



**The journey to clean cooking:  
Insights from Kenya and Zambia**

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Cover photo: A woman in Kiambu County, Kenya, cooks on a Philips advanced biomass stove, using pellets produced from sawdust. Photo © Fiona Lambe

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**ABSTRACT**

A shift to advanced cookstoves can bring significant health and environmental benefits, but only with proper and consistent use. Yet empirical evidence of what drives households to adopt advanced cooking technologies is limited. We use case studies in peri-urban Kiambu County, Kenya, and urban Lusaka, Zambia, to examine what drives households to adopt clean stoves for most or all of their cooking needs, and to stick with those stoves for the long term. We use a service design methodology to build “user journeys” that illustrate the cook’s experience with the technology, from the point of hearing about it, to purchasing it, learning to use it, and making it part of daily routine. We find that the main motivating factors for buying a stove were the prospect of saving money and/or fuel, added convenience, and the aesthetic and aspirational appeal of the stove. However, those factors may not continue to motivate people as they begin to use the stove. At that point, what matters most is whether the stove works well and as expected. Most users also need to use the stove several times before realizing its full value. It is therefore crucial that users get the support they need to learn how to use the stove, so they do not abandon it in frustration. Key interventions that can support stove adoption include hands-on trials before purchase, to ensure that users know what to expect; high-quality user manuals; and building a trusting relationship between users and sales agents that continues after the purchase, to provide longer-term support.

## CONTENTS

<b>Summary for decision-makers</b> .....	<b>3</b>
Study structure .....	3
Key findings .....	3
Recommendations and areas for further research .....	4
<b>1. Introduction</b> .....	<b>5</b>
1.1 Research questions .....	6
<b>2. Theoretical framework and methodology</b> .....	<b>6</b>
2.1 Cognitive and social influences on behaviour .....	7
2.2 Behaviour change frameworks and techniques .....	7
2.3 Drivers of advanced stove acquisition and adoption .....	8
<i>Opportunity: Can individuals acquire advanced stoves?</i> .....	8
<i>Ability: Does the individual know how to use the advanced stove?</i> .....	9
<i>Motivation: Does the individual want to use the advanced stove?</i> .....	9
2.4 Methodology .....	9
Case study locations.....	10
Interviewee selection, sample type and size .....	11
Stoves sold.....	11
What we did .....	12
2.5 Limitations of the study.....	15
<b>3. Results and analysis</b> .....	<b>15</b>
3.1 Before: How did households decide to buy a stove?.....	15
<i>Ability: Finding out about the new stove and gathering information to inform the purchase</i> .....	16
<i>Opportunity: paying for the stove</i> .....	18
<i>Motivation to buy the stove</i> .....	18
3.2 During: How did households start using the stoves and establish a new routine .....	20
<i>Ability and opportunity to use the new stove: Learning to use it</i> .....	22
<i>Motivation: establishing a new routine by staying motivated</i> .....	23
<i>Tailoring appropriate responses to meet high and low points in the user journey</i> .....	25
<b>4. Synthesis and recommendations</b> .....	<b>26</b>
Recommendations .....	28
Future research .....	29
<b>References</b> .....	<b>30</b>
<b>Appendix</b> .....	<b>33</b>
Interview guide Kenya .....	33
Interview guide Zambia.....	35

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## **SUMMARY FOR DECISION-MAKERS**

African governments are increasingly looking to modernize household energy options for the 700 million people who still rely on traditional biomass fuels such as wood, charcoal and dung for cooking and heating. Advanced cookstoves are now on the market in several African countries, but the level of adoption of those stoves – correct, consistent use over time, as the main or only stove – still falls far short of what is needed to achieve substantial benefits.

We used two case studies, in peri-urban Kiambu County, Kenya, and urban Lusaka, Zambia, to examine what drives households to purchase advanced stoves, adopt them for most or all of their cooking needs, and stick with those stoves for the long term.

In order to understand the factors that motivate or discourage users at each step of the process, and what interventions would further support adoption, we created “user journeys”, an approach to service design that has not yet been widely applied to the advanced cooking sector. A user journey is a tool for mapping users’ experience with a product or service, in sequence, from the first point of interaction, to when they begin to use it, to when they become accustomed to it, to when they move on to something else. Our analysis is informed by the literature on drivers of human behaviour, including “automatic” thinking, social thinking, and “mental models”.

### **Study structure**

We worked closely with cookstove sellers in each location: a microfinance institution that helps women acquire “life enhancing products” in Kiambu County, and two social enterprises that sell advanced stoves and pellets in Lusaka. As part of the project, we shared the results of our research with them, and obtained their feedback. We visited a total of 36 households in the two locations, all of whom had purchased a stove from one of these sellers. The interviewees (mostly women) had been using their stoves for two weeks up to nine months.

All interviewees in Kiambu County and half in Lusaka cooked on the Philips advanced biomass cookstove, using pellet fuel. The other households in Lusaka cooked on one of two natural draft gasifier cookstoves that burn different types of granular fuels: the Vitalite stove and the Peko Pe stove. To learn more about the local context, we also interviewed staff members at the three cookstove companies whose customers were part of the study, as well as energy sector experts at UN Women and in the Swedish foreign service.

