to pilot the viability of solar electric cooking within a camp setting. These stoves, sourced from Pesitho, were acquired, assembled, and installed by a local technical partner. A qualified engineer oversaw the installation of the cookers and solar panels, providing them on a complimentary basis to project participants. Additionally, six stoves were allocated to a children's care centre for institutional use.

Figure 9 - A pilot participant with her solar electric cookstove in Dzaleka Refugee Camp.

The Pesitho ECOCAs, characterized by their compact, self-contained design, serve as versatile cooking units. They include solar panels, a battery pack, and well-insulated cooking pots designed to retain warmth for extended durations. Notably, these stoves feature two USB ports, facilitating the solar charging of low powered devices such as phones, torches and radios. WFP Malawi and WFP Innovation in Dzaleka refugee camp spearheaded the adoption of these cookers as a strategic response to energy challenges and deforestation concerns. Many households within the camp heavily rely on locally sourced firewood and charcoal for cooking. The cookers can provide cooking energy for a family throughout a day, contingent upon the availability of sunlight. Preliminary results indicated the cooker's efficacy in heating water and preparing food, although the cooking process might be comparatively longer than with traditional fuels. It was acknowledged that users would need to acquaint themselves with the devices and adjust their cooking methods based on factors such as the cooking pots, battery charge, and daily solar radiation.

An evaluation of the Pesitho ECOCA pilot in Dzaleka refugee camp was commenced in January 2024, with findings expected to be published in March/April 2024.

[59] https://pesitho.com/the-ecoca-new/

Furthering WFPs commitment to reduce its emissions by 2030, WFP aims to promote climate-smart approaches in schools by sourcing school meals commodities from local and low-carbon value chains and introducing clean energy solutions to schools, hereunder for cooking, which are efficient and/or powered by renewable energy sources. In the first half of 2024, WFP Malawi will initiate a pilot on Institutional Cooking Solutions with Solar-powered Electric Cookers (off-grid), which aims to assess the viability of using solar powered electric cookers in off-grid schools. These schools will be established in the communities as energy hubs, to benefit community members, and provide them with access to electricity.

Box 3: : Piloting eCooking on hydroelectric mini-grid for carbon finance

MEGA built and operates the first hydro-electric mini-grid in Malawi with 220kW peak of generation capacity. Between March 2021 and February 2022, Atmosfair[60] conducted a pilot study on electric cooking at the MEGA mini-grid, in order to understand cooking demand to inform their plans for leveraging carbon finance to support clean cooking in Malawi. 20 households participated in the pilot, each receiving an electric cooking set (a 1.5kW hotplate, pots and a heat retention device) along with two smart meters; one measured total household power consumption, the other measured only the consumption of the hotplate. Customers had the freedom to cook with whichever cooking devices and fuels they preferred.

The study showed that cooking on electricity on hydro-mini-grids in Malawi is possible and scalable in the context of mini-grids with a surplus of electricity generation. Surveys showed that the hotplate became the main cooking device for 89% of households, and cooking on electricity was affordable at the MEGA tariff of 0.08 USD/kWh and increased the average household electricity demand by up to 50%.

Users most often reported positive health and cleanliness impacts, but also a reduced spend on cooking energy, ease of cooking and feeling modern. Users also pointed out that the hotplate was less versatile than their baseline cooking device and were likely fuel stacking using more than one cooking technology/fuel to support their needs [50] [61] [62]. Meter data shows that with freely distributed appliances and a tariff below the national grid (in 2021 MEGA = 0.08 USD/kWh, ESCOM = 0.09 USD/kWh) customers rarely used more than 1kWh per household per day, less than half of what might be expected if using electricity for all their cooking needs 50,000 (then USD46)

Atmosfair is currently in the process of certifying the activity under the Gold Standard as one of the first electric cooking projects ever certified under a carbon framework. While a further scale-up is planned, the potential total number of eCooking households on the MEGA mini-grid is limited by the generation capacity during peak demand. With attention and investment in further pilots on- and off-grid, Malawi's eCooking sector can make more informed decisions towards a scale up of eCooking in the country.

