

Policy Analysis on Clean Cooking in Malawi: Case of Improved Cookstoves

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Abstract. Transition from cooking with traditional biomass to clean cooking is a persistent challenge in Malawi. The underlying technologies in clean cooking are improved cookstove. Improved cook stoves are designed to reduce fuel consumption per meal and to curb smoke emissions experienced in traditional three-stone cookstove. However, promotion adoption and utilisation of clean cooking requires coordinated policy and regulatory framework. This study analysed the Malawi policy regulatory framework on clean cooking by benchmarking with relevant literature. The following policy gaps were identified: (i) the lack of clear cookstove rating by Malawi Bureau of Standards; (ii) uncomplimentary policies and regulations in the energy and forestry sectors on clean cooking fuels and technologies; (iii) the lack of empirical data on adoption and utilisation of clean cooking technologies and fuels in Malawi; (iv) predicaments in adopting and using international standards for testing cookstoves; and (v) the value chain of improved cookstoves and other forms of clean cooking fuels and technologies that is not adequately analysed. Coordinated development and harmonious implementation of clean cooking regulations in the key sectors of energy and forestry can promote adoption and utilisation of clean cooking methods and technologies in Malawi.

1 Introduction

Transition from traditional cooking with biomass to clean cooking is a persistent challenge in developing countries [1]. Lack of appropriate technology as alternative to traditional three-stone stoves, inadequate investment in energy generation and poor management of biomass resources have been highlighted as key factors perpetuating the dilemma to transition to clean cooking [2]. Universal access to clean cooking is the goal for SDG#7.1.2. On a global scale, the energy tracking SDG7 Energy progress report [3] showed that the number of people gaining access to clean cooking increased significantly, however, there

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were still challenges in Sub-Sahara Africa. One of the challenges was population growth which outpaced the clean cooking improvements. Clean cooking is the utilisation of energy-efficient cookstoves and sustainable thermal fuels in order to reduce carbon emissions and prevent depletion of forest cover. Improved cookstoves (ICS) is one of the technologies that has been widely advocated to promote clean cooking in households and institutions that use biomass in form of firewood and charcoal [4]. Improved cook stoves (ICS) are stoves designed to reduce fuel consumption per meal and to curb smoke emissions from open fires. The term ICS usually refers to stoves which burn firewood, charcoal, agriculture residues or dung more efficiently than traditional three-stone stoves. Common improve cook stoves in Malawi are the *chitetezo mbaula* clay stove, *Esperanza* stove and the institutional rocket stoves. These stoves have been used as a way of mitigating climate change impacts in Malawi through their contribution towards preserving forests[5,6] on the stoves have included assessment on performance, factors that affect the stove adoption and impacts of the stoves on health and social economic factors. The Malawi national population and household census 2018 showed that more than 87% of the total population use firewood and 8% uses charcoal as cooking and heating energy source [6]. This unsustainable use of fuel wood has contributed to deforestation degradation. This paper analyses the links and implementation challenges in the legal framework. Policy framework on energy has been rated as one of the most outstanding because if its greater complexity, higher costs, and stronger path dependency [2]. The policy framework for cookstoves for sustainable energy utilization in Malawi is not exempted from this analogy of being complex and having a strong path dependency. Therefore the need to analyse the policy gaps for possible recommendations.

2 Clean cooking policy in Malawi

2.1 Sustainable development goals

Sustainable Development Goal (SDG) number 7 aims at ensuring access to affordable, reliable, sustainable and modern energy for all [7]. The targets are:

- Ensuring universal access to electricity and clean cooking solutions;
- Substantially increasing the share of renewable energy;
- Doubling progress on energy efficiency;
- Increasing international collaboration in support of clean and renewable energy.

This agrees with SDG 13 which promotes climate action; to take urgent action to combat climate change and its impacts. The challenge is that latest available data and selected energy scenarios reveal that at today's rate of progress, most vulnerable developing countries are not on track to achieve any of the targets under SDG 7. Malawi, being one of the vulnerable countries, is intensifying its efforts in achieving the sustainability goals. One of the measures that Malawi is implementing is increasing access to clean cooking solutions. Even though there is a global increase in electricity production there is still a large number of households failing to access the electricity and hence lower use of electrical cooking appliances.

The Malawi agenda 2063 also has environmental sustainability emphasized. Enabler number 7 states that Malawi shall have a safe, clean, secure and sustainable environment. The agenda plans to diversify cooking away from using biomass towards cleaner and environmentally sustainable means by promoting innovations and technologies in this area [8].