### **Key findings**

Adopting an advanced cookstove requires, as a first step, having the opportunity, ability and motivation to purchase and use the stove. Buyers learned about the stoves through demonstrations by the sellers. We found that access to finance or favourable terms was a critical factor. In both locations, the wholesalers acted as financial enablers, actively intervening to make the stoves affordable and allowing buyers to pay in instalments.

The three main motivating factors for purchase were similar in both locations. A majority of users bought the stove to save money and/or fuel. The second most-quoted factor was convenience: the stoves could save time and, because they are less smoky than traditional biomass stoves, could be used indoors. The third key factor was the stoves’ aesthetic appeal and the association of modern technologies with the buyers’ personal goals and aspirations. We also found that people are strongly influenced by their peers when making purchasing decisions, so embedding sales in existing social networks, as two of the sellers do, can encourage people to buy advanced stoves.

While the sellers' strategies are effective at motivating the *purchase* of a stove, however, they may not motivate its ultimate *adoption*, and could even hinder it. Once households begin to use the stoves, the decisive factor is whether they work well and as expected. However, although the vendors give demonstrations, they do not currently invite prospective buyers to actually handle the stoves, so they get the full experience. Customers typically make the decision to buy with limited information, and several interviewees spoke of being surprised when they started using their stoves and discovered that they had limitations or were harder to use than expected.

### **Recommendations and areas for further research**

These issues could be addressed by providing hands-on testing opportunities and making more information available to people before they purchase a stove. In addition, particularly when there is a waiting period between the purchase and delivery of the stove, it is important that sales agents provide active support and information to help users get started. Several interviewees stressed the importance of an easy-to-read, comprehensive user manual, with clear instructions and pictures.

The stoves also need to be designed to be easy to use, convenient and practical in daily operation. Given that the look and feel of the stove is an important factor for many buyers, the stove also needs to be easy to maintain – not only to keep working well, but to keep looking good. When problems arise – and they often do – it is vital that a system is in place to re-motivate users to keep choosing the stove. This is best delivered in the form of personal follow-up by a trusted source, through periodic visits, phone calls, and/or invitations to social cooking gatherings.

Importantly, vendors also need to ensure that purchased fuel, such as pellets, is of consistent quality, affordable and easily accessible. Ideally, fuel should be made available in sizes equivalent to those for charcoal or other widely used fuels, so consumers can easily compare the cost and replicate existing purchasing patterns, but with the new fuel.

For governments that want to strengthen the enabling environment for advanced cookstove uptake, incentives that make advanced biomass stoves and fuels, such as biomass pellets, easily available to clients can play a very important role in lowering the barrier for initial purchase, as well as the formation of a new cooking habit. Of equal importance is a regulatory environment with a vision to favour clean technologies and fuels over less-efficient options. While such a transition requires a careful approach, to ensure no one is left behind, a long-term vision and associated implementation plan are crucial to achieving a household energy transformation.

For international donors interested in this sector, it is important to recognize that new cooking habits take a long time to develop. In order to understand the long-term benefits, ample funds must be put aside for regular, long-term monitoring and evaluation. Earmarked funds for interventions that have a clear strategy for how to support the formation of a new habit, such as follow-up visits by local implementers over several years, also hold promise.

There is little evidence still of how interventions can aid the formation of new cooking habits in low-income countries. This study has begun to fill that gap, but we strongly encourage further user-centred, ethnographic studies focused on these questions, particularly on how to help people develop new cooking habits once they have bought an advanced stove. Studies that follow households over several years would be particularly valuable.

## 1. INTRODUCTION

African governments are increasingly looking to modernize household energy options for the 700 million people who still rely on traditional biomass fuels such as wood, charcoal and dung for cooking and heating. The use of traditional biomass energy has significant negative effects on public health, air quality and, in some cases, forests, and a shift to modern cooking technologies and fuels could bring multiple benefits (IEA 2014; WHO 2014). The stakes are particularly high for children, who are particularly vulnerable to smoke exposure, and for women, who do most of the housework, often at the expense of leisure or livelihood-improving activities such as education.

Achieving long-term health and climate benefits requires sustained, proper use of clean cooking technologies, coupled with rejection of inefficient polluting stoves (Grieshop et al. 2011). The question is how to achieve this shift at scale. Although advanced cookstoves are on the market in several African countries, the level of adoption still falls far short of what is needed to achieve substantial benefits.

We know how to build efficient and clean-burning stoves, but empirical evidence of what drives households to adopt advanced cooking technologies is limited. We know that to start using an advanced stove, people must know about the stove and where to find it, be able to afford it, and be motivated to acquire it. Then they need to know how to use it correctly, and know where to go for support if something goes wrong.

Yet even when those factors are in place, we know that large numbers of households only use their advanced stoves sporadically, or discontinue their use over time (Puzzolo et al. 2011). Therefore, we need to learn more about how to motivate people not only to buy an advanced stove, but to *keep using it*, and apply these insights to the design and implementation of cookstove programmes and businesses, so they can be more successful.

This paper uses case studies in Kenya and Zambia to examine what drives households to adopt clean stoves for most or all of their cooking needs, and to stick with those stoves for the long term. We use a service design methodology to build “user journeys” that illustrate the cook’s experience with the technology, from the point of hearing about it, to purchasing it, learning to use it, and making it part of their daily routines. Our goal is to help fill a key knowledge gap on what types of mechanisms can be used to support the formation of a new cooking routine.