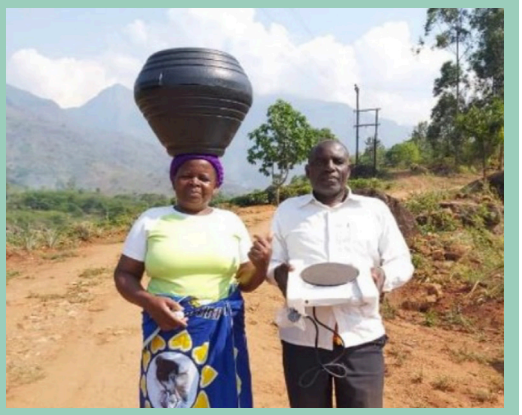

Figure 10 – Improved meter and double hotplate installed for second phase of the project (left), MEGA customers Peter Chikosi and Mai Namwendo receive their cooking set (right)

[60] https://www.atmosfair.de/en/

[61] https://documents1.worldbank.org/curated/en/920661600750772102/pdf/Cooking-with-Electricity-A-Cost-Perspective.pdf

[62] An additional study carried out by atmosfair with 30 households exclusively using double hotplates found, when instructed to cook exclusively with electricity and incentivised with free power, users consumed 0.6 kWh per capita per day (approx.3kWh per household).

3 eCooking Roadmap

3.1 Roadmap development process

The following section, developed in collaboration between the GoM, MECS, SEforALL and a cross-cutting group of key stakeholders, outlines a roadmap to foster an accelerated transition from unsustainably harvested biomass to eCooking.

The objectives for the roadmap's development were threefold:

a) To build key sector stakeholders' understanding around the importance of clean cooking, and eCooking in particular, in Malawi's energy mix;

b) To understand existing gaps within the sector and recommend potential remedies with a focus on eCooking;

c) To map opportunities and the way forward towards scaling up access to eCooking.

Semi-structured interviews and group discussions were used to establish a clear and robust picture of the prevailing situation regarding practices, capacity, and policy around eCooking. This was followed by a workshop with two distinct components: the first seeking to generally capacitate a wide range of relevant stakeholders on the importance of cooking in Malawi's energy mix and eCooking, specifically; and the second discussing the findings and inputs from the bilateral engagements towards creating the first draft of the eCooking roadmap for review. The workshop was held in August 2023 involving representatives from 12 different organisations and was followed by a period of drafting and reviewing.

Timeline of relevant initatives

- 2017: National Charcoal Strategy
- 2018: National Energy Policy
- 2019: Duty and VAT waivers for gas and wood cookstoves
- 2020: 2 milion cookstoves goal achieved
- 2021: Malawi Cleaner Cooking Energy Compact
- 2022: Integrated Energy Planning tool
- 2023: eCooking roadmap development
  - April: Project commencement
  - May-Aug: Bilateral engagements
  - Aug 23rd: eCooking roadmap workshop
  - Oct 26th: Presentation at National Energy Conference
  - Nov: Draft circulated for stakeholder input
  - Dec 5th: Presentation Cooking Conference
- 2024: Roadmap launch and publication (March)

A draft summary was then presented at the National Energy Conference in October 2023 followed by the circulation of a full draft to all relevant stakeholders in November 2023. Feedback was incorporated and the final version was made publicly available from March 2024.

Stakeholders who have fed into the roadmap development process are listed below:

Ministries, Departments and Agencies

- Ministry of Energy* (MoE)
- Ministry of Natural Resources and Climate Change (MoNRCC)
- Ministry of Finance* (MoF)
- Ministry of Gender, Children, Disabilities and Social Welfare* (MoGCDSW)
- Malawi Bureau of Standards* (MBS)
- Malawi Energy Regulatory Authority (MERA)*
- Electricity Supply Corporation of Malawi Limited (ESCOM)*
- Electricity Generation Company Malawi Limited (EGENCO)*

Malawi private sector/civil society

- Mulanje Electricity Generation Agency (MEGA)*
- 265 Energy
- Kachione LLC

International funders/implementers

- Sustainable Energy for All (SEforALL)
- Modern Energy Cooking Services Programme (MECS)
- Global Energy Alliance for People and Planet (GEAPP)*
- World Bank*
- United Nations Development Programme (UNDP)*
- Self Help Africa (SHA)*
- ATEC
- Modern Cooking for Healthy Forests in Malawi Programme (MCHF)*
- GIZ Energising Development (EnDev)*
- Atmosfair
- World Food Programme (WFP)

* attendees of August workshop

3.2 Roadmap aim, pillars, and actions

The roadmap has been developed as the first step in a journey specifically focussing on eCooking, laying the foundation for the development of future clean cooking strategies and key steps to aid in Malawi's clean cooking transition.