2.2 Cook stoves legal framework

2.2.1 The national charcoal strategy policy

Under the charcoal strategy for 2017-2027, the Ministry of Forestry and Natural Resources (MFNR) under the Department of Forestry seeks to eliminate the use of unsustainable charcoal production and use [9]. In order to achieve this there are 7 strategic pillars that must be followed and targeted; promote alternative household cooking fuels, promote adoption of fuel-efficient cookstove technologies, promote sustainable wood production, strengthen law enforcement, regulate sustainable charcoal production, enhance livelihoods, promote information awareness and behavior-change communications. The MFNR has extended the work to law enforcement departments like Rangers, courts and police. Technologies for alternative household cooking include: biogas, electricity, LPG pellets and briquettes (promoting household cooking fuels). The policy targets middle income earning households and institutions. The national charcoal strategy pillars are having some cross-cutting issues but still not ambitious enough to meet the health burdens of the population in Malawi. The strategy describes drivers of charcoal production and utilisation to be complex, and cross-sectoral. These include rural and urban poverty, a readily-available urban market for charcoal tied to a lack of reliable, affordable alternatives, and weak law enforcement. Therefore, the recommends multiple solutions covering both supply and demand. These solutions are complimented with recent government efforts including adoption of new Forestry Policy (2016) and National Climate Change Policy (2016), Malawi REDD+ Program, and review and pending approval of The Forests (Charcoal) Regulations to guide legal charcoal production under the Forest Act 1997, draft Malawi Biomass Energy Strategy (BEST), National Energy policy and SE4ALL Action Agenda. Revisions of the Forestry Act (1997).

National Energy Policy (NEP)

The overall goal of the NEP is to provide guiding framework for increased access to affordable, reliable, sustainable, efficient and modern energy for all sectors and every person in the country. It emphasizes the importance of private sector participation. The Policy targets to increase the number of households with electricity to 30% by 2020 and 40% by 2050. There is a gap in assumption that this increase in electricity access may mean increase in use of electrical devices for cooking efficiency. In its priority area 2 on biomass, the NEP's objective is to ensure that the biomass is sustainably used and carbon emissions are reduced through the use of energy efficient technologies with a time frame of up to 2023. The policy also outlines plans to promote certification and labelling of all energy efficient commercial cook stoves that are sold as commercial products on the market. This was supposed to be achieved by 2019 but the policy document on certification and labelling is still work in progress. The monitoring and evaluation chart in the NEP gives good guidance for all the other policies and strategies. However, the actual means of collecting the data is not specified for consistency. For example, on data for number of people trained in Biomass energy technologies; there is no clear category of level or type of training.

Sustainable Energy for All: Action Agenda

The Action Agenda (AA) presents an energy sector-wide vision spanning the period 2015 to 2030. It outlines how Malawi will achieve the SE4All goals of universal access to modern energy services, increase the rate of energy efficiency, and increase the share of renewable energy in its energy mix, by 2030. The agenda targets that by 2030 technologies should be as follows; Electric cookers 135,000, LPG stoves 54,000, Efficient woodstoves 5 million, solar water heaters 21 million, biogas 2 million (0.8 MW to 550 MW), Bagasse 18 MW to 46 MW. These targets fit well with the goals for the NEP.

2.3 Discussions from the legal framework

Having studied the legal framework on the cookstoves in Malawi, the following issues were noted for discussion:

A. Rating of legal charcoal. There is a gap in the rating of the legal charcoal. The NCS and NEP promotes sustainable production of the charcoal but it does not give reference on how the consumer would rate the charcoal to know whether they are paying for a desirable value. The charcoal may be legally produced but still be of low quality in terms of the other rating attributes such as affordability, exposure and efficiency. This is similar to carbon - labeling for climate change mitigation. In a study by Xu & Lin [10], 85.97% of respondents were willing to pay more for carbon-labeled products which shows that effective carbon labels have the potential to guide consumers to make low carbon choices and reduce their carbon footprint. Environmental sustainability contributes less when it comes to the consumer decision on which charcoal type to use. The consumer is driven by efficiency in convenience and affordability. Therefore, more effort is required to ensure that the consumers are still choosing the sustainable charcoal, hence the importance of rating. Rating the charcoal would give the consumer informed guidance and hence promote utilization of the legal charcoal.

B. Complimenting on gaps across policies. There are some gaps in some policies that are being complimented by other different policies. Therefore, it is important to always cross refer to different policies when addressing issues in clean cooking. Facilitation of behavioral change in stove users requires coordinated policy support and stakeholder engagement [11]. Where one policy fails to cover other issues, another policy is required to fill in the gap. One of the gaps in the national charcoal strategy is lack of set mile stones to measure how the targets will be achieved by using the pillars. This is complemented with the set milestones in the SE4ALL agenda. The milestones set can then be monitored and evaluated by the monitoring and evaluation tool provided in the NEP.