With more than 30 years’ experience with improved cooking technologies, Kenya is at the forefront of advanced cookstoves in sub-Saharan Africa. There are many cookstove businesses in the country, and the numbers are growing as more entrepreneurs recognize the economic opportunities (Lambe et al. 2015). Yet more than 70% of Kenyans – around 32 million people – still rely on traditional biomass for cooking.<sup>1</sup> Zambia, on the other hand, has limited experience with advanced cooking technologies, with only a few businesses selling advanced cookstoves, primarily in urban areas. About 13.5 million people – 84% of the population use charcoal and/or firewood as their main cooking fuel (Central Statistical Office 2007).

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<sup>1</sup> Our knowledge about the uptake rates of improved cookstoves remains limited both at the country and global level. According to Energising Development, a multi-donor programme that promotes sustainable access to modern energy services for households, about 5 million people in Kenya had access to modern cooking energy in June 2015 as an outcome of the programme (<http://endev.info/content/Kenya>). The Global Alliance for Clean Cookstoves, a public-private partnership that aims to creating a global, thriving market for clean and efficient household cooking solutions, estimates, based on reports from its members, that 82 million improved stoves, of which 53 million are clean and/or efficient, were distributed between 2010 and 2015 (Global Alliance for Clean Cookstoves 2016). We don’t have a comprehensive overview to what extent these stoves are being used, and to what degree traditional biomass and other fuels are also being used.

Our case studies of Kiambu County in Kenya and Lusaka in Zambia provide valuable new perspective on what drives cookstove adoption in different settings and how people who purchase advanced stoves can stay motivated to permanently change their cooking practices.

The research we present is part of the SEI Initiative on Behaviour and Choice, a multi-year effort funded by the Swedish International Development Cooperation Agency.<sup>2</sup> The initiative explores different factors in low-income countries (within households, in peer groups and in social structures) that influence households' choices and decision-making, aiming to better understand how such factors can affect the uptake of innovative technologies.

### 1.1 Research questions

This study focuses on *what kinds of services* people who have purchased and started to use an advanced cookstove need to get the stove to fit into their everyday lives. Our aim is to identify drivers of behaviour change related to both the purchase and adoption of advanced cookstoves, and to pinpoint critical moments where interventions can support the formation of new habits.

To that end, we set out to answer the following research questions:

- 1) What motivates individuals to purchase advanced cookstoves and to adopt them as their main or only stove for daily cooking?
- 2) What factors might stop individuals from buying an advanced stove, or lead them to use the stove only sparingly and/or for a limited time?
- 3) Are there critical points at which these factors arise, and where interventions are needed?

We begin by introducing the theoretical framework used to guide the interpretation of data. We then provide a brief overview of determinants of cooking behaviour described in the research literature, and describe our methodology. We then present the findings of the two case studies, followed by a discussion that maps the findings onto a framework for understanding behaviour change in relation to advanced cookstove adoption. We conclude by offering recommendations for stakeholders on all levels.

## 2. THEORETICAL FRAMEWORK AND METHODOLOGY

Advanced cookstoves typically function differently than traditional biomass stoves. They often use different fuels (e.g. gas or ethanol instead of wood, or pellets instead of branches and twigs), or require preparing traditional fuels in a different way (e.g. chopping wood into very small pieces). They may regulate temperature differently; they may not expose food to open flames, as many traditional stoves do, and by producing less or no smoke, they may flavour the food differently. Adopting a new stove may thus require changing one's habits and cooking methods, establishing a new cooking routine, and maintaining this routine over time, choosing to use the stove again and again.

In short, adopting a new stove requires *behaviour change*. Therefore, if we want to promote the adoption of advanced cookstoves, we need to consider determinants of human behaviour, decision-making and choice.<sup>3</sup>

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<sup>2</sup> To learn more about the SEI Initiative on Behaviour and Choice, visit <https://www.sei-international.org/behaviour-choice>.

<sup>3</sup> We start from the premise that adopting advanced cookstoves is a good thing, with benefits for both the household and society as a whole. That may not always be the case: a stove could be prohibitively expensive, or be poorly built and dangerous, or simply not reduce smoke enough to make a difference. People also may not use

## 2.1 Cognitive and social influences on behaviour

Insights from cognitive psychology and behavioural economics tell us that individuals typically make decisions for non-economic reasons, often with incomplete information, influenced by social norms or emotions (Kahneman 2011). The *World Development Report 2015: Mind, Society and Behaviour* builds a strong case for grounding development interventions in a deeper understanding of human behaviour and decision-making (The World Bank 2014). It highlights several key factors, including “automatic” thinking, social thinking, and the use of “mental models”.

Kahneman (2011) holds that individuals have two systems of thinking: the automatic and the deliberative. The automatic system influences nearly all our judgments and decisions (Kahneman et al. 1982), causing us to simplify problems and fill in any gaps based on our assumptions about the world, rather than seeking out reliable information. This means that in everyday decision-making, people typically do not weigh their options carefully, even when making choices with real consequences, such as financial decisions. One result of this is that often people opt for small, short-term gains over larger future gains.