The roadmap aligns with all relevant policies as previously outlined, which feed into Malawi 2063 which recognises the need to "diversify our cooking away from using biomass towards cleaner and environmentally sustainable means"[49].

This will be achieved through supply-side (Pillar 1) and demand-side (Pillar 2) interventions, coupled with enhancing the enabling environment (Pillar 3) for increasing adoption of eCooking. The following table details the three overarching pillars, listed below, under which sub-pillars and actions have been developed alongside their respective suggested lead stakeholders responsible for their implementation towards the aim of the roadmap.

Pillar 1 - Improved supply: Integrate eCooking into grid extension and densification efforts

Sub-pillar 1)a) Fully integrate eCooking into electricity access planning and delivery

Sub-pillar 1)b) Strengthen the resilience and capacity of the national grid

Pillar 2 - Increased demand: Increase proportion of grid-connected households and institutions using electricity as their primary cooking fuel

Sub-pillar 2)a) Increase affordability of eCooking (and other clean cooking solutions)

Sub-pillar 2)b) Increase awareness of eCooking as an attractive alternative for grid connected households, businesses, and institutions

Pillar 3 - Enhanced enabling environment: Build capacity within key ministries, departments, agencies (MDAs) and key stakeholders around cooking and eCooking in particular

Sub-pillar 3)a) Continue to build capacity with key MDAs and stakeholders on clean cooking and eCooking

Sub-pillar 3)b) Strengthen tracking of progress towards Malawi's cooking sector commitments

Sub-pillar 3)c) Encourage research and development of innovations in the eCooking and clean cooking sector

Pillar 1 – Improved supply: Integrate eCooking into grid extension and densification efforts				
Element	Summary	Details	Leader stakeholder	Suggested timeframe
Sub-pillar	a) Fully integrate eCooking into electricity access planning and delivery	Improved capacity and evidence are needed to best support integrated eCooking and electrification planning and enable a more reliable and rapid transition to eCooking.		
Action	i. Improve understanding of technical requirements of eCooking adoption at scale	ECooking appliances are some of the most powerful electrical appliances in a home and are often used by many households at similar times. A widespread increase in adoption of eCooking will therefore put the electricity generation and distribution networks under different stresses than traditionally considered in electrification planning. The technical requirements of increased uptake of eCooking shall be examined drawing on evidence from work within Malawi and elsewhere, including research and lessons learned by other national Governments and utilities.	Lead: ESCOM + MoE + MERA Support: MBS + SEforALL	By end June 2024
Action	ii .Examine existing network capacity to support eCooking expansion	It is essential to also understand the specification and capacity of existing infrastructure to support an increase in demand driven by a transition to eCooking. In parallel to 1)a)ii), drawing on existing data and tools such as the IEP, the national grid shall be assessed as to the extent to which eCooking can be supported by existing generation and distribution systems, and key bottlenecks highlighted for addressing. Such considerations will also inform the design of planned densification, expansion and generation increases.	Lead: ESCOM Support: MoE + MERA + SEforALL	By end June 2024
Action	iii. Leverage the IEP tool and others to produce a reliable and high resolution electrification and eCooking transition strategy	Building on the IEP and leveraging improved understanding of the technical requirements of an eCooking transition from 1)a)i) and capacity requirements from 1)a)ii) a targeted strategy for an eCooking transition shall be developed. This will: 1) target areas which have the greatest need (high demand for unsustainable cooking fuels) and technical capacity (sufficiently sized generation and distribution) to support eCooking adoption in the short term; and 2) outline the generation and distribution infrastructure upgrades needed to reach Cleaner Cooking Energy Compact and other GoM clean targets in the medium-long term.	Lead: MoE Support: ESCOM + MoNRCC	By end June 2025
Sub-pillar	b) Strengthen the resilience and capacity of the national grid	customers, the national grid must grow and remain reliable for the transition to scale and be sustained.		

