



BEYOND FIRE **BACKCASTING** A PATHWAY TO FULLY ELECTRIC COOKING IN RURAL KENYA BY 2030

Fiona Lambe, Anne Nyambane and Rob Bailis

"Dreams are powerful. They are repositories of our desire. They can inspire us to imagine that things could be radically different than they are today, and then believe we can progress toward that imaginary world",

Stephan Duncombe

June 2020

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INTRODUCTION

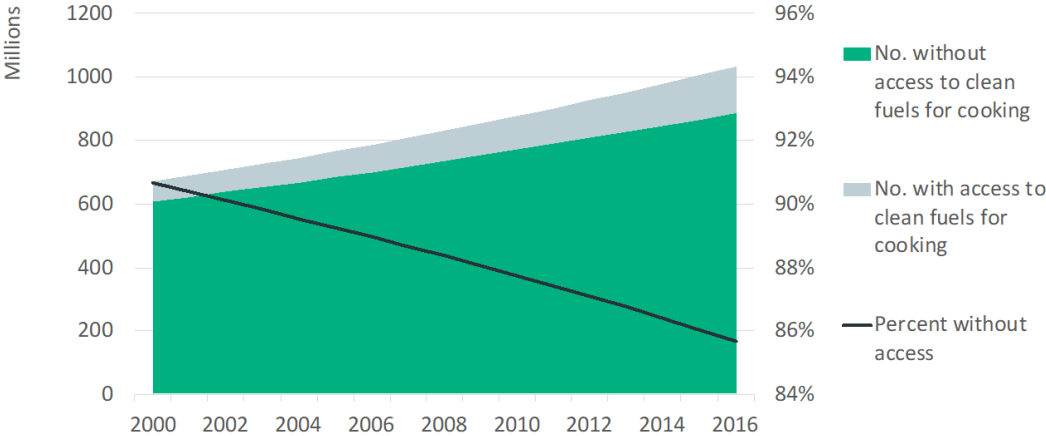
The negative health and environmental implications of cooking with traditional biomass are well known, and efforts to shift households to cleaner, more sustainable cooking technologies and fuels have been underway for many decades. Sustainable cooking means transitioning to a future where cooking needs are met in a way that is economically, socially and environmentally sustainable. In the research and policy literature on cookstoves, articles and reports focused on the transition to clean cooking typically begin with a reflection on the urgent need to transition households in low income countries away from unhealthy and polluting cookstoves to modern, clean and safe forms of energy for cooking. Current epidemiological research indicates that simply increasing ventilation or taking other low-cost measures that incrementally reduce smoke exposure are not sufficient to reduce household air pollution-related health risks (Burnett et al. 2014). Indeed, it is widely accepted that only the cleanest fuels – liquid petroleum gas (LPG), biogas and ethanol – and electricity can deliver health benefits to households, and many development organizations and governments are increasingly prioritizing clean fuels and technologies. However, progress with scaling-up access to clean cooking options in sub-Saharan Africa has barely kept pace with population increase (Quinn et al. 2018; Blimpo and Cosgrove-Davies 2019). Figure 1 shows recent trends in access to clean cooking fuels in sub-Saharan Africa. Even as the proportion of people without access to clean cooking options declined from 91% to 86% between 2000 and 2016, the absolute number of people without access increased from 600 million to nearly 900 million. Under the policies and plans currently in place, 40% of the those with no such access will

reside in sub-Saharan Africa by 2030. This demonstrates the need for substantial efforts to boost access.

Recent reports demonstrate that cooking with electricity is quickly becoming a cost-effective and feasible alternative in both urban and rural areas, particularly in sub-Saharan Africa (Couture and Jacobs 2019; Modern Energy Cooking Services 2019). For example, a recent report commissioned by Hivos estimates that the daily cost of cooking exclusively with electricity could range from €0.04–0.32/day. This compares favorably with other clean options such as biogas and LPG (€0.15–0.36/day), as well as polluting options such as fuelwood and charcoal (€0.16–0.50/day) (Couture and Jacobs 2019).¹ The main catalysts for cooking with electricity are the growing number of people that have access to electricity through grid expansion, the widespread availability of standalone solar home systems (SHS) and the vast progress being made with mini-grid and storage technologies. In combination with efficient cooking appliances, such as electric slow cookers and pressure cookers, cooking with electricity could become cost competitive for households in sub-Saharan Africa. A recent report by the Netherlands Environmental Assessment Agency found that cooking with electricity brings the most benefits in terms of health and environmental impacts (Hof et al. 2019). Given that cooking with electricity is the most viable solution for the future, this raises the question of how to arrive at a future in which people who currently rely on polluting cooking fuels such as firewood, charcoal and kerosene use electricity as their primary or even *exclusive* cooking fuel.

¹ The report makes numerous assumptions about technologies, efficiencies and fuel costs in order to make these estimates. For a full explanation, see Couture and Jacobs (2019).

Figure 1: Number of people with and without access to clean cooking fuels in sub-Saharan Africa, 2000 to 2016 (Ritchie and Roser 2019)



Efforts to scale-up access to clean cookstoves have typically focused on promoting technically more efficient cooking technologies. Important socio-cultural aspects of cooking such as taste, cooking practices, cultural norms and gender roles have been given less attention. There is an urgent need to understand the behaviors, practices and perceptions of those households which will potentially

be on the receiving end of interventions. This report describes the results of a participatory exercise to introduce the concept of transitioning to primary or exclusive use of electricity for cooking in a rural off-grid community. It gathers insights directly from community members to understand how they would envisage such a transition taking place.



Workshop participants reflect on the transition to electric cooking in their village © Fiona Lambe / SEI

OBJECTIVES OF AND RATIONALE FOR THE REPORT

Cooking primarily or exclusively with electricity would represent a major transition for households in sub-Saharan Africa, particularly those living in rural off-grid communities. All successful technological transitions are accompanied by a range of important cultural, administrative, legal and behavioral changes (Ekouevi, Freeman and Soni 2014; Sovacool 2016). A number of research groups and development practitioners have already begun to promote a transition to cooking with electricity. Hivos, which funded this pilot study, commissioned a 2016 report *Beyond Fire: How to Achieve Sustainable Cooking* (Couture et al. 2016), which was updated in 2019 with a specific focus on cooking with electricity (Couture and Jacobs 2019). Using the most recent data on the cost and efficiency of rapidly commercializing cooking appliances and off-grid electricity options, the 2019 report focuses on the economics of cooking with electricity. The report also seeks to inform decision makers of the merits and comparative costs of cooking with electricity and to urge them to move away from improved (biomass) cook stove technologies. Finally, the report repeatedly mentions the importance of behavioral and cultural factors in any cooking transition and notes that factors could present barriers to the transition it seeks to promote. Although it does not provide specific details on how to address these challenges, the report stresses that governments and donors need to commit to research on the behavioral and cultural aspects of transitions to cooking with electricity. This study represents an initial step in that direction.

One of the primary objectives of the updated “Beyond Fire” report was to inform the political and donor discourse and thereby trigger a wider policy dialogue about future pathways for the cooking sector. This case study of Kenya is an attempt to down-scale some of its insights and recommendations in order to understand what these transition *pathways* might look like from a household and community perspective, the actions and changes that would be required, and the roles and responsibilities of various actors in the system from the household to civil society and government. In particular, the study aims to understand whether and how household cooking and food preparation would change as households transition to electric cooking, and how these changes are perceived locally.

The overarching objective of this study is to co-develop and explore future pathways to achieving 100% cooking with electricity in the rural Africa context. The study uses Kenya as a test case. Despite relatively high levels of access to electricity (EED Advisory and SEI 2019), there is very little cooking with electricity in Kenya. To shift the focus toward behavioral drivers and barriers at the individual and household levels, the research participants in this study were households in a rural off-grid community that currently rely on fuelwood as their primary cooking fuel. The objectives of the study were: to articulate a future pathway to 100% cooking with electricity in Kenya by 2030 from the perspective of rural households; to identify key interim targets for reaching the overall goal; and to develop policy recommendations

to achieve the transition. The research questions were:²

1. What would cooking practice in a rural African context look like when full cooking with electricity on standalone SHS or mini-grids with efficient cookers is assumed?

2. What steps need to be taken for people to adopt this practice for 100% cooking with electricity in 2030? In terms of changing behavior at the household and community levels, changing food habits, and policy and regulation.



Workshop participant displays his vision for a modern kitchen in 2030 © Fiona Lambe / SEI

² These are the questions as they were originally written in the study terms of reference.

METHODOLOGY

The intention of this study was to work with a rural community to co-develop transition scenarios. Scenarios can be developed using a range of approaches (Bradfield, Derbyshire and Wright 2016; Kok, Rothman and Patel 2006). Backcasting was selected as the methodology as it has proved to be a useful approach for facilitating open discussion and speculative thinking about desirable future scenarios. Backcasting originated in the field of Futures Studies and has gained recognition as a method for addressing complex questions of sustainable development. First developed in Sweden in the 1970s as a method for the analysis and planning of energy systems, backcasting has since been applied to the study of a broad range of sustainability-related issues, such as land use change, transport, urban development and food production (Dreborg 1996). The approach assumes that future states are mainly a function of current policy decisions, and that it can be useful to describe a desirable future state and then systematically assess how this could be achieved (Lovins 1977). Images and ideas about the future are then connected to the present by elaborating one or more transition pathways developed from the future looking back.