Humans are inherently social beings and can be motivated by social factors, such as the actions or opinions of a friend or neighbour, to change their behaviour (Rothschild 1999). Individuals acquire new knowledge and change behaviour by observing and imitating the actions of others in the context of social interactions, education and media (Bandura 1986). They also adopt their group’s shared values about what is right and wrong (and the assessment of facts that support those views). Research on “cultural cognition” has shown that individuals tend to evaluate new information based on how it fits with those shared values, and reject what does not conform. The same research has also pointed out that it is socially risky for individuals to think or act in ways that differ from their social group’s norms (Kahan et al. 2011). Given the importance of food in human interactions, it stands to reason that household perceptions of traditional and advanced stoves alike would be shaped by the social and cultural context.

Mental models, in turn, are the “toolkit” of concepts, categories, identities and prototypes that we use to interpret the world around us. They are learned from our experiences, from parents, and from collective beliefs or social conventions (Bisin and Verdier 2001). Although many mental models are useful in complex decision-making processes, others are less helpful and can contribute to reinforcing biases (e.g. stereotypes about certain cultural groups), or beliefs about the possibility of achieving future goals (The World Bank 2014). In the context of cooking, mental models may lead the concept of cooking to be closely associated with particular methods or stoves: for example, that meat is cooked over an open flame, using charcoal or wood as fuel. This means that to adopt a new stove, people first have to grapple with how it conflicts with their mental model, and find a way to accept a new model.

## 2.2 Behaviour change frameworks and techniques

There are a plethora of frameworks for understanding behaviour change that are used to improve the design and practice of interventions. In this paper, we use Goodwin et al. (2015)’s “cleaner cooking intervention” framework. It is based on a review of 48 cookstove interventions to capture the behaviour change techniques used and their documented effectiveness. The framework is accessible enough to be useful to practitioners such as NGOs,

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them to the extent that is required to reap significant (health) benefits. While our analysis touches upon some of these issues, they are mostly beyond the scope of this paper. For further discussion of such concerns, see Jeuland and Pattanayak (2012) for a comprehensive overview.

but is also academically rigorous, following a well-recognized behaviour change taxonomy developed by Michie et al. (2011).

The Goodwin et al. (2015) framework uses an “opportunities, abilities and motivations” approach that is widely used in fields such as public health (Rothschild 1999), organizational management (MacInnis et al. 1991) and sanitation (Devine 2009), to classify the different determinants of behaviour. When combined, these factors speak to the cognitive and social context of human choice and to what motivates a change in practice. In our analysis, we use the questions formulated by Devine (2009, p.4) to define the three factors: Opportunity – does the individual *have the chance* to perform the behaviour? Ability – is the individual *capable* of performing it? Motivation – does the individual *want* to perform it?

The cleaner cooking intervention framework also includes a classification of behaviour change techniques. In this paper, we define behaviour change techniques as strategies used to support cooks in getting the stove to work for them, by creating opportunity, ability and/or motivation. The behaviour change techniques include shaping knowledge (e.g. information and how it was conveyed); reward and threat (e.g. financial incentives, modes of payment); change in physical environment (includes both the physical environment and better design of technologies); social support (e.g. home visits from sales representatives, support from friends); comparisons (e.g. peer effects, including “peer pressure”); identity/self-belief (includes empowerment of women); regulation (changes in formal social or political structures); and goals, planning and monitoring (includes actions to achieve goals, such as savings plans).<sup>4</sup>

### 2.3 Drivers of advanced stove acquisition and adoption

There is no commonly accepted definition of cookstove adoption, but we follow Shankar et al. (2014) to understand it as correct and consistent use over time. As noted above, achieving this requires changing patterns of behaviour that are deeply engrained (Troncoso et al. 2007). A wide range of social, cultural and technical determinants of cooking behaviour need to be addressed, operating at various scales (individual, household, community, sub-national, national). Below we examine the state of knowledge on determinants of cookstove purchase and adoption.

#### **Opportunity: Can individuals acquire advanced stoves?**

This includes factors that are mostly external to the individual, such as physical access and availability, product attributes, social norms, sanctions and enforcements. In a systematic review, Lewis and Pattanayak (2012), identify several determinants of stove and fuel choice, including income, education, urban vs. rural location, fuel availability, price, household size and composition. Takama et al. (2012), in turn, show that is crucial to separate the socio-economic characteristics of households that take time to change – such as income, age or education level – from fuel- and product-specific attributes that can change rapidly, such as the type of stoves available in local markets. Access to finance is another important factor, including different forms of financial support, such as grants or loans. Often-ignored factors such as supply-chain strengthening and social marketing also influence adoption (Goodwin et al. 2015; Simon et al. 2014). Changes in regulation, such as tax incentives, can facilitate purchase and adoption, especially by supporting the development of stove businesses (Rehfuess et al. 2013).

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<sup>4</sup> The classification comes from Michie et al. (2011)’s health behaviour framework, which has been recognized by the U.S. National Institutes of Health, among others. Goodwin and colleagues bring Michie’s list of 93 techniques (grouped into 16 “core components”) down to eight core clusters.

Socioeconomic, gender, cultural and environmental factors matter as well (Rehfuess et al. 2013). These may include fuel availability, seasonal fluctuations, and the division of responsibilities and power relationships within the household and in society at large, including societal, institutional and cultural structures (Pachauri and Rao 2015; Clancy et al. 2012). For instance, women's control over household assets and ability to make purchasing decisions can vary greatly.