Pillar 1 – Improved supply: Integrate eCooking into grid extension and densification efforts				
Element	Summary	Details	Leader stakeholder	Suggested timeframe
Action	i. Improve the efficiency and reliability of distribution networks	The reliability of Malawi's national grid has significantly improved recently, a trend which must continue in order to grow and sustain customer confidence in its ability to support eCooking. Efficiency and reliability gains shall be made by identifying potential 'pinch points' and causes of high losses (e.g. substations, transformers, cables, inefficiencies), upgrading components, and enhancing automation and control; as well as increasing supply capacity (1)b)ii)	Lead: ESCOM Support: EGENCO & IPPs	Ongoing
Action	ii. Increase supply capacity (through generation and interconnection)	Malawi will soon have increased supply capacity through the Malawi-Mozambique interconnector and has targeted increasing electricity generation to 1000MW by 2025. These milestones must be achieved and built upon with further supply growth to accommodate an increase in adoption of eCooking and reduce the risk of demand outstripping supply.	Lead: ESCOM Support: MoE + EGENCO + IPPs	Ongoing
Action	iii. Improve catchment management around existing and planned hydro-electric generation sites	With Malawi relying heavily on hydroelectric generation – especially in the Lower Shire region – these areas must be protected and restored to ensure reliability of supply. Through application of the Natural Forest and Landscape Restoration Strategy and other measures, hydroelectric catchment areas will be made more resilient to extreme weather.	Lead: MoNRCC and MoAg Support: MoE	Ongoing
Action	iv. Diversify renewable generation sources	It is essential that Malawi's electricity generation growth include a diversity of sources and transition away from an over-reliance on the Shire river to improve resilience and stability whilst continuing to maintain a high share of renewables. Plans to do this shall be accelerated through the completion of feasibility studies including for solar, hydroelectric, geothermal and battery storage projects towards having a plentiful supply of reliable, renewable electricity with which to support eCooking demand.	Lead: ESCOM Support: MoE + EGENCO and IPPs	Ongoing

Pillar 2 – Increased demand: Increase proportion of grid-connected households and institutions using electricity as their primary cooking fuel				
Element	Summary	Details	Leader stakeholder	Suggested timeframe
Sub-pillar	a) Increase affordability of eCooking (and other clean cooking solutions)	Efficient eCooking appliances are generally more expensive than other stoves; reducing this barrier without compromising quality will encourage increased adoption and allow the grid to support more households to eCook.		
Action	i. Fiscal impact assessment for eCooking (and other clean cooking solutions)	To inform evidence-based decision making around fiscal incentives, an assessment shall be conducted including four key components: 1) Examine a variety of fiscal incentives/ exemptions for their impact (e.g. duty/VAT waivers, subsidy, etc.); review best practices and lessons from similar contexts; conduct stove/fuel price benchmarking. 2) Identify current fiscal framework in Malawi, incl. a baseline of current tariffs/applicable taxes. 3) Conduct a cost-benefit analysis through economic modelling to determine the short to medium-term effect of adjustments to fiscal incentives. 4) Conduct multi-stakeholder engagement and awareness raising throughout to ensure that recommendations are appropriate and actionable. As part of the fiscal assessment, or a standalone piece of work, the potential for an eCooking tariff shall also be investigated. Consideration shall also be given to both on-grid and off-grid incentives.	Lead: MoE Support: MoFinance + MRA + MBS	By end 2024
Action	ii. Adoption of regulations and implementation of incentives around eCooking (and other clean cooking solutions)	The regulatory framework related to fiscal incentives for clean cooking in Malawi is incomplete (e.g. eCooking, VAT and duty is policy but not regulation). To resolve this, clear and actionable secondary regulations shall be adopted following a multi-stakeholder process. This process will hinge on in-depth consultation with the private sector, through a clearly articulated process with timelines and roles and responsibilities. Other recommendations coming out of the fiscal impact assessment will also need to be implemented and enforced.	Lead: MoE Support: MBS + MRA + private sector	By end March 2025
Action	iii. Development of standards	There is no enforceable standard for efficient electrical devices (eCooking included) in Malawi and ideally only quality-verified, efficient eCooking appliances should benefit from fiscal incentives (similarly for other clean cooking solutions). Hence clear performance (e.g. emissions and efficiency) and quality (e.g. durability and safety) criteria should be developed and adopted drawing on international standards. A clear process needs to be defined through which companies can benefit from VAT/duty waivers and include measures to ensure the enforcement of compliance requirements. E.g. selection of accredited laboratories in manufacturers'/suppliers' countries; pre-import verification and certificate of conformity issuance through third party inspection, etc.	Lead: MBS Support: MoE + MRA + private sector	By end 2025