Our study applied participatory target-orientated backcasting, where the emphasis is placed on describing images and ideas of the future as goal-fulfilling (Wangel 2011). The goal is typically expressed in a quantitative manner. In this case, the goal was 100% cooking with electricity. Setting a tangible goal challenges the imagination to identify radical solutions and to go beyond what is considered probable or feasible. Thus, target-orientated backcasting can be said to explore the question of what needs to change in order to arrive at a future desirable state.

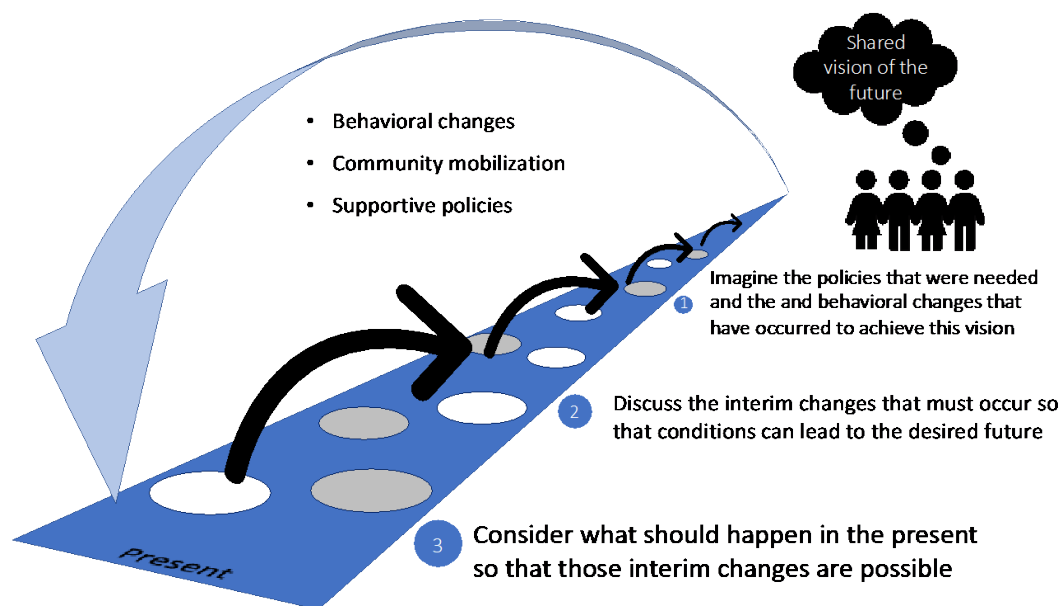
Speculative thinking

A key step in participatory target-orientated backcasting is for participants themselves to clearly establish the desirable future state and to imagine that this state has become a reality. This requires that participants are “transported” into the future and primed to think *speculatively* about the goal in question. Speculative thinking requires people to break with their current realities and imagine how things could be, rather than focus on the technical difficulties or barriers implicit in transitioning to the future state (Dunne and Raby 2013). When it comes to technology and technological change, it is notoriously difficult to make accurate predictions about the future. Speculative thinking can be useful for articulating ideas of possible futures and then using these ideas as tools to better understand the current reality, and for opening up discussions about the kinds of futures that people want and how they might be achieved.

Study site and participant selection

Machakos County was selected as the study site as it is close to Nairobi, where most of the members of research team are based, and because cooking practices in Machakos are similar to many other parts of Kenya, which makes the study findings transferrable. Only households without an electricity connection were selected from seven villages close to Machakos town. The villages selected were: Kitulu, Kwauunda, Kingo`Ngo`l, Kalambya, Linga, Syauni and Thinu, which are located in Mitaboni in the sub-county of Kathiani (Figure 3). Although just 10 km from an urban center, the infrastructure, access to services and main livelihoods

Figure 2: Schematic diagram of a participatory backcasting process (adapted from Cruz 2016)



give the communities a rural character. Unpaved roads connect each community to the main road into Machakos, there are minimal healthcare facilities in the area and small-scale agriculture is the primary source of livelihood.

Household energy access in Kenya and Machakos County

A study of the household cooking sector by Kenya's Ministry of Energy and Petroleum in 2019 reported that over 90% of rural Kenyans rely on simple woodstoves as their primary cooking option (EED and SEI 2019). The rural residents of Machakos County are similar to those in other parts of Kenya. Just under 90% use a simple three-stone fire woodstove to cook the majority of their meals (Kenya National Bureau of Statistics 2018).

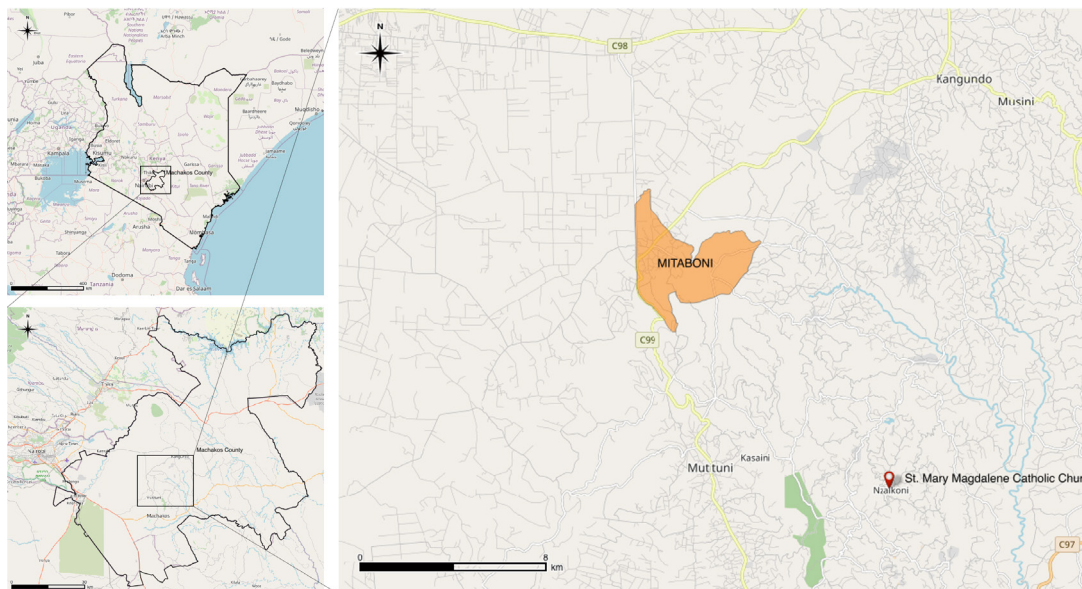
Participants were recruited with the support of the area chief in Kitulu and

a community mobilizer. The mobilizer identified 30 participants who were available and interested in attending the two-day workshop. The key selection criterion was that participants should not currently be cooking with electricity. The group consisted of 21 women and 9 men. The group was skewed towards women because they bear greater responsibility for cooking and fuel acquisition, but men were also included in order to capture their views.

Workshop design

The workshop was conducted over the course of two days with a day in between to allow the research team to review and synthesize insights from the first day. The 30 participants self-divided into five groups of six, ensuring that there was at least one man in each group, and remained in these groups throughout the course of the two days. In all, there were 10 facilitated breakout sessions with these groups. (For a summary of the sessions see the appendices.) Each group was assigned a

Figure 3: Maps of Kenya (upper left), Machakos County (lower left) and Mitaboni and Ngiini (right), the two sub-locations from which participants were recruited, as well as the location of the church that hosted the workshop



facilitator to guide it through the sessions and take notes on the discussions in each session. The facilitators were selected from a list of enumerators from a previous study on energy consumption dynamics carried out in Machakos and Kitui County. They were selected because they came from the two counties and spoke Kamba as their mother-tongue. Prior to the workshops, the facilitators were provided with training on the methodology and the objectives of the study, and given clear written instructions to refer to if needed during the sessions.

Various measures were taken to build trust and rapport, and to encourage open engagement between the research team and the participants:

- A local community member was appointed as the community mobilizer to initiate dialogue regarding the study with the local government. Moreover, the area chief attended the workshop and encouraged participants to engage freely in the discussions.
- The workshop venue was a church in Kitulu village, a familiar and convenient location for the participants to gather in.
- The workshop was conducted in the local language, Kamba. The community mobilizer also acted as a facilitator, translating the discussions in the main sessions from English to Kamba. Group discussions were held in Kamba and the facilitators took notes in English.
- Various approaches were taken to ensure that the participants remained engaged throughout the workshop. On the first day of the workshop, each participant introduced him/herself and the facilitator constantly encouraged them to seek clarification and ask questions at any point. After moving into groups, group members and their facilitator remained in the same group throughout. During the discussions, the participants were provided with writing and drawing materials for setting down their individual and group ideas, and a participant from each group presented the key messages from the

discussions. The research team moved around the various groups to provide an opportunity for the participants to ask questions and seek clarification.