***Ability: Does the individual know how to use the advanced stove?***

This includes factors that are both internal and external to the individual, such as knowledge, skills and social support. To buy and use a stove, households must first know it exists and where to find it, and be able to afford it. They must also know how to use it, and have access to technical support and somewhere to go for maintenance and repairs. It takes time to learn how to cook on a new stove, and learning how to use an advanced stove is not a one-off event. Rather, continual learning, including follow-up visits from sales agents, can help support adoption (Shankar et al. 2014). Importantly, there is a big difference between knowing how to operate a stove and knowing how to cook on it in a way that aligns with one's expectations of how the food should taste, smell and feel. While it may be relatively straightforward for a cook to figure out how to light and control the heat on a new stove, mastering how to cook dishes that have been prepared on traditional stoves for generations requires a different degree of learning.

***Motivation: Does the individual want to use the advanced stove?***

Many of the potential benefits of adopting an advanced cookstove can take time to be experienced (e.g. the cumulative effect of fuel savings, or improved respiratory health from reduced smoke exposure). Given what we discussed in Section 2.1, this means that individuals' motivation to adopt an advanced stove is likely to be based on factors beyond an objective analysis of long-term benefits and costs. Those include internal factors, such as attitudes and beliefs, values, emotions and priorities that affect people's willingness to pay for an advanced stove and make the effort to use it. Importantly, internal motivators can be triggered by external factors, such as social networks, or physical factors such as access to a service.

Different members of a household may have different motivations, depending on their own experiences; as noted earlier, it is women and children who are most exposed to cooking smoke, and women and girls who stand to benefit most from reduced drudgery related to fuel collection. However, evidence of the extent to which these benefits are realized is limited, and there is no conclusive evidence that they primarily accrue to women (Jeuland and Pattanayak 2012; Pachauri and Rao 2015). SEI's previous work has highlighted that it is critical to approach the question of motivation from the perspective of stove users: their priorities, preferences and needs, and how well the new technology fits them (Lambe and Senyagwa 2015; Atteridge et al. 2013).

## **2.4 Methodology**

We set out to conduct meaningful, in-depth interviews with households that had purchased and used an advanced cookstove in each of the two case study sites. We chose a case study approach to study two different "bounded systems" through in-depth interviews and observations (Creswell 2012). We used service design methodology, a user-centred qualitative method for data collection and analysis. The focus of service design is to make a service or product useful, usable, efficient, effective and desirable to the user. Service designers use co-creative methods, such as sketching and group facilitation, to encourage

interviewees to actively engage in the service provision, and propose solutions to identified problems (Stickdorn and Schneider 2012).

The goal of our empirical work was to build “user journeys” of advanced cookstove purchase and adoption. This is an innovative approach that has not yet been widely applied to the advanced cooking sector. A user journey is a tool for sequencing the user’s experience with a service, from the first point of interaction, to when (s)he begins to use the service, through to the post-service period (Stickdorn and Schneider 2012). The consecutive ordering of events highlights that the uptake process is dynamic and takes place over time. This makes this approach suitable for exploring what motivates people to purchase and adopt a new technology or service and what support mechanisms can be put in place to aid the formation of new habits.

To facilitate the design of the study, we chose to work with a leading service design firm in Stockholm, where we are based: Transformator Design.<sup>5</sup> This allowed us to work closely together and build trust within the team. To ensure that our work was embedded in the local contexts, we collaborated closely with advanced cookstove implementers in Kenya and Zambia. We also worked with local guides who participated in the interviews, workshops and initial data analysis.

### **Case study locations**

As noted earlier, we chose two sites: Kiambu County, Kenya and Lusaka, Zambia.<sup>6</sup> In both locations, the households sampled had some ability to pay for advanced cookstoves, so income was not considered a key deterrent to adoption. By studying an urban (Lusaka) and a peri-urban setting (Kiambu County), however, we could examine whether users’ motivation to adopt advanced cookstoves differed depending on whether fuel was collected for free (fuelwood in Kiambu County) or purchased (charcoal or electricity in Lusaka; in Kiambu County, most interviewees also bought charcoal, kerosene or liquefied petroleum gas (LPG) to supplement fuelwood).

We also wanted to explore whether changing contextual factors can motivate the purchase and adoption of stoves. At the time of our visit, people in Lusaka had been experiencing daily scheduled power outages of up to 14 hours for more than a year. The power cuts had disrupted everyday energy use and sometimes forced households to change their habits, such as by adjusting the times of day when they cooked.

In both locations, SEI has partnerships that enabled access to households that had purchased advanced cookstoves. In Kiambu County, SEI has a strong partnership with SNV Netherlands Development Organisation, which sponsors a cookstove programme there, implemented by the Visionary Empowerment Programme (VEP). VEP is a microfinance institution that provides loans to purchase “life enhancing products” such as advanced cookstoves. Members are recruited from women’s savings and loans groups.

In Zambia, we sampled customers from two social enterprises we knew from prior work that sell advanced cookstoves and pellets. Emerging Cooking Solutions has conducted most of its sales through payroll reduction schemes at large companies, schools and other public institutions. Vitalite sells cookstoves and pellets from five small shops across Lusaka, targeting customers who live within roughly 500 metres of each shop.