Pillar 2 – Increased demand: Increase proportion of grid-connected households and institutions using electricity as their primary cooking fuel				
Element	Summary	Details	Lead stakeholder	Suggested timeframe
Sub-pillar	a) Increase affordability of eCooking (and other clean cooking solutions)	Efficient eCooking appliances are generally more expensive than other stoves; reducing this barrier without compromising quality will encourage increased adoption and allow the grid to support more households to eCook.		
Action	i. Fiscal impact assessment for eCooking (and other clean cooking solutions)	To inform evidence-based decision making around fiscal incentives, an assessment shall be conducted including four key components: 1) Examine a variety of fiscal incentives/ exemptions for their impact (e.g. duty/VAT waivers, subsidy, etc.); review best practices and lessons from similar contexts; conduct stove/fuel price benchmarking. 2) Identify current fiscal framework in Malawi, incl. a baseline of current tariffs/applicable taxes. 3) Conduct a cost-benefit analysis through economic modelling to determine the short to medium-term effect of adjustments to fiscal incentives. 4) Conduct multi-stakeholder engagement and awareness raising throughout to ensure that recommendations are appropriate and actionable. As part of the fiscal assessment, or a standalone piece of work, the potential for an eCooking tariff shall also be investigated. Consideration shall also be given to both on-grid and off-grid incentives.	Lead: MoE Support: MoFinance + MRA + MBS	By end 2024
Action	ii. Adoption of regulations and implementation of incentives around eCooking (and other clean cooking solutions)	The regulatory framework related to fiscal incentives for clean cooking in Malawi is incomplete (e.g. eCooking, VAT and duty is policy but not regulation). To resolve this, clear and actionable secondary regulations shall be adopted following a multi-stakeholder process. This process will hinge on in-depth consultation with the private sector, through a clearly articulated process with timelines and roles and responsibilities. Other recommendations coming out of the fiscal impact assessment will also need to be implemented and enforced.	Lead: MoE Support: MBS + MRA + private sector	By end March 2025
Action	iii. Development of standards	There is no enforceable standard for efficient electrical devices (eCooking included) in Malawi and ideally only quality-verified, efficient eCooking appliances should benefit from fiscal incentives (similarly for other clean cooking solutions). Hence clear performance (e.g. emissions and efficiency) and quality (e.g. durability and safety) criteria should be developed and adopted drawing on international standards. A clear process needs to be defined through which companies can benefit from VAT/duty waivers and include measures to ensure the enforcement of compliance requirements. E.g. selection of accredited laboratories in manufacturers'/suppliers' countries; pre-import verification and certificate of conformity issuance through third party inspection, etc.	Lead: MBS Support: MoE + MRA + private sector	By end 2025

Pillar 2 – Increased demand: Increase proportion of grid-connected households and institutions using electricity as their primary cooking fuel				
Element	Summary	Details	Lead stakeholder	Suggested timeframe
Action	iv. Introducing consumer finance for efficient eCooking appliances via on-bill financing	On-bill financing can reduce the up-front cost barrier of eCooking appliances, incentivise their usage and improve the financial position of electricity utilities. Technical barriers/ gaps to introducing on-bill financing will be identified and addressed, and financing models such as working with financial institutions, appliance manufacturers, investors, carbon finance, and/or development agencies will be investigated to support its implementation. Only appliances reaching defined quality and efficiency standards shall be included in the scheme.	Lead: ESCOM Support: MERA + MBS	By end 2026
Sub-pillar	b) Increase awareness of eCooking as an attractive alternative for grid connected households, businesses, and institutions	Majority of grid-connected households and institutions in Malawi do not know that eCooking is an available, accessible, appropriate and affordable cooking solution. Improving awareness of this will increase adoption of eCooking.		
Action	i. Leverage existing, and build new, evidence to demonstrate the cost effectiveness of eCooking (and other clean cooking solutions)	There is increasing evidence from similar contexts to Malawi (e.g. Kenya, Tanzania, Zambia) that eCooking is cheaper than other more polluting cooking solutions but awareness of this in Malawi is low and there is limited evidence specific to the Malawian context. Results and methodologies from relevant sources will be drawn upon to conduct studies on the comparative cost of cooking using different solutions in Malawian households, businesses, and institutions; these may include controlled cooking tests (CCTs) and cooking diaries. These results will be publicly available and shared widely, supporting 2)b)ii).	Lead: MoE Support: MNRCC + Academia + NCSC	By end June 2024
Action	ii. Mass communication encouraging adoption of eCooking (and other clean cooking solutions)	To address misconceptions about eCooking and other clean cooking solutions, a multi-platform mass communication campaign will be implemented including a variety of means (e.g. door-to-door, radio, roadshows, banners, TV, social media, testimonials etc.). This should be supported by evidence and target those who cook, as well as others who influence which cooking solutions are used, such as heads of households, business/institution managers/owners, etc.	Lead: MoE + MoNRCC Support: MoGCDSW + MoHealth + MoEducation + NCSC	Starting July 2024 and ongoing