- To ensure that participants attended the workshop on both days, a transport allowance was paid to all the participants on each day to facilitate their travel to and from the venue.

Workshop part one: establishing the goal and developing storylines

Day one of the workshop focused on establishing the future goal of 100% take-up of cooking with electricity. A large pre-prepared banner was used to present a timeline from 2020 to 2030, broken down into three time intervals: 2020–2024; 2024–2027; and 2027–2030. The timeline comprised three lanes for collecting data on the actions and activities required at the governmental, community and household levels (see Figure 5). The timeline was pinned to the wall, where it remained for the duration of the workshop.

During the workshop introduction we directed the participants' attention to 2030 on the timeline and explained that this is where we would like them initially to focus. A pre-prepared narrative was read to the room, describing the scenario of 100% cooking with electricity (see appendix 2). The participants were then asked to discuss in detail in their groups what 2030 would look like for them, in terms of their household and the community. A key task for the facilitators at this stage was to help their groups to imagine the 2030 scenario, and to help them to describe this future state in detail. Each group was provided with a set of printed picture cards depicting generic symbols and imagery related to cooking, energy, family life and community, as well as blank paper and colored pens. These materials were

provided to help support the discussions by allowing the groups to sketch ideas and/or create collages using the pictures. Some prompt questions were also given to the facilitators to help them trigger thoughts and ideas (see appendix 3).

To help 'transport' the participants into the future and imagine cooking with electricity, the research team partnered with Burn Manufacturing, a Kenyan company that produces improved cookstoves.³ On the first day of the workshop, a representative from Burn conducted a cooking demonstration, using an electric pressure cooker to prepare a traditional meal known as *muthokoi* (see picture, page 11). *Muthokoi* is a popular, staple dish in Machakos and variations are common in other parts of Kenya under different names (e.g. githeri, nyoyo). Tasting the meal and having an opportunity to see a familiar meal prepared using the pressure cooker provided the participants with a tangible reference point for cooking all their meals using electricity in 2030.

Workshop Part two: backcasting

The second part of the workshop focused on backcasting. Workshop participants began to systematically think through what would be required to achieve the vision for 2030. The first step in the backcasting process was to consider the time interval closest to the goal, 2027–2030, and to develop a narrative to describe this time period in the light of the vision established for 2030. Once a narrative had been established for 2027–2030, the participants moved on to the next time interval, 2024–2027, and repeated the exercise thinking through what this time interval would "look like" given the state that they had established for the period 2027–2030. Finally, the groups considered the time interval 2020–2024 and repeated the exercise of establishing a narrative

³ Burn Manufacturing's core business is improved charcoal stoves. Although they are currently exploring the potential market for electric pressure cookers, they had no financial stake in this project.



Cooking demonstration © Fiona Lambe / SEI

for this time interval given the state that they had established for the following time interval. In developing the narratives, the workshop participants were asked to consider what would be happening during the time intervals not only in their households, but also in the community and beyond.

The backcasting exercise was conducted in breakout groups (see picture page 14). Each group shared its narratives on each time interval with all the participants, resulting in five storylines for each time interval. The research team then consolidated the storylines into an overarching narrative that described the key activities and the changes taking place in each time interval. The consolidated narratives were then fed back to the workshop participants to allow them a chance to comment and correct any inaccuracies.

Once all the participants were happy with the narratives, they worked in the same groups to identify the key enabling factors that would be required at each time interval in order to achieve the desired state, and which actors should be involved. Their ideas were captured on post-it notes, which were color-coded according to the type of actor that should carry out the action: orange for household, yellow for community or NGO and pink for government. Post-it notes were placed on the timeline at the relevant time interval. As with establishing the narratives, the groups worked systematically backwards from their vision for 2030, considering which enabling factors would be needed to achieve the preceding storyline.

To understand the relative importance of the actions required in each time interval, all the groups voted for the three actions that they felt should be prioritized in

each time interval. Votes were cast by placing stickers next to the actions that the groups wished to prioritize. Groups

could vote for an action more than once if they wished.



Workshop participant tastes Muthokoi cooked on an electric pressure cooked © Fiona Lambe / SEI

RESULTS

Part 1: The participants' vision for 2030 and a 100% cooking with electricity scenario

The first part of the workshop focused on establishing what it would mean to cook with electricity by 2030 and what this future scenario would look like from the household and community perspectives. In describing their vision for 100% cooking with electricity by 2030, a range of themes emerged related to family life, food security and health, household cooking habits, technology and infrastructure, and gender. An overarching theme was that cooking with electricity is inextricably linked to wider development aspirations such as improved standards of living and perceptions of modernity.

Electricity for cooking is closely associated with increased levels of development at the household and community levels

When imagining the goal of 100% cooking with electricity in 2030, workshop participants immediately connected cooking with electricity with access to electricity in the community more generally, and the widespread benefits that this would bring. This was clearly demonstrated in their descriptions of what households and the community will “look like” in a scenario that assumes 100% cooking with electricity in 2030. Participants described how having electricity in their community would mean that they would have access to clinics, improved education facilities for students – two of the groups mentioned that there would be computers in schools – and street lighting that would increase security in the villages. Having electricity would enhance agricultural activities through use of improved farming

techniques such as heat lamps in hatcheries and cold storage for products before they are taken to market. It would also enable value addition in dairy farming, which would boost farmers' incomes. Electricity could also be used to pump water, which would be used in people's homes. Water is currently pumped up from the lowlands in a scheme managed by the government that has been interrupted recently due to a broken water meter.

Several groups mentioned having access to information through both television at home and widespread internet connectivity. One group described how the community would be connected to the outside world through the internet.

Workshop participants imagined multiple improvements within households associated with cooking with electricity. Even though we emphasized that in this future scenario, the power for cooking was supplied through a mini-grid, households began to imagine having lighting and other appliances such as refrigerators, washing machines and kettles. This suggests that cooking with electricity is closely associated with development and modern living. Indeed, as discussed below, almost all the groups' respondents described modern kitchens as a prerequisite for cooking with electricity, and told how they could not imagine installing electric cookers in their homes without first “upgrading” their kitchens.

Family life and gender impacts

All the groups described the far-reaching impacts of electrification on family life, leading to far less stress overall due to the reduced burdens of gathering fuelwood and cooking in smoky environments. When asked to elaborate further, participants explained that the current cooking system requires a great deal of



Breakout discussion © Fiona Lambe / SEI

effort, such as walking for 4–6 hours per week to gather wood that is becoming increasingly scarce due to deforestation, drying the wood and spending hours every evening cooking in a smoky kitchen after a long day engaged in tasks related to farming and housekeeping. The heavy workload for women is often a source of stress and conflict within families and leaves women exhausted. Once these time-consuming tasks are completed, household members have little mental bandwidth left to engage with one another or manage problems in a constructive way. As one female participant explained:

In 2030, our households will be harmonious. There will be more love and unity in our homes. Husbands and wives will have time to talk in the evenings. If visitors come, they will experience the harmony.

It was also suggested that having access to electricity for cooking would shift roles and responsibilities within households, and that men would begin to help with the cooking. Several reasons were given for this shift. One male respondent said that he would be capable of cooking with electricity as it would be a lot more straightforward than using a three-stone fire or charcoal. Two of the groups mentioned that in 2030, children would also help more with the cooking as the electrical technologies would be safer and easier to use, and require less supervision than cooking with fuelwood or charcoal.

The modern house that we would have built by 2030 will have the kitchen and the lounge in the same area. I can help my wife prepare meals as we discuss important development projects for our family.

According to participants, the reduced burden on women in combination with the availability of modern cooking devices would also mean more time and energy available to prepare a wider variety of dishes.

These days, when I return from the fields in the evening, I am so tired that I just prepare what is easiest and that is ugali...ugali, ugali, ugali!!! In 2030 we will all have time to plan and prepare delicious meals with more variety just like the people who live in the cities.

Every group mentioned the impact on women that access to electricity for cooking would have in terms of easing their workload. In addition, two of the groups mentioned that access to electricity could bring new income generating opportunities for women, through selling snacks and cakes that can more easily be produced at home. One of the groups mentioned that women would have opportunities for education. One younger woman – the rapporteur in one of the groups – described how having access to electricity at home would allow her to use the time freed up from cooking, as well as the availability of internet connectivity and lighting, to pursue online learning at home. One group mentioned that street lighting in the community would enhance security for women and girls after dark.