C. Time gaps: In the case that a certain policy or strategy has some shortfalls but the review period has not arrived yet, the shortfalls can be addressed by another policy whose review period is due. For example, at the time of developing the 2016 National Forestry policy, it had been 19 years (since 1996). In those years there were some emerging climate change issues such as Payment for Ecosystem Services (PES) and Reduced Emissions from Deforestation and Forest Degradation (REDD+) that were then addressed in other related policies such as the Energy Policy 2003 and National Population policy 2013. Therefore, in the same manner, if there should be any emerging issues concerning any of the clean cooking policies, it is possible to compliment that with another related policy which has reached it review period. The attribute of affordability needs to be well reflected in the policy framework [12] whereby the following factors are considered; irregular and uncertain earnings of the poor, and gender and rural/urban differences. These factors are not elaborated in the policies.

D. The value chain: The NCS has a clear value chain for charcoal but there is a gap from other policies on the value chain for cook stoves and other biomass products such as briquettes. The value chain for charcoal has interaction of actors such as producers; rural and urban intermediaries (including charcoal packers, transporters by bicycle, headload, and trucks, and wholesalers); predominantly urban retailers (including women); and mostly households. These same actors can be used to determine the value chain for the other clean cooking technologies. The value chain is important for analyzing progress in achieving targets and also in implementation of regulations. Charcoal value chain can be used to determine efficiency gaps in achieving sustainable goals [13]. The legal framework in Malawi needs to have clear value chains for all the clean cooking technologies so that its efficiency gaps can also be determined. An analysed value chain for the chitetezo mbaula identified the following groups as value adding: sourcing and curing of clay soil group, clay soil kneading, and firing group, stove warehouse caretakers, stove marketing group, and

producer group administration officers [14]. Hence these could be used for assessment for other clean cooking developments.

E. Utilization of electricity as an alternative source of energy for cooking and heating: The legal framework studied here promotes the utilization of electricity but there is lack of clear targets and strategies to assure that having the electricity connection in the household should mean having electrical appliances for cooking and heating. The use of electricity for cooking meets up with the challenges of electricity supply shortages which has led to massive load shading in the country. The Sustainable Energy for All Action Agenda (SEforALL) targets electricity access of 31.6% national by 2030 yet access to non-solid fuels is at 20.2%. This shows that the access to electricity does not guarantee that the households involved will shift from unsustainable use of biomass to electricity. As such there is a gap in promotion of the electrical cooking methods/technologies. A study on the market assessment for modern cooking showed that main barriers to electric cooking are weakness of existing infrastructure, lack of consumer willingness and ability to pay. This study showed that there are a lot of households that have electrical wiring which is not suitable for electrical cooking appliances. Therefore making it difficult to conclude that access to electricity means higher access to electricity cooking.

F. Challenges in use of international standards due to the lack of national standards of cook stoves. The standards commonly used in testing cook stoves in Malawi are the British standards (BS ISO 19867-12018) and the IWA standards, ISO/TC 285, ISO/TR 1986-3:2018. A number of studies on the cook stoves in Malawi have used the IWA standards which are recommended by the ENDev (leading organisation in ICS mandated by Energy affairs department). These international standards need to be used as a base for developing national standards tailored to the country. Main challenges in applying the international standards when testing cookstoves are high tech equipment requirements, different types of cooking environments such as kitchen setup, different types of basic food and their cooking methods and culture traditions. Therefore, the conclusions may not completely reflect the true situation for Malawi.

G. Cook stove distribution and legal charcoal production distribution data gaps. There is some data consolidation by some organization (for example ENDev and United Purpose) on cook stove distribution. But there is no clear data on all progress on the strategies. The strategies do not give a consolidated monitoring and evaluation method. Another important data that is usually missed out on cookstove distribution data is 'stacking' data [15]. This is data for cookstoves that are being stacked for non-continued utilization. This data would help in analyzing the actual shift from use of traditional unsustainable cookstoves or/and fuels. There are also gaps in the cookstove stacking data in the Malawi energy policy guide information literature. The consolidated data would be helpful for evaluations on carbon offsets which may be used in negotiating for carbon credits.

H. General assumptions on the source of fuel-wood. There is a general assumption that all fuel wood that is being used is sourced from forests. Therefore, impacts of the policies are measured based on how much forests cover would be saved. There is less consideration of other sources of wood such as personal farms, roadsides tree-twigs and residual from construction works. A study in India analysed separately impacts of clean cooking on the relative fuelwood consumption and composition change in both forests and farms. The results of this study gave an insight in policy formulation on forest management and clean cooking [16]. Considering households' dependence on forest-based fuels, such policies could need to be modified to secure households' access to these fuels [17]. Therefore the need to consider other sources of firewood in policy decisions.