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<sup>5</sup> See <http://www.transformatordesign.com>.

<sup>6</sup> For a different perspective on the Lusaka case study, with several more photographs, see the visual feature *Clearing the Smoke*: <https://stockholmenvironmentinstitute.exposure.co/clearing-the-smoke>.

### **Interviewee selection, sample type and size**

We selected interviewees who could speak to our research questions and the overall focus of the study. We visited households that had purchased and in most cases started to use an advanced cookstove. The number of household interviews and their geographical spread were chosen to achieve a “typical case” sample (Creswell 2007). In both locations, we reached “a typical case” after about 15 interviews, meaning that no new patterns emerged when new data was collected.

In all households, we asked to speak to the person who had purchased the stove (and claimed to be able to make purchasing decisions for the household), as well as the primary cook. In a majority of cases, it was a woman in the household who both purchased the stove and was one of several primary cooks (cooking is often a chore shared by (female) family members across generations). In a few cases in Lusaka, the male head of the household had purchased the stove, and a woman (or several women) was the primary cook. In two households in Lusaka, a man was both the purchaser and the primary cook.

We supplemented household interviews with key informant interviews to give us contextual information. In Kiambu this included three field staff at VEP, three staff at SNV, and one sector expert at UN Women. In Zambia, this included seven interviews with cookstove professionals from the two companies (maintenance, sales and headquarters staff), and two interviews with sector experts from the Swedish Embassy and the Swedish International Development Cooperation Agency (Sida).

Households in Kiambu County were sampled from the customer registries of VEP. Nineteen interviews were conducted over five days in October 2015 in Kikuyu, a major peri-urban centre, and the rural villages of Gikambura, Thogoto, Kamangu, Ruthigiti, and Ikinu. As VEP operates through women’s groups, all interviewees were women. The average household size was four, and most households reported agriculture as their main source of income; several also ran small businesses. The majority of households had access to electricity, mostly used for powering electrical devices. None of the households reported using electricity for cooking.

In Lusaka, interviewees were randomly selected from the customer registries of Emerging Cooking Solutions (nine) and Vitalite (eight), for a total of 17 households. The interviews were conducted over five days in April 2016, in the compounds of Chipata, Mtendere, Kanyama, Ngombe, Chilulu, Emmasdale, Matero, Foxdale and Kalingalinga. As Emerging Cooking Solutions conducts a large share of its sales through schools and other public institutions, all nine of the customers interviewed were teachers – six women and three men. Among Vitalite’s customers, we interviewed six women and two men. The households varied in size from five to 16 people. All households had a grid connection, and most had a selection of electronic appliances, including electric stoves, refrigerators, irons and TV sets. Almost all reported using electricity for cooking, but to varying degrees: half said electricity was their main source of energy for cooking, while the rest said they rarely or never used it for cooking, either due to unreliable supply or high costs. This means that for some households we interviewed in Lusaka, advanced biomass stoves do not necessarily represent a “step up” towards cleaner or more modern technology – not relative to their electric stoves. Instead, they are a more affordable and reliable option; they are also cleaner and more affordable than other available alternatives to electric stoves, such as the traditional charcoal-fuelled *mbaula*.

### **Stoves sold**

In October 2015, VEP marketed and sold the Philips forced-draft advanced biomass cookstove. Along with pellets, the stove can be fuelled with wood or charcoal. To promote

the use of pellets, VEP gave all customers a free bag upon purchasing a stove. The stove has an electric fan that should be switched on when cooking to minimize fumes. The battery has to be charged once a week to accommodate daily cooking.

All Emerging Cooking Solutions customers interviewed used the same Philips cookstove as the households in Kiambu County. In April 2016, these cost 1,200–1,350 Kwacha (US\$120–140). Emerging Cooking Solutions also sell pellets from its head office and at a few petrol stations in Lusaka. Customers are given a free bag of pellets when they purchase the stove. Pellets are promoted as the only fuel suitable for the stove. None of our interviewees said they used any other fuels on the Philips stove.



The Philips forced-draft cookstove. Photo by Fiona Lambe.



The Peko Pe stove. Photo by Sophie Andersson.



The Vitalite stove. Photo by Marie Jürisoo.

Vitalite's customers cooked on two different types of natural draft gasifier stoves that burn granular fuels: the Peko Pe stove, designed in Norway and assembled in Zambia, and the Vitalite stove, designed and manufactured in Zambia. They also sell pellets and wood chips, and customers are given free bags of pellets and wood chips when purchasing the stove. The most frequently cited retail price of the Vitalite stove was 50 Kwacha (US\$5). The Peko Pe stove was not widely sold at the time of our visit, but was quoted to cost 200–350 Kwacha.

### **What we did**

The service design process for gathering data is iterative, starting “broad” and gradually narrowing the scope. It includes four key steps: interactions (interviews), insights (brainstorming of initial findings among researchers), ideation (fine-tuning the analysis and identifying patterns), and triggers (visual aids such as pictures, prototype products, games, etc.). The method is collaborative, with a group of service designers/researchers working together during all of the above stages (Andersson et al. 2016).