Pillar 3 – Enhanced enabling environment: Build capacity within key ministries, departments, agencies (MDAs) and key stakeholders on cooking and eCooking in particular				
Elememt	Summary	Details	Lead stakeholder	Suggested timeframe
Sub-pillar	a) Continue to build capacity with key MDAs and stakeholders on clean cooking and eCooking	Increasing capacity around eCooking and other clean cooking solutions across relevant stakeholder groups would facilitate more impactful progress in the transition to eCooking.		
Action	i. Identify capacity gaps and clean cooking focal points/ champions/teams for intensive capacity building, regular follow-ups, and advocacy	Outside of a relatively small group of individuals within the cooking sector capacity regarding cooking, clean cooking and eCooking in particular is low. The key ministries of Energy, Natural Resources and Climate Change, Health, Finance, Gender Community Development and Social Welfare as well as MERA, MBS, ESCOM and other MDA stakeholders shall nominate clean cooking focal points who will be provided with training to build their, and their respective MDA's, capacity around eCooking and other clean cooking solutions. This will facilitate improved cross-sectoral collaboration and better embed clean cooking in the agendas of MDAs as well as facilitate MDAs to better advocate for clean cooking issues.	Lead: MoE Support: MNRCC + NCSC + SEforALL	By end May 2024
Action	ii. Provide semi-annual broad-based clean cooking refresher sessions to wider stakeholder groups	Cooking focal points shall invite a wide range of relevant stakeholders including the private sector, development agencies and civil society to participate in clean cooking fora to raise awareness, update on progress and maintain focus and capacity around the clean cooking transition. Each forum will necessarily include specific updates on eCooking as well as other clean cooking solutions and should be delivered in collaboration with the NCSC and its requisite Working Groups.	Lead: MoE Support: MNRCC + NCSC + SEforALL	Ongoing
Sub-pillar	b) Strengthen tracking of progress towards Malawi's cooking sector commitments	In order to achieve the targets of Malawi's cooking sector commitments included in the Cleaner Cooking Energy Compact, Nationally Determined Contributions (NDCs), Malawi 2063 and others, regularly updated and robust data-driven monitoring is needed.		
Action	i. Strengthening and updating the IEP and Energy Compact with respect to data resolution and focus on eCooking and other clean alternatives	Malawi's IEP provides a strong foundation with which to geospatially monitor progress and inform the revision of ongoing and planned interventions. However, at the time of its development, there was limited available data with which to build the IEP's baseline scenario around cooking practises across Malawi. Recently collected, high resolution Multi-Tier Framework data and other applicable data, can be integrated into the IEP. This will provide a more accurate picture of the state of access to clean cooking solutions and inform an update to Malawi's Clean Cooking Energy Compact targets alongside the results of the IEP analysis and other relevant data and analyses.	Lead: MoE Support: ESCOM+ NCSC + SEforALL	By end 2024

Pillar 3 – Enhanced enabling environment: Build capacity within key ministries, departments, agencies (MDAs) and key stakeholders on cooking and eCooking in particular				
Element	Summary	Details	Lead stakeholder	Suggested timeframe
Action	ii. Implement scheduled IEP updates and monitoring of progress including cooking and electrification data	There is currently limited functionality and capacity to update the IEP with the latest data on electrification and cooking practices and no regular process for collecting and entering such data, limiting its applications beyond the initial analysis. This shall be remedied by: 1) forming an IEP unit to manage the tool, update it, and provide services in its application towards the needs of stakeholders; and 2) developing a standardised process for the collection and entering of relevant data into the IEP to better inform analysis and track progress towards targets such as the Clean Cooking Energy Compact and Malawi 2063.	Lead: MoE Support: SEforALL	Ongoing
Sub-pillar	c) Encourage research and development of innovations in the eCooking and clean cooking sector	To foster an accelerated transition to eCooking and clean cooking solutions, more innovation, piloting and testing of technologies and approaches needs to be implemented alongside scaling up those which prove, or have proven, successful.		
Action	i. Encourage piloting and sharing of research of innovations around eCooking and other clean cooking solutions	There are few examples of projects piloting eCooking in Malawi and learnings from research and innovation into clean cooking are poorly disseminated across sector stakeholders. To foster improved knowledge exchange, the clean cooking fora (3) a)ii)) shall include focal points sharing examples of new developments from their respective MDAs. Focal points shall also be required to attend the NCSC's annual cleaner cooking stakeholder events and the National Energy Conference will encourage presentations from the clean cooking sector. Through improving visibility, successful pilots will be enabled to scale though gaining increased exposure to funding and investment opportunities.	Lead: MoE Support: NCSC + REIAMA + wider civil society	Ongoing