Food security and health

A clear theme that emerged from the focus group discussions was the effect that having electricity in the home would have on food security and health. All the groups mentioned that a reliable supply of electricity for cooking would mean that they would eat more food – three meals a day instead of the two that most eat today. All the groups reported that they would consume a much wider variety of dishes if they had electricity, including pasta and noodles which are considered luxury items today – some mentioned only

eating spaghetti at Christmas or on special occasions. Two of the groups described how the food they eat in 2030 would be fresher, partly because they would be able to “cook on demand” since cooking with electricity is quick and efficient, and partly because the participants assumed that they would also have a refrigerator at home for storing food. Today, households typically save leftovers from dinner to eat the following day, but food often spoils causing stomach upsets. Four of the groups mentioned that all their meals would be warm in 2030, in contrast to the current situation where leftovers are often eaten cold since warming them means lighting an open fire, which takes too long.

Cooking with electricity 100% of the time would also have a positive impact on household health as kitchens would be less smoky. Almost all the groups mentioned that in 2030 there would be fewer trips to the hospital or clinic linked to respiratory ailments, especially among children, and that they would spend less money on hospital bills and medication. Two of the groups mentioned that there would be fewer burns and accidents resulting from cooking on three-stone fires and charcoal stoves. The prevalence of respiratory infections among children was confirmed by a health worker who participated in the workshop. One of the groups mentioned that in 2030 there would probably be some accidents, such as electric shocks and fires related to cooking with electricity, particularly while households are getting used to the new cooking techniques.

Cooking habits

All the groups mentioned that local staple dishes such as *ugali* and *muthoko*i would still be cooked regularly in 2030 because households like them and are familiar with them, but that preparing these dishes would be faster and easier using electrical appliances like the pressure cooker. One

group discussed how they would cook mandazi using electricity, a task that requires pieces of dough to be deep fried in oil, which is not currently possible when cooking on an open fire or charcoal stove for safety reasons. Three of the groups imagined that they would be baking cakes and biscuits a lot more in 2030, as they assumed that most kitchens would have an electric oven.

When prompted on what other current staples would still be eaten in 2030, several groups mentioned that grilled meat would be cooked occasionally, and that charcoal would be needed to ensure the smoky barbeque taste. One of the groups mentioned that in 2030 it would be possible to cook several items at the same time using several rings on an electric hob, or by combining it with a pressure cooker. Two of the groups mentioned that even with electricity for cooking, they would like to have a “back-up” cookstove such as a *jikokoa* or “rocket stove” – the popular fuel-efficient charcoal stove sold by Burn Manufacturing – in case of a power cut. It should be noted that even though workshop participants frequently mentioned the *jikokoa* in their discussions, they were really referring to an efficient wood burning stove, the *kuniokoa*, and not an actual charcoal stove.⁴

Technology and infrastructure

As noted above, all the groups imagined having a modern kitchen in 2030, and that installing new kitchens would be an important prerequisite for getting access to electricity for cooking. There were many ideas about what a modern kitchen would look like and several groups sketched their visions on paper (see Figure 4). In most cases, the groups imagined that the kitchen would be part of the main living area rather than the separate structure that is typical in rural Kenya communities (EED

and SEI 2019). The kitchens would be well ventilated, with windows and an extractor fan to remove fumes from cooking. Floors would be tiled (current kitchens typically have earth floors) and there would be ample space for storage. All the groups imagined having several electrical appliances in their kitchens beyond electric cookers, such as refrigerators and kettles. One group imagined having a washing machine. All the groups envisaged having a range of utensils for cooking, such as pots and pans, and knives and spoons.

Our modern house will have a sink to wash hands, a refrigerator, a microwave, a modern cookstove and no smoke so no teary eyes; in short, the atmosphere will be heavenly.

Beyond the household, the participants described larger infrastructure improvements that will have taken place in the community by 2030. The road into the villages will have been repaved. It is currently in very poor condition and impassable during the rainy season, leaving the villages cut off from the main road to Machakos. There will also be a new clinic and improvements will have been made to the local school.

Part 2: Pathways to 2030

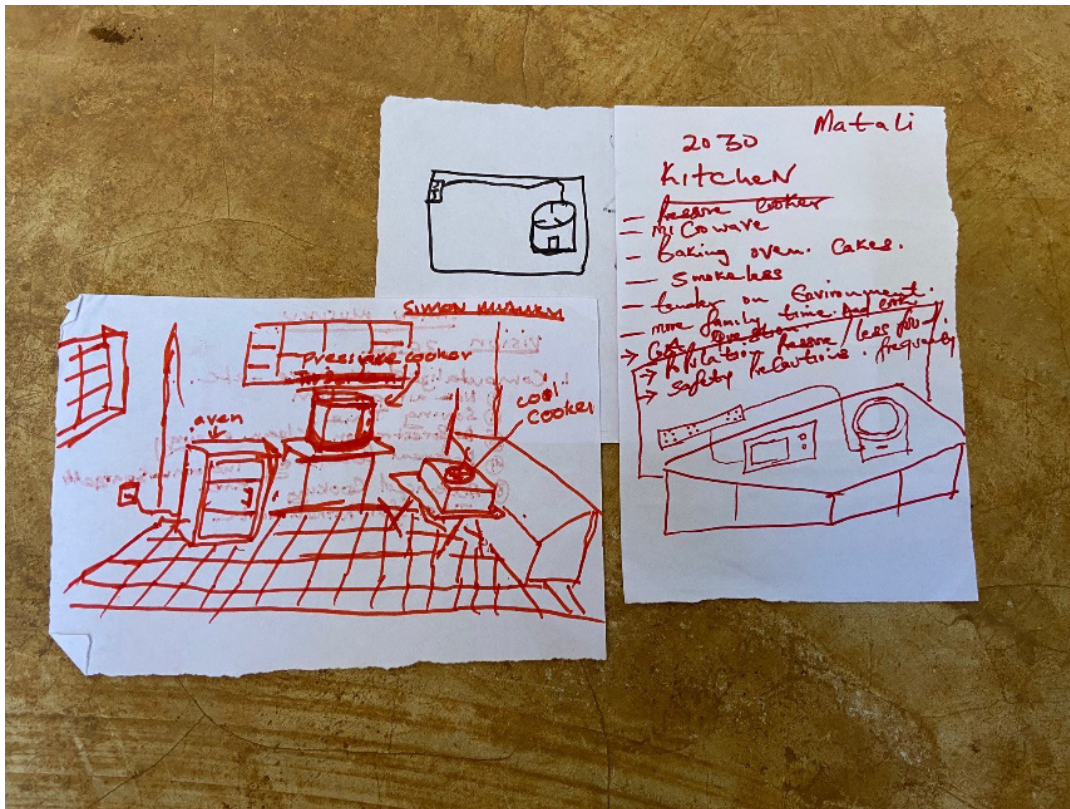
This section presents the consolidated storylines for each time interval, as well as an overview of the actions identified by the participants and of the actors they imagined would need to be involved.

First time interval, 2027–2030: Modern cooking systems, village electrification and widespread development benefits

During this period, all households gain access to electricity but the poorest

⁴ For a description of the stoves currently offered by Burn Manufacturing see: <https://burnstoves.com/burn-jikos/>.

Figure 4: Sketches showing visions of modern kitchens in 2030



households connect last. Families are saving time gathering fuelwood and are cooking a wide variety of foods on their electrical appliances, allowing them to eat three meals per day and eat a wide variety of food which has improved nutrition. Health is also improved as the number of respiratory infections decreases. Kitchens are clean and modern with tiled floors and multiple electrical appliances, including a refrigerator, kettle, pressure cooker and microwave. Households are harmonious; husbands and wives are spending more time together in the kitchen and experiencing less stress from the burden of fuelwood gathering and long hours cooking in a smoky kitchen. The village is electrified, bringing with it improved health services and attracting outside investment and improved infrastructure. New jobs have been created in electricity service provision, and the sale and repair of electrical appliances. The environment has been restored and the area has been

reforested. The community working in unison has played a central role in bringing about these transformations.

What are the key actions required in 2027–2030 to reach the goal and who needs to be involved?

At the community level, a strong emphasis is placed on the importance of early adopters as catalysts to influence others to connect to electricity. These individuals are seen as playing a key role in “last mile connections” once the necessary foundations of community awareness and the infrastructure have been put in place. Community-based organizations continue to run information sessions and demonstrations of electrical appliances, including safety demonstrations.

All the groups emphasized the need for financial stability at the household and community levels in the period 2027–



Participants placing actions on to the timeline © Fiona Lambe / SEI

2030 in order to achieve their vision of 100% cooking with electricity. Participants discussed the need for increased economic activity in the community and increased investment to ensure that households can mobilize the resources needed to pay for electricity connections and the purchase of kitchen appliances. One group observed that an increase

in the number of electrical appliances in homes will mean that more income is generated by the suppliers of the appliances, which will mean more income available to pay for the electricity supply. One of the groups mentioned that the community could save money by sharing the cost of maintenance and repairs related to electricity connections, which

would mean employment opportunities for electricians and appliance repairers. One participant reflected on the knock-on effects for the local economy of having electricity for cooking: "Now that homes are electrified, we can start cafes, restaurants and salons".

Although most of the awareness-raising activities are conducted in the period 2024–2027, three of the groups mentioned that some sensitization activities would be needed in 2027–2030 to remind people about the benefits of cooking with electricity, the negative effects of cooking with fuelwood and the safety aspects of cooking with electricity.