3 Conclusion and policy implications

The policies on clean cooking in Malawi are having efficiency gaps when analysed separately. The gap in the rating of legal fuels and cookstoves for clean cooking is further affected by the time gaps delay in policy amendments. This concludes to a need for the value chain assessment for the cookstoves including other fuels used in them. The use of international standards for testing and rating the stoves has left some gaps in consideration of the development status in the nation. However, the gaps are being filled with sections from other policies and strategies. Therefore, the effectiveness of the legal framework on clean cooking in Malawi is dependent on all the separate policies working or being implemented in cohesive for they are complimentary of each other. Further to that the policies are more effective when there is a provision of multiple sources of fuel wood and cooking technologies.

During this study there was limitation on data on financial status of households against cooking options in the rural areas affected the conclusion on some assessment on how policy strategy on improving livelihoods would increase options for clean cooking. Therefore a recommended further study for this area so that policy makers may be informed on the effective strategies that combine livelihoods improvement and environmental conservation through clean cooking.

Having analysed the policy on clean cooking in Malawi, the following recommendations are made:

- Make the legalization of charcoal production accommodative for the population in rural poverty. This includes considering the costs and increase on sensitization on certification process.
- Develop a well research-based set of standards for cook stoves and sustainable biomass fuels which should include rating protocols.
- There should be modalities on how to balance up the poverty-energy-environment nexus. This requires more intensified collaboration amongst the policy actors in the implementation of cross-cutting issues.
- There should be a consolidation of data on cook stove distribution and utilization and stacking and not just distribution.

References

1. W. Akpalu, I. Dasmani and P.B. Aglobitse, Demand for cooking fuels in a developing country: To what extent do taste and preferences matter?, *Energy Policy* , **39**, 6525-6531 (2011)
2. A. Goldthau, B.K. Sovacool, The uniqueness of the energy security, justice, and governance problem, *Energy Policy*, **41**, Pages 232-240, (2012)
3. IEA, IRENA, UNSD, World Bank, WHO. *Tracking SDG 7: The Energy Progress Report*. World Bank, Washington DC. © World Bank. License: Creative Commons Attribution—NonCommercial 3.0 IGO (CC BY-NC 3.0 IGO). (2022)
4. C.F. Gould, S. Schlesinger, A. Toasa, M. Thurber, W.F. Waters, J.P. Graham, D.W. Jack, Government policy, clean fuel access, and persistent fuel stacking in Ecuador, *Energy for Sustainable Development*, **46**, Pages 111-122, (2018)
5. T. Aung, R. Bailis, T. Chilongo, A. Ghilardi, C. Jumbe, P. Jagger, Energy access and the ultra-poor: Do unconditional social cash transfers close the energy access gap in Malawi. *Energy for Sustainable Development*, **60**, Pages 102-112, (2021)
6. National Statistics Office. *Population and Housing Census*. Main Report.Zomba, Malawi: National Statistical Office. (2018)

7. Government of Malawi, *Second Malawi Growth and Development Strategy (MGDS II)*, 2011-2016. Government of Malawi (GoM), Lilongwe, Malawi.
8. Government of Malawi, *Malawi's Vision; Malawi 2063*. National Planning Commission. (2020)
9. Government of Malawi, *National Charcoal Strategy (2017-2027)*, (2017). Malawi.
10. M. Xu, & B. Lin. Leveraging carbon label to achieve low-carbon economy: Evidence from a survey in Chinese first-tier cities. *Journal of environmental management*, 286, 112201. (2021)
11. A. Karanja, A. Gasparatos, *Adoption and impacts of clean bioenergy cookstoves in Kenya*, *Renewable and Sustainable Energy Reviews*, **102**, 285-306, (2019)
12. A-Gill-Wiehl, I. Ray, D. Kammen, 2021. *Is clean cooking affordable? A review*, *Renewable and Sustainable Energy Reviews*, **151**, 1364-0321, (2021)
13. C. Blodget, *Charcoal Value Chain and Improved Cookstove Sector Analyses* (2011)
14. M. Nkululeko, *An analysis of Value Chain of Chitetezo Mbaula Cookstove in Dedza District Malawi*. Lupane State University. (2015)
15. A.V. Shankar, A. K. Quinn, K. L. Dickinson, K.N. Williams, O. Masera, D. Charron, D. Jack, J. Hyman, A. Pillarisetti, R. Bailis, P. Kumar, I. Ruiz-Mercado, J.P. Rosenthal, *Everybody stacks: Lessons from household energy case studies to inform design principles for clean energy transitions*, *Energy Policy*, Volume **141**, (2021)
16. D. Singh, H. Zerriffi, R. Bailis, V. LeMay, 2021. *Forest, farms and fuelwood: Measuring changes in fuelwood collection and consumption behavior from a clean cooking intervention*, *Energy for Sustainable Development*, **61**, 196-205, (2021)
17. B. Gebru, K. Elofsson, *The role of forest status in households' fuel choice in Uganda*, *Energy Policy*, **173**, (2023)