We gathered data by following the four steps, but adapted them to fit each location. Interactions were conducted as semi-structured or open interviews and observations, lasting one to three hours. The interviews were executed somewhat differently in the two locations (see Appendix 1). In Kenya, they were organized around different themes related to cookstove adoption. After about half of the interviews, the user journey – the sequenced process of becoming aware of the advanced stove, purchasing it, and starting to use it – emerged from the data.

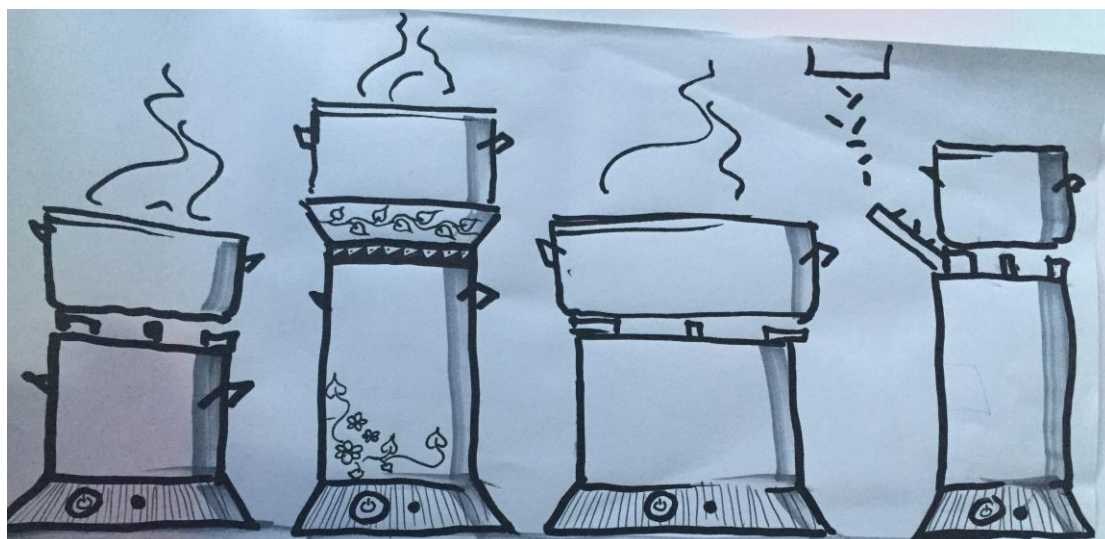
We found the concept of a user journey to be a useful way to structure interviews, and therefore modified the interview guide in Zambia to trace the “before”, “during” and “after” phases of each household’s user journey. The “before” phase refers to the stages of hearing about the stove and deciding to purchase it; the “during” phase refers to the period of starting to use the stove and establishing a new cooking practice; the “after” phase refers to the period when the user starts looking for a new technology to replace and/or complement the stove. The interviewees had used the advanced stove for three weeks to nine months, so none had actually reached the “after” phase of their user journey.

*Step 1: Interactions:* All household interviews occurred in people’s homes. Each involved at least one interviewee, two researchers and one translator/local guide. One researcher led the interview, while the other took detailed notes and made other observations. About half of the interviews were conducted in English, and half in the relevant local language (Bemba or Nyanga in Zambia, and Kiswahili in Kenya). Interview guides and trigger material were used to guide all interactions. In Kenya, trigger material was produced during interviews and in analysis sessions between interviews. In



An interview using previously prepared materials. Photo by Marie Jürisoo.

Zambia, trigger material had been prepared prior to the interviews, but was supplemented by sketches done during the interviews, often at the request of the interviewee. All interviewees participated voluntarily, had given prior approval, and consented to interviews being documented in writing and by taking pictures. All interviewees received modest compensation, in the form of cooking condiments, for their participation.



Trigger materials used in Kiambu County. Drawing by Per Brolund.

*Steps 2 and 3: Insights and ideation:* After each day of interviews, the research team engaged in an interactive analysis process to identify emerging patterns. In subsequent interviews, we explicitly tested those insights, to determine whether the patterns held true or were contradicted by new information. In both locations, we also held workshops with representatives of VEP, UN Women, Emerging Cooking Solutions and Vitalite, to present indicative insights for their



Representatives of the two cookstove companies reflecting on the results presented at the Zambia workshop. Photo by Marie Jürisoo.

consideration and discussion. The workshop was also an opportunity for the research team to give something back to these project partners: insights on possible improvements to their business models. Due to unforeseen logistical problems, we were unable to include interviewees in the workshops, which would have strengthened the validity of the results.

During the workshops, findings were organized along the user journey and illustrated on an “ecosystem service map” that described the users’ experience of purchasing and adopting the advanced cookstove as conveyed during the interviews. The map also shows which actor was involved at which point in the user journey, providing insights into how different actors, independently of each other, influence user experience. The map allowed us to engage in a discussion of key drivers of behaviour and also to pinpoint when in the change process particular drivers come into play, for whom (which type of user), and which actors can influence this.



User journey presented to workshop participants in Kiambu. Photo by Susanna Nissar.

The accessible workshop format of presenting research insights on a paper canvas made it easy for stakeholders to engage with the data collected. Representatives from different companies, and from different levels in the company (e.g. headquarters and local sales staff) had spontaneous conversations about how the insights of the study related to their business model, what they could improve, and how their respective understandings differed.