All the groups saw a key role for government to play during the final phase of electrification in terms of supporting last mile connections so that households with lower incomes are helped to connect. Two of the groups mentioned the need to renew and extend the Last Mile Connectivity Project (LMCP) to support low income households to connect to the grid in the run-up to 2030.

The key enabling factors for achieving the goal that were prioritized by workshop participants for 2027–2030 were: government incentives, such as the LMCP to connect all remaining households by 2030; and community-level savings schemes, such as "merry-go-rounds" and "table banking", to provide access to finance for kitchen appliances and to support small businesses.⁵

Second time interval, 2024–2027: Community coordination, construction and transition to cooking with electricity

All the groups considered this time interval to be a period of major transition and

implementation. Some households have gained access to electricity but these are mostly the early adopters and those with higher incomes. Infrastructure is being rapidly put in place from electricity poles to transmission lines and transformers in the community. Kitchens and houses are being upgraded. The community is working hard together to source funds to prepare for the electrification of their villages, using table banking and merry-go-round schemes to purchase improved stoves and electricity connections. The community is also coordinating closely to make the case to Kenya Power to electrify their villages. (The transformer optimization utilization initiative by Kenya Power means that the cost of connections is more affordable if several households are connected at the same time.) Households are cooperating with the government to support grid extension activities, for example by allowing electricity poles to be erected on their land. Many households have transitioned from fuelwood to LPG and kerosene for cooking. There is still significant deforestation due to the construction taking place in the community but the widespread planting of seedlings is compensating for this. Employment will be generated through these construction activities. Recognizing an investment opportunity, banks will move into the area to provide loans to households to invest in their kitchens and to start small businesses.

During the plenary discussion, one group expressed concern that charcoal and firewood sellers will lose their source of livelihood. Another participant countered that many new business opportunities will emerge that the charcoal and firewood sellers can switch to.

⁵ A merry-go-round is a common group savings scheme in Kenya where all members of the group contribute a small sum of money on a regular basis, often monthly or weekly. Each time money is collected, the full sum is paid out to one of the members. Table banking group members contribute a small sum of money weekly or monthly and members can borrow larger sums of money from the fund.



Group presenting actions to all participants © Fiona Lambe / SEI

What are the key actions required during 2024–2027 to reach the scenario imagined for 2027–2030 and who should be involved?

Three of the groups mentioned that early adopters of electricity for cooking had an important role to play. These will be influential members of the community, such as elders and village leaders, who can easily convince others to try new technologies or ideas. Two of the groups mentioned that the county government should support these individuals to be local ambassadors of household electrification and provide incentives to them to recruit other households. One participant noted that: “People will strive to upgrade their standards to match their friends who are already cooking with electricity”.

In connection with this point, two of the groups mentioned the need for

community sensitization on the collective aspects of electricity access; that is, that the whole community should have access and that it can be easier to access grid electricity by applying collectively to Kenya Power for connections. There will also be a need for those already connected to guide others on how to apply for a connection.

On the national government and its role, two of the groups mentioned that it will be important that the Ministry for Energy and Petroleum budgets for the LCMP to cover all of the applications that would be made during this period. Two of the groups mentioned that the government should tighten the law on deforestation, making it illegal to cut trees and providing financial incentives to the community for forest conservation. Three of the groups mentioned that NGOs would play an important role during this period, complementing ongoing grid access

activities by demonstrating mini-grids in the community.

The key enabling factors prioritized by the workshop participants in the period 2024–2027 in order to achieve the goal were: a community fund to support the electrification of villages; community savings and loan facilities; and government-led infrastructure development, including on roads.

Third time interval, 2020–2024: Sensitization, civic engagement and the start of the transition to modern cooking

This is a period of intense community sensitization and awareness raising. The community already understands the urgent need for strong leadership to achieve the 2030 goal. Strong and good leaders are elected in 2022, and community members are participating more and more in civic life, attending *barazas* – the local “town-hall” meetings convened to inform citizens about key issues such as how to engage with policymaking at the county and ward levels. At the village level, existing community-based organizations (CBOs) and faith-based organizations (FBOs) are playing a major role in raising awareness and encouraging community mobilization to promote a shift to modern cooking energy sources. The transition away from cooking with fuelwood has begun and many households are using the improved *jikokoa*, while a few are using LPG and kerosene.

What are the key actions required in the period 2020–2024 to reach the scenario imagined for 2024–2027 and who should be involved?

A foundational requirement for the transition to the use of electricity for cooking and electrification more generally is education. All of the groups mentioned the need for civic education to prepare the

community to actively engage in the 2022 elections, and to build the know-how and confidence needed to engage with the government in order to access key services – not only electricity, but also sanitation and health services. Several of the groups mentioned that the church and local self-help groups should organize *barazas* on civic engagement and to train community members on their rights, as well as how to organize and demand basic services. One of the groups mentioned the need for a grassroots campaign for village lighting to reduce instances of theft in the villages.

There was a strong focus on activities linked to finance and income generation in 2020–2024. Four of the groups mentioned that savings and loan groups and table banking groups would begin to play a larger role in supporting small-scale investments in cleaner cooking technologies. One of the groups mentioned that community savings and loan groups would begin to promote the idea of long-term savings plans with a focus on electricity for cooking. Two of the groups mentioned that some of the self-help groups would become more targeted and focused on supplying improved cookstoves to the community, and providing demonstrations of improved cookstoves.




Most of the key stakeholders during this period are local, but the groups also mentioned a key role for the government, in particular Kenya Power, in raising awareness about the LMCP. Few participants had heard of this scheme and there was a discussion in the plenary about organizing a *baraza* about it. The key enabling factors prioritized by the workshop participants for 2024–2027 in order to achieve the goal were: a national level prioritization of funds for relevant stakeholders, including the Rural Electrification Authority; and civic education to ensure the election of good leaders by the community.

Part 3 Towards a transition pathway?

Figure 5 summarizes the actions and priorities identified in the above discussions. A transition pathway from 2020 to 2030 begins to emerge.

- **Building community capability to access public services:** The participants view 2020–2024 as a period of preparation for the large-scale transition that is to come. Civic education on how to access government-run electricity access schemes and on the importance of electing engaged public officials in the 2022 elections will result in increased capacity in the community to take collective advantage of government-subsidized connections to the grid. The community continues to submit collective applications to the LMCP right up until 2030. As time goes on, connections are made more quickly as the community demonstrates the capacity to utilize and pay for the electricity. In response, the government replenishes the LMCP funding in 2027. In the period 2027–2030, there is a final push to connect poorer households using the community connection fund.
- **Early planning for long-term savings and investment:** At the community level, sensitization on the need to save up for and invest in modern cooking energy results in actual savings during 2024–2027, as well as a dedicated community savings fund which can be used to cover the cost of collective connections. This will also trigger additional investment in the community, as well as access to finance through bank loans to support business start-ups. The need for community savings continues until 2030, which reflects how the participants view the transition as a long-term process with investment required along the way – early on for household infrastructure and at a later stage for investment in businesses to take advantage of the opportunities brought about by electrification. Several groups mentioned the need for training – either from the government or from NGOs – on how best to utilize the resources made available through table banking and cooperatives.
- **Early adopters are key to triggering lasting change:** The role of local early adopters was highlighted from 2024 onwards as a crucial part of the transition pathway, demonstrating the benefits of modern cooking and encouraging the rest of the community to follow suit. The participants see the influence of such individuals on catalyzing change in the community as more powerful than that of government or NGOs.
- **Cooking technology transition within the household:** The workshop participants described a transition from cooking with fuelwood on a three-stone fire to cooking almost 100% with electricity that involves a gradual adoption of improved stoves and fuels rather than a direct switch from one to the other. In 2020–2024, fuelwood is still the primary cooking fuel for most households but almost half of households have adopted a jikokoa and some have been connected to mini-grids. In 2024–2030, households are “stacking” a three-stone fire, an LPG stove, a jikokoa and kerosene, and some have started to cook with electricity. By 2030, electricity is the primary cooking fuel for most households, but LPG and the jikokoa are important “back-up stoves”.
- **A variety of electrical appliances are envisaged:** When describing how their kitchens would be upgraded, all of the groups mentioned a variety of electrical appliances beyond cooking devices, such as washing machines,

Figure 5: Summary of actions and targets to meet the goal of 100% cooking with electricity by 2030

2020-2024 Sensitization, civic engagement and the start of the transition to modern cooking	2024-2027 Community coordination, construction and transition to cooking with electricity	2027-2030: Modern cooking systems, village electrification, and widespread development benefits
 Outreach on LMCP Prioritization of funds to REA	Tightened laws on deforestation Large infrastructure (roads)	LMCP renewed by the MoE Deforestation banned
 <ul style="list-style-type: none"> Civic education on accessing electricity and other services (bazaras) Sensitization on savings and loans for energy transition 	<ul style="list-style-type: none"> Collective application made to Kenya power for LMCP Early adopters incentivized to recruit others Community fund to invest in electrification 	<ul style="list-style-type: none"> CBOs run demos on technology and safety Community saving schemes provide finance for local start-ups Roads built alongside electrical connections
 <ul style="list-style-type: none"> Households access jikokoa via NGOs Mini grids are introduced to the community by development partners 	<ul style="list-style-type: none"> Banks provide loans to upgrade kitchens HHs saving via table banking HHs accessing jikokoa + cleaner fuels e.g. LPG, kerosene via NGOs 	<ul style="list-style-type: none"> HHs sharing the maintenance and repair cost for electrical connections LPG, jikokoa + electricity Men sharing the cooking tasks
Targets: 15-40% adopted jikokoa; 60% civic education	Targets: 50-60% electricity access; 100% modern roads; 50% LPG	Targets: 95-98% connected; 70-90% cooking on electrical appliances

refrigerators and lighting, that are linked with an overall improvement in the standard of living.