4 Recommendations

Drawing on the background, challenges, opportunities and roadmap outlined in the previous sections, the roadmap's proposed actions are presented and summarised as a two phased approach to highlight those which should be more immediately prioritised. Phase 1 focusses on laying a strong foundation to foster a scaled transition to eCooking through capitalising on immediate opportunities to build capacity, develop evidence and strategy, and create a more enabling environment. International funders such as the World Bank and AfDB have committed to supporting Malawi's transition to clean cooking; this should be most immediately leveraged towards Phase 1 actions. The second phase focuses on scaling up an eCooking transition through marketing, incentives, and continued electricity infrastructure expansion and strengthening.

Phase 1: Build a strong foundation for eCooking

Timeline: by end June 2025 (see detailed roadmap for action-specific proposed timelines)

Develop a strong understanding of supply-side limitations and eCooking demand requirements on the national grid.

Actions: 1)a)i) / 1)a)ii)

The potential for a scaled transition to eCooking is contingent on the capacity of the national grid to generate and transmit a sufficient quantity and quality of electricity to support it. This is essential not only to satisfy existing eCooking users but also build confidence in potential new ones. Baseline analyses and regular updates should be conducted to understand electricity generation and distribution capacity to support demand growth in eCooking (as well as industry and high-demand sectors), to highlight the opportunity for scale-up and ensure that it does not destabilise the grid. This should be supported by contextually accurate load profiles for eCooking device use in Malawi.

Develop a comprehensive, evidence-based, clean cooking strategy which includes eCooking and a comprehensive monitoring system.

Actions: 1)a)iii) / 2)a)i) / 2)a)iii) / 2)b)i) / 3)b)i) / 3)b)ii)

GoM should lead a process of developing a clean cooking strategy, which integrates all relevant sub-sectors including eCooking and electrification in collaboration with all other relevant non-governmental stakeholders. The process should be supported by the best available evidence (e.g. MTF, MCHF data, IEP) and studies to fill knowledge gaps including a fiscal incentive impact assessment, development of efficiency standards for all electrical devices, technical studies into the interface between the national grid and eCooking (see next recommendation), and studies on the comparative cost of using different cooking solutions. A process of regularly and robustly tracking progress against targets should be established based on a revised Cleaner Cooking Energy Compact and regularly updated IEP tool with strengthened cooking component.

Build capacity of, and foster coordination and shared learning between, key clean cooking, eCooking and electrification stakeholders.

Actions: 3)a)i) / 3)a)ii) / 3)c)i)

Capacity of key clean cooking, eCooking and electrification stakeholders needs to be strengthened and clean cooking focal points and/or champions in all relevant GoM and non-governmental institutions should be established to coordinate and advocate on clean cooking issues. The creation of an eCooking working group within the NCSC which reports to the National Planning Commission's Economic Infrastructure Enabler Coordination Group should encourage coordination and monitoring of progress. Those piloting innovative eCooking technologies and approaches should also be encouraged to use the NCSC as a platform to share learning to inform and inspire new entrants into the sector.

Implement and enforce existing legal and policy instruments to create a more enabling environment for growth in the eCooking and clean cooking sector in general.
Actions: 1)a)iii)

Malawi already has several policy and regulatory instruments which are relevant to a scale-up of eCooking. These include the Forestry Act's ban on unlicensed charcoal and National Energy Policy commitment to remove tax and duty for energy-efficient eCooking and water heating devices. If effectively implemented, these would significantly improve the enabling environment for the eCooking and clean cooking sector and boost private sector investment. Malawi should immediately begin developing efficiency standards for all electrical devices, drawing on existing standards from more developed markets such as Kenya or South Africa. To kick-start an eCooking transition GoM should, in the short term, remove tax and duty on all eCooking devices. The finalisation of Malawi's carbon framework will also give investors and implementors in the space more confidence to develop eCooking and clean cooking carbon finance projects at scale. Relevant stakeholders should begin to develop on-bill financing capabilities in preparation for phase 2 initiatives.