The use of sticky notes to gather ideas seemed to provide a “neutral ground” where stakeholders could exchange insights without any finger-pointing. Their input helped us confirm some findings, and reconsider others. Notably, the collaborative nature of the workshop facilitated a co-creative process, giving agency to all actors present.

## 2.5 Limitations of the study

As noted earlier, due to the authors' inexperience with service design methods, we opted to work with service designers in our own city, Stockholm. Our choice to work with Stockholm-based service designers meant we did not consult service designers in the case study locations. This could have strengthened the findings of the paper, and should be considered if pursuing a similar undertaking in the future.

Also, because the women and men we interviewed had been cooking on their advanced stoves for as little as two weeks, and no more than nine months, we have no data for households in the "after" phase of cookstove adoption. Furthermore, since we only interviewed people who had purchased a stove, our data does not capture the views of those who have received information about an advanced cookstove but decided not to buy one.

Another limitation of our study is that we did not purposively sample interviewees to analyse gender differences. Gender is a key factor in household energy choices, but the user journey approach did not lend itself well to a gender analysis. Gender was also not a major focus of the study; instead, we wanted to explore factors that motivate acquisition and adoption of advanced cookstoves that can be considered generic to any user, female or male.

Lastly, as noted earlier, due to unforeseen logistical problems, no interviewees were able to attend the stakeholder workshops. As one of the aims of the workshops was to validate initial findings with stakeholders, this means that our interpretation of the data collected has not been verified by any interviewees.

## 3. RESULTS AND ANALYSIS

Our findings on the drivers of behaviour generally reflect the literature on cookstove adoption: Households must have the opportunity, ability and motivation to first acquire the stove and then learn to use it correctly and consistently over time. This involves a series of choices, not only to purchase the stove, but to use it to prepare each meal and establish a new routine.

Below we summarize our findings for two phases of the user journey that we evaluated: before adoption of a new stove, and during its introduction. Each section includes a table that shows the behaviour change techniques observed in each phase to support customers as they purchase or start using the advanced stove (red text). The tables also present evidence of behaviour change techniques not used, but that interviewees said they would have appreciated (green text).

### 3.1 Before: How did households decide to buy a stove?

Our ways of thinking can reinforce or discourage adoption of a new technology. Automatic thinking encourages us to always take the easy way when faced with a choice. This means that actors selling advanced cookstoves need to apply a range of techniques that persuade customers that purchasing a new product will lead to an improved life situation without too much hassle. Our analysis shows that advanced stove sellers overcame this challenge by making the purchase easier (e.g. through instalment plans), giving demonstrations, providing support, and relying on the impact of peers, among other strategies. Our data also shows that the purchasing decision can likely be aided by giving more, and better, information on the technical aspects of the stove, and the comparative advantage of choosing this particular stove over another model.

**Table 1: 'Before': Behaviour change techniques used and behaviour change techniques missed to encourage purchase of the stove**

**Main behaviour change determinants:** *Opportunity:* Can individuals acquire the stove?  
*Ability:* Do they know how to use the stove? *Motivation:* Do they want to use the stove?

**Red** = observed technique to support formation of new habit

**Green** = technique not yet used that interviewees said could support a change in cooking practices

Main behaviour change determinants	Behaviour change technique observed	Location	Evidence
Opportunity	<b>Reward and threat</b> , e.g. financial incentives	Kenya & Zambia	All paid in instalments Free trial of pellets triggered purchase for some
Opportunity	<b>Identity and belief</b> , e.g. agency-based empowerment training	Kenya	Economic empowerment of women
Ability	<b>Shaping knowledge</b> , e.g. information on how to use the stove	Kenya & Zambia	Brief product demonstration
Motivation	<b>Shaping knowledge</b> , e.g. information on how to use the stove	Kenya & Zambia	Appealed to through information on how to achieve savings, including time, fuel and money
Motivation	<b>Changing the physical environment</b> , including better design, fuel switch	Kenya & Zambia	Design that helps meet users' expectations of what the purchase will lead to, e.g. save time, save money, save fuel, less smoke, more efficient combustion, etc.
Motivation (& opportunity)	<b>Social support</b> , e.g. cooking demonstrations, home visits, etc.	Kenya	Strong trust in implementing partner, including quality assurance, distribution and after-sales support
Motivation	<b>Goals and aspirations</b> , e.g. modern technology	Kenya & Zambia	Sellers fuelled hopes of increasing social status by purchasing a modern technology
Motivation	<b>Peer impact</b> , through appeal to social groups  <b>Peer impact</b> , e.g. friends and neighbours also purchase stoves	Kenya & Zambia	Demonstrations to groups, e.g. women's groups, colleagues, and church groups, trigger purchase Several buy the product after hearing about a friend's positive experience.
Motivation	Regulation	Zambia	Ongoing power outages led people to look for alternatives
Ability	<b>Shaping knowledge</b> , e.g. information on how to use the stove	Kenya & Zambia	Access to technical information on stove use, e.g. maintenance, monitoring time required, fuel consumption, etc.
Motivation	<b>Shaping knowledge</b> , e.g. information on how to use the stove	Kenya & Zambia	Information on the comparative advantages of the promoted stove relative to other stoves, e.g. running costs compared other cooking options, absolute savings, etc.

**Ability: Finding out about the new stove and gathering information to inform the purchase**