- Large-scale infrastructure development occurs in parallel with electrification:**
 For the workshop participants, the pathway to 100% electricity use

in cooking involves far-reaching improvements in infrastructure in the community. Beginning in 2024, the main roads into the villages would be upgraded as the grid is gradually extended to the communities. By 2027, all the roads into the villages will have been upgraded.



Working together © Fiona Lambe / SEI

DISCUSSION

In answer to the research question of what cooking practices in a rural African context would look like assuming 100% cooking with electricity using efficient cookers on an SHS or a mini-grid, the participants described a future in which they experienced the health, environmental and socio-economic benefits of modern cooking. Within the household, the behavioral shifts required to achieve this future were generally considered feasible. At the societal level, however, their visions touched on aspects of development beyond those usually associated with access to modern energy, such as the adequate provision of public services, increased economic activity and large-scale infrastructure projects.

The pathway developed by the workshop participants to 100% cooking with electricity could be seen as a development roadmap. In the literature, energy transitions are usually framed the other way around: access to electricity is assumed to be a prerequisite for development. **The workshop participants laid out a complex process of gradual access to electricity that both requires and delivers progress on a wider set of development goals.**

Another key insight is related to how the participants conceptualized the transition to modern cooking. The so-called energy ladder model – the idea that economic development leads households to adopt increasingly clean and more modern cooking technologies and fuels – has been widely debunked in the literature on cookstove adoption, to be replaced by the idea that households instead stack cookstoves and fuels, and use them in tandem to meet various needs. However, the participants we worked with in Machakos clearly imagine a trajectory towards modern cooking that reflects *both*

the energy ladder and stacking models. They describe a 10-year journey away from 100% cooking with fuelwood, in which improved cooking technologies are gradually incorporated in parallel with the rollout of electricity in the community. This trajectory involves the adoption of more efficient wood burning *jikokoa* in the 2020–2024 period, and LPG and kerosene becoming more widespread in 2024–2027. While electricity reaches almost all households by 2027–2030, other stoves – even the *jikokoa* – would still be used for some tasks.

It is of course possible that this trajectory looks the way it does because of the methodology applied. Backcasting entails a stepwise and systematic description of transitions from one stage to another so it might be expected that the resulting transition narratives take on a step-wise character. In follow-up discussions about this pattern during the plenary sessions, however, the participants explained that it would be difficult to switch to cooking with electricity “overnight” because so much infrastructure and know-how in the household and the community would still be missing, from the appliances they would like to use to modern kitchens, and new foods and utensils. These insights were backed up in the discussion the research team had with two of the facilitators who described how they had made efforts to support their families to access clean cooking stoves by purchasing modern cookstoves for them, or by paying to connect them to the grid. They described how their mothers were reluctant to use the new technologies, arguing that their kitchens were not clean or modern enough to use a shiny new stove, that their pots were blackened from cooking on open fires, and that they did not want to spoil the new technologies with their existing

utensils. Perhaps the energy ladder makes most sense as a “mental” and “contextual” energy ladder in that people need to mentally adjust to new technologies and systems, which involves implementing and embracing new socio-technical practices in a gradual, step-by-step manner.

A key message to take away from the workshop is that the community members see themselves as the drivers of the changes they envisage. The participants identified existing resources within the community, such as community savings and loan groups; opportunities, such as using *barazas* for civic education; and relationships, such as organizing to make a collective application to the LMCP and providing financial support to neighbors who cannot afford connection fees, that would go a long way towards achieving the aim. The government is mentioned in the context of large-scale infrastructure development and the LMCP, and NGOs are assigned important roles in demonstrating new technologies but the engine of change is clearly the community itself. The private sector is seen as playing an important role in overall economic activity and development following electrification of the villages, but not as the key driver of the transition.

Another takeaway is that when communities first gain access to electricity through a grid connection, a mini-grid or an SHS, cooking will not be their only priority. During the workshops, which specifically asked participants to envisage a future in which they cooked with electrical appliances, people quickly made connections between electricity and many other aspects of life. The ensuing conversations ranged from improved healthcare services to income generation and street lighting. As with other development goals, clean cooking – with electricity or another source of energy – does not exist in a vacuum. It must be considered in a broader context that encompasses a set of personal and community objectives and priorities.

Some may be complementary. Increased income generation, for example, could make it easier for families to afford electrical appliances and electricity bills. Others, however, could mean competition for resources.

Reflections on the methodology

In this small case study, backcasting proved to be a useful method for facilitating discussions about a future scenario and how to get there. Several key features of the approach and its application are worth highlighting as important factors that may be useful for researchers or practitioners interested in applying it in other cases.

By *beginning at the end* and using the 2030 scenario as the starting point, the method ensures that the focus is shifted from technical problem-solving at the micro-level – such as how the grid will be extended to communities or how households will be able to afford cooking with electricity – to a more open discussion that brings out important contextual aspects linked to community need and development goals. These might have been missed if 2020 had been the starting point. Had we begun with the present day, it is unlikely that the actions identified in the first time interval would have included civic education and community sensitization on the importance of long-term savings.

The *speculative and creative* aspect of the methodology undoubtedly played a role in how the participants considered the questions and engaged with the backcasting. Several facilitators mentioned that they felt as though the participants in their groups had genuinely transported themselves into the future. We observed how some participants, unprompted by the facilitators, fully immersed themselves in the future by writing the imagined date on their personal notes (see picture above).

Imagining a desirable future and articulating in detail what it looks like seemed to be a



Participant notes the date as 18 February 2030 © Fiona Lambe / SEI

positive, even joyful experience for some of the participants. As one man mentioned when his group began to discuss the initial time interval (2020–2024) after backcasting from 2030: “It feels like coming from a dream, or from the moon, and crashing down to earth”.

Several of the older participants commented how they felt happy that by attending the workshop, they had had a chance to see into the future and witness how life would be like for their grandchildren, even though they themselves might not be around in 2030.

With adequate preparation in terms of training facilitators and preparing materials in advance (time line, picture cards, etc.) the methodology proved to be a *feasible and efficient* approach to exploring complex questions in a relatively short space of time. In just two days, the community managed to collectively articulate a desired future

state, and to develop a bottom-up road map of how they could get there.

The method seemed to have an *empowering effect* on the workshop participants. On the first morning, the participants continuously referred to the “training” we were conducting, as though we were there to impart knowledge. Towards the end of the first day, however, this impression seemed to shift. By then, the participants were speaking more assertively about their own future, often correcting us and each other on the statements and assumptions that were being made. At the end of the final day, one of the older male participants noted: “NGOs sometimes come here and ask what we would like them to do for us. Sometimes this is a difficult question to answer. There are so many things needed here. But now we have a roadmap, we can use it to remind ourselves of where we would like to go, and what help we should be asking for”.

RECOMMENDATIONS

- **The transition to electrical cooking should be viewed as a long-term development process.**

Efforts to introduce or scale-up improved cooking technologies should be planned with long-term energy transitions in mind. Program managers and policymakers should consider how programs can be designed to support a *dynamic* transition, where increasingly modern cooking technologies and fuels are added to the mix, and clean cooking and energy access ramp up towards the 100% goal over a clearly defined time period. There is also a need to think beyond cooking technologies to provide access to a range of electrical appliances associated with modern living.

- **Early adopters should be engaged throughout the process.**

To ensure sustainability, there is a need to understand and embed communities' existing capacities, relationships and resources in the design of rural modern cooking energy initiatives. Early adopters, such as elders and community leaders, can play a catalytic role in expanding cooking with electricity in the community. More research is needed to identify local early adopters early on in the design of modern cooking energy schemes.

- **There is a clear need for targeted external support.**

There is a clear role for external actors to support the modern energy transition. The Kenyan government could do more to publicize the Last Mile Connection Program as many participants did not know anything about it. Development partners and

NGOs could focus on introducing new cooking transition technologies and demonstrating mini-grids.

- **Local capacities, relationships and resources should drive the transition process.**

At the same time, the starting point for rural, off-grid energy access must be the households and communities in question. The communities' perceptions of what needs to happen and when, and their conceptualization of energy access – both the prerequisites for and the outcomes of a sustainable development transition – demonstrate their central role as drivers of the transition. The government and development partners should explore practical ways to support and leverage existing local capacity to manage the transition.