Phase 2: Scale up eCooking

Timeline: following phase 1 actions

Encourage adoption of eCooking and clean cooking through cohesive marketing and awareness raising
Actions: 2)b)ii)

Leveraging the strengthened capacity, coordination and strategies built under the first pillar, targeted marketing campaigns should seek to transition an appropriate segment of households onto eCooking and other clean cooking solutions as recommended by phase 1 analyses. This should include endorsement from all relevant GoM departments and bust common myths on topics such as cost and safety.

Incentivise households and the private sector to accelerate the scale-up of efficient eCooking devices
Actions: 2)a)iv)

The recommendations of the fiscal impact assessment from phase 1, should be implemented and work hand in hand with efficiency standards to incentivise growth in the eCooking market for higher efficiency devices in particular and make them more affordable to consumers. On-bill financing, the development of a framework for which is recommended as part of phase 1, would enable consumer incentives such as appliance financing to be offered in a targeted and scalable manner. An instituted carbon framework should provide investors with more confidence towards entering the sector, and project developers should focus on generating high-quality offsets using the Gold Standard metered fuels methodology to which many eCooking technologies are well suited.

Continuously upgrade, grow and diversify electricity generation and distribution infrastructure
Actions: 1)b)i) / 1)b)ii) / 1)b)iii) / 1)b)iv)

Malawi will need orders of magnitude more electricity generation and requisite distribution infrastructure to support a transition to eCooking at scale, particularly in the context of urbanisation, rural electrification and industrialisation. Planned interconnection and generation increases should be realised and, drawing on the analyses conducted under phase 1, targeted distribution infrastructure upgrades should be made where recommended, to facilitate growth in the adoption of eCooking and avoid destabilisation of the grid. The grid must also become more resilient through diversifying its sources of generation and better protecting its vulnerabilities (e.g. strong catchment area management around key hydro-electric sites).

Appendix

Appendix 1: List of active projects, programmes and funding opportunities

- National Cookstove Steering Committee
  - Chaired by Ministry of Energy
  - Coordinates cooking sector with MCHF, EnDev, Self Help Africa and 265 Energy
- Modern Cooking for Healthy Forests (MCHF)
  - Malawi's largest cooking dedicated programme leading on from predecessor PERFORM
  - Strong focus on urban private sector support and protecting forest areas
  - Launched different accelerators/catalyst funding opportunities
- EnDev
  - Various projects with long-term engagement in Malawi cooking sector
  - Long track record of access to efficient biomass stoves for households and institutions in rural areas
  - Piloting higher tier cooking in particular via access to pellet gasifier stoves and eCooking in mini-grids in Malawi
  - EnDev is an anchor partner of GeCCo and contributes particularly via the Global eCooking Accelerator (GeCA) initiative.
- GEAPP
  - Strong support for IEP development and delivery
  - Continued capacity building around electrification
  - Increasing interest in eCooking in Malawi via GeCCo
  - GeCCo anchor partner
- SEforALL/MECS
  - Partners in IEP development
  - Previous support for research/market assessment
  - GeCCo anchor partner
- GETF – Green Economic Transition Facility (UNDP, Irish Embassy, KfW funded)
  - Support for private sector projects on green energy (cooking fuels, stoves etc.)
  - Particular focus on urban areas
- Embassy of Ireland/Irish Aid
  - Historical supporter of cookstoves initiatives, particularly integrating social welfare
- UNDP
  - Recently supported LPG and cookstove distribution project
- Modern Cooking Facility for Africa (MCFA)
  - Second funding round targeting Malawi (amongst size other sub-Saharan African countries) opened late 2023
- Others
  - World Bank (Clean Cooking Fund)
    - Scoping mission leading to technical assistance with MoE
  - AfDB (African Climate Window)
    - Scoping mission leading to technical assistance with MoE
  - Carbon Finance
    - Various actors leveraging funding and investment from various sources
    - C-Quest Capital/EnerGAfrica, Self Help Africa, Ripple Africa and others
  - Research/piloting
    - Atmosfair small-scale pilot of eCooking for carbon credits on hydro-minigrid
    - Kachione LLC research on direct drive solar electric cooking
    - WFP Pesitho ECOCA pilot
    - ATEC interest in eCooking pilot in Malawi

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