- **Back casting should be explored further as a method for generating locally owned development roadmaps.**

This case study demonstrated the potential of backcasting for facilitating discussions on future scenarios at the very local level. Using speculative thinking and a clearly defined goal in a structured workshop resulted in a detailed, locally owned development plan. Backcasting as an approach should be explored in other contexts to understand local perceptions of long-term, complex change processes.

Acknowledgements

This is the section in a report when we would typically thank all the research participants for allowing us to visit their community and for sharing information about their lives. This, however, was a very different kind of study. For one thing, it was the workshop participants themselves who drove this process and collectively articulated a vision for the future they would like see and a detailed roadmap for getting there. Our role was to provide space for these discussions and tools for collecting, discussing and organizing ideas. As facilitators, our focus was on ensuring that all the voices in the room were heard, and that some level of consensus was reached through the discussion. We would like to thank the workshop participants for trusting us to facilitate this process and for their high level of engagement and openness in sharing their visions about

the future with each other and with us. A draft of this report has been shared with the participants and they have provided feedback and suggestions for improving the report (see Appendix 1).

We would like to thank Mary Mutemi for her invaluable support in gathering the participants, facilitating the workshop and acting as a cultural guide. We also thank John, Collins, Michael and Mary for excellent facilitation of the smaller groups during the workshops. We are grateful to Hivos for supporting this work and for suggesting this innovative methodology for exploring local energy transitions. We would like to thank Henrik Carlsson for his guidance and inspiration in developing the methodology and Erik Widmark for his support in designing the workshop material.



Group photo with all workshop participants and research team © Fiona Lambe / SEI

REFERENCES

- Blimpo, M.P. and Cosgrove-Davies, M. (2019). *Electricity Access in sub-Saharan Africa: Uptake, Reliability, and Complementary Factors for Economic Impact*. Washington, DC: World Bank, <https://doi.org/10.1596/978-1-4648-1361-0>.
- Bradfield, R., Derbyshire, J. and Wright, G. (2016). The critical role of history in scenario thinking: Augmenting causal analysis within the intuitive logics scenario development methodology. *Futures* 77 (March), 56–66, <https://doi.org/10.1016/j.futures.2016.02.002>.
- Burnett, R.T., Pope III, C.A., Ezzati, M., Olives, C., Lim, S.S., Mehta, S., Shin, H.H., Singh, G., Hubbell, B., Brauer, M., Anderson, H.R., Smith, K.R., Balmes, J.R., Bruce, N.G., Kan, H., Laden, F., Prüss-Ustün, A., Turner, M.C., Gapstur, S.M., Diver, W.R. and Cohen, A. (2014). An integrated risk function for estimating the global burden of disease attributable to ambient fine particulate matter exposure, *Environmental Health Perspectives* 122(4), 397–403, <https://doi.org/10.1289/ehp.1307049>.
- Couture, T.D. and Jacobs, D. (2019). *Beyond Fire: How to Achieve Electric Cooking*. Hivos and World Future Council, The Hague, <https://greeninclusiveenergy.org/publication/beyond-fire-how-to-achieve-electric-cooking>, accessed 29 November 2019.
- Couture, T., Jacobs, D., Schurig, S., Matser, E., Leidreiter, A. and García, I. (2016). *Beyond Fire: How to Achieve Sustainable Cooking*. World Future Council: Hamburg, https://knowledge.hivos.org/sites/default/files/beyond_fire-how_to_achieve_sustainable_cooking.pdf.
- Cruz, N. (2016). Backcasting: Starting with the end in mind. Energy Futures Lab. 17 February, <https://energyfutureslab.com/backcasting-starting-with-the-end-in-mind>, accessed 12 May 2020.
- Dreborg, K.H., Essence of backcasting (1996). *Futures*. 28(9), 813–828, [https://doi.org/10.1016/S0016-3287\(96\)00044-4](https://doi.org/10.1016/S0016-3287(96)00044-4).
- Dunne, A. and Raby, F. (2013). *Speculative Everything: Design, Fiction and Social Dreaming*. Cambridge, MA: MIT Press.
- EED Advisory and SEI (2019). *Kenya Cooking Sector Study: Assessment of the Supply and Demand of Cooking Solutions at the Household Level*. Kenya Ministry of Energy and Clean Cooking Association of Kenya: Nairobi, 2019, <https://www.eedadvisory.com/resources/resources/>.
- Ekouevi, K., Freeman, K.K. and Soni, R. (2014). *Understanding the Differences between Cookstoves*. World Bank Group: Washington, DC, <http://hdl.handle.net/10986/18411>.

- Hof, A.F., Dagnachew, A.G., Lucas, P.L. and van Vuuren, D.P. (2019). *Towards Universal Access to Clean Cooking Solutions in sub-Saharan Africa: An Integrated Assessment of the Cost, Health and Environmental Implications of Policies and Targets*. PBL Netherlands Environmental Assessment Agency: The Hague, https://www.pbl.nl/sites/default/files/downloads/pbl-2019-clean-cooking-solutions-sub-saharan-africa_3421_0.pdf.
- Kenya National Bureau of Statistics. (2015). Kenya Integrated Household Budget Survey, 2015–2016, National Data Archive (KeNADA). 13 October, <http://54.213.151.253/nada/index.php/catalog/88/study-description>, accessed 15 November 2019.
- Kok, K., Rothman, D.S. and Patel, M. (2006). Multi-scale narratives from an IA perspective. Part I: European and Mediterranean scenario development. *Futures* 38(3), 261–284, <https://doi.org/10.1016/j.futures.2005.07.001>.
- Modern Energy Cooking Services (2019). Loughborough University, <https://www.mecs.org.uk>, accessed 29 November 2019.
- Lovins, A. (1977). *Soft Energy Paths: Toward a Durable Peace*. London: Friends of the Earth International, <https://cds.cern.ch/record/2271842>, accessed 7 April 2020.
- Quinn, A.K., Bruce, N., Puzzolo, E., Dickinson, K., Sturke, R., Jack, D.W., Mehta, S., Shankar, A., Sherr, K. and Rosenthal, J.P. (2018). An analysis of efforts to scale-up clean household energy for cooking around the world. *Energy for Sustainable Development* 46 (October), 1–10, <https://doi.org/10.1016/j.esd.2018.06.011>.
- Ritchie, H. and Roser, M. (2019). Access to energy. Our World in Data. Updated November 2019, <https://ourworldindata.org/energy-access>, accessed 12 May 2020.
- Sovacool, B.K. (2016). How long will it take? Conceptualizing the temporal dynamics of energy transitions. *Energy Research and Social Science* 13 (March), 202–215, <https://doi.org/10.1016/j.erss.2015.12.020>.
- Wangel, J. (2011). Exploring social structures and agency in backcasting studies for sustainable development. *Technological Forecasting and Social Change*. 78/5 (June), 872–882, <https://doi.org/10.1016/j.techfore.2011.03.007>.

APPENDICES

Appendix 1 Summary of community feedback on the workshop report

Project Title: Pathway to electric cooking in rural Kenya by 2030 through back casting

County: Machakos

Subcounty: Kathiani

Location: Mitaboni

Villages represented in the workshop

1. Kitulu village
2. Kwauunda village
3. Kingo`Ngo`I village
4. Kalambya village
5. Linga village
6. Syauni village
7. Thinu village

Dates of workshop: 17 and 19 February 2020

Dates when the participants provided inputs: 29–31 May and 1 June (4 days)

Introduction

In February 2020, the Stockholm Environment Institute conducted a workshop at Kitulu Catholic Church. The workshop attracted 37 participants from the seven villages. These were people from households that had not yet been connected to an electricity supply .

After drafting the report, the methodology required that the report be shared with the participants for their input and verification, and to ensure ownership. It was not possible to hold a group workshop due to government restrictions on interactions and social distancing as a result of the highly infectious Corona Virus, the draft report was shared with the participants in pairs. They were given a day to read and reflect. Two community members (Patrick Kitali and Peter Masaku) then visited the small groups to discuss the report together and get their input. The leaders helped with reading and translating the report from English to Kamba, which the participants can understand. Mary made some follow-up phone calls to clarify and verify the reported inputs.

Key Points Highlighted by the Participants

1. The village names should be corrected (see above).
2. The participants want the challenges they face in using firewood and kerosene documented.
 - High cost of kerosene
 - Long time taken while searching for and collecting fire wood
 - Long time taken for the wood to dry,
 - Scarcity of firewood due to deforestation.
 - There are no security lights in the village at night. Sometimes, there is a hyena roaming at night and people find it difficult to deal with the animal at night.
3. One of the groups discussed some advantages of electricity to be included in the report
 - E.g. availability of electricity will enable the pumping of water from underground water tanks for domestic use. Currently, the community sources water from far down the hills. Water supplied by the county is no longer available in Kitulu and Kingongoi because the water meter was stolen.
 - The availability of electricity will enhance small and medium-sized enterprises and farming enterprises such as poultry farming. It will also make it easier for value addition in farm products such as milk. This will diversify income sources and enable households to pay their electricity bills.
 - Having cold rooms will improve the economy by preserving farm produce such as avocados and kale for the market.
4. Group members also identified the need for training by either NGOs or government on how to utilize their resources well by having savings in table banking and forming cooperatives to achieve the vision of a 100 % transition to electricity use by 2030.
5. Pioneers in installing electricity can act as learning and reference point for others.
6. If a power supply existed right now, development could be significant. There has been no power for over two months because trees fall and interfere with power lines. Kenya power has taken a long time to respond.

Concluding Remarks

Participants agreed with the other areas indicated in the report.

The group members thanked SEI for their recognition and sharing the report with them, and agreed that they (the community) own the work.



Selected photographs from the group feedback session © Patrick Kitali

Appendix 2 Narrative for introducing the 2030 goal of 100% cooking with electricity

It is 2030 and everywhere in Kenya, both rural and urban people are doing all of their cooking with electricity. Not all of the connections are on the main grid – many rural households are connected through renewable mini-grids. The mini-grid systems are much improved in terms of reliability compared to those we have now. The power never cuts out and all rural households have access to electricity 24 hours per day. Households pay for the electricity – it is not cheap (a bit more than what they pay in time and money for wood, charcoal and kerosene) but it is affordable. One of the main reasons why it is affordable is that households use energy-efficient appliances such as pressure cookers to cook their meals. These appliances cook fast and keep the cost of electricity at a reasonable level. Without the use of these appliances, many of the poorer households would not be able to afford to cook with electricity.

Appendix 3: Instructions to Facilitators

Instructions for facilitators: Day one

Break-out 1: Establishing the goal

In your group, discuss the 2030 goal of cooking with electricity using the following key questions to guide the discussion:

What will my kitchen look like in 2030?

For this question, ask the group to use their imagination to visualize what their kitchens will look like in 2030, given that they will be cooking 100% with electricity. Participants are free to draw what they imagine using the paper and pens. Some questions to get the discussion going:

- **What** sort of cooking appliances do they imagine?
- **Who** is doing most of the cooking?
- **What does it feel like** (health wise) to cook in 2030?
- **What meals** are mostly being cooked?
- What meals are they **unable** to cook?
- **At what time** are the meals cooked? Breakfast, lunch and dinner?
- If everyone is cooking 100% with electricity: how are households **interacting** with one another? More / less interaction? E.g. sharing of appliances? Know-how?
- Other benefits to the household / community?

Take notes on what the participants say. Try to summarize the main discussion points.

Feed back to the room: one of the participants summarizes key points heard during the discussion.

Break-out 2: Time interval storyline 2027–2030

(i) 2027–2030: Given that we aim to reach this end goal as you have described it, what does the period just before the goal look like? The participants may use the printed pictures to support the development of the story line. They can also draw their own pictures on the blank cards.

The aim is to develop a storyline (like a comic strip) for these three years using the questions below to frame the story:

- What is happening in the community?
- Who has already adopted electricity?
- What other fuels, stoves are in use?
- What is preventing more households from adopting?
- What is the role and position of women?
- Who is making the decision in the household?

The result will be a storyline with several pictures explaining what these years look like.

Take notes on what the participants say. Try to summarize the main discussion points.

Feedback to the room: One participant is responsible for presenting the storyline to the room.

Breakout 3: Time interval storyline 2024–2027

(ii) 2024–2027: Given the storyline (2027–2030), what does the period just before the goal look like? The participants may use the printed pictures to support the development of the storyline. They can also draw their own pictures on the blank cards.

The aim is to develop a storyline (like a comic strip) for these three years using the questions below to frame the story:

- What is happening in the community?
- Who has already adopted electricity?
- What other fuels, stoves are in use?
- What is preventing more households from adopting?
- What is the role and position of women?
- Who is making the decision in the household?

The result will be a storyline with several pictures explaining what these years look like.

Take notes on what the participants say. Try to summarize the main discussion points.

Feedback to the room: One participant is responsible for presenting the storyline to the room.

Breakout 4: Time interval storyline 2020–2024

(iii) 2020–2024: Given the story line (2024–2027), what does the period just before the goal look like? The participants may use the printed pictures to support the development of the story line. They can also draw their own pictures on the blank cards.

The aim is to develop a storyline (like a comic strip) for these three years using the questions below to frame the story:

- What is happening in the community?
- Who has already adopted electricity?
- What other fuels, stoves are in use?
- What is preventing more households from adopting?
- What is the role and position of women?
- Who is making the decision in the household?

The result will be a storyline with several pictures explaining what these years look like.

Feedback to the room: One participant is responsible for presenting the storyline to the room.

Backcasting Instructions for facilitators: Day 2

Breakout session 1: validation of insights from day one

Please read storyline one for the group (2027–2030). Explain that this is a summary of all of the tables' insights from day one. Ask the group if this story accurately reflects what they told us yesterday. Allow 10 minutes for this exercise.

- Is something missing? If yes, please put it on a sticky note
- If something is incorrect, please put it on a sticky note.
- Additional question: Are people in the community influenced by what others do? (like trend setters/early adopters?)
- Are such people important in the transition to cooking with electricity? If yes, how?

Please read storyline two for the group (2024–2027). Explain that this is a summary of all of the tables' insights from day one. Ask the group if this story accurately reflects what they told us yesterday. Allow 10 minutes for this exercise.

- Is something missing? If yes, please put it on a sticky note
- If something is incorrect, please put it on a sticky note.

Please read storyline three for the group (2020–2024). Explain that this is a summary of all of the tables' insights from day one. Ask the group if this story accurately reflects what they told us yesterday. Allow 10 minutes for this exercise.

- Is something missing? If yes, please put it on a sticky note
- If something is incorrect, please put it on a sticky note.

Breakout session 2: Identifying enabling factors 2027–2030

In this session we will work our way through the timeline to identify key enabling factors that need to be in place for the necessary changes to happen. Please use the following steps:

Read storyline 1 (2027–2030) again for the group. Ask: what are the most important factors that need to be in place for this to happen? These factors should be concrete actions (rather than “unity” or “empowerment”). For each key factor, try to ask who needs to make this happen, e.g. is it a NGO, CBO, government, private sector, etc.? Try to name the organization that needs to make this change happen (if Kenyan governments, be specific about which ministry, which authority)

The group then selects 2 key factors at the community level and 2 key factors at the national level. Write the key factors at the national level clearly on pink sticky notes and the key factors at community level on yellow sticky notes. Place all sticky notes on the big poster in the time interval 2027–2030).

Breakout session 3: Identifying targets 2024–2027

Read again storyline 2 (2024–2027) for the group. Ask: what targets should we be aiming for during this time period to achieve the end goal? These factors should be concrete actions (rather than “unity” or “empowerment”). For each key factor, try to ask who needs

to make this happen, e.g. is it an NGO, a CBO, government, the private sector, etc.? Try to name the organization that needs to make this change happen (if “Kenyan government”, be specific about which ministry, which authority)

The group then selects 2 key factors at the community level and 2 key factors at the national level. Write the key factors at the national level clearly on pink sticky notes and the key factors at the community level on yellow sticky notes. Place all sticky notes on the big poster in the time interval 2024–2027.

Breakout session 4: Identifying enabling factors 2020–2024

Read storyline 3 (2020–2024) again for the group. Ask: what are the most important factors that need to be in place for this to happen? These factors should be concrete actions (rather than “unity” or “empowerment”). For each key factor, try to ask who needs to make this happen, e.g. is it an NGO, a CBO, government, the private sector, etc.? Try to name the organization that needs to make this change happen (if “Kenyan governments”, be specific about which ministry, which authority)

The group then selects 2 key factors at the community level and 2 key factors at the national level. Write the key factors at the national level clearly on pink sticky notes and the key factors at the community level on yellow sticky notes. Place all sticky notes on the big poster in the time interval 2020–2024.

Break out session 5: Voting on the most important actions in each time interval.

Each table will receive nine voting dots. They must then vote for the three actions that they think are most important to implement in each time interval: three in 2027–2030, three in 2024–2027 and three in 2020–2024. The group should look at the big poster and read through all of the factors that are there. They may need some help from you to translate from English. The group must vote as a team, so must reach consensus on which factors are most important.

In order to vote, they then place the dots on the appropriate sticky note. It is permitted to place more than one dot on the same sticky note.

Break out session 6: Agreeing on targets for each time interval

Read the storyline for each time interval. Ask the group: **what target should we be aiming for** to make each storyline possible. A target could be, for example, a percentage of households with access to electricity, the percentage of tree cover restored, the amount of finance raised or the number of new electric connections.

The group should agree on **one household level target and one community level target for each time interval.** Write each target clearly on sticky notes. Community-level targets should be written on yellow sticky notes and household-level targets on green sticky notes. Place all sticky notes on the poster.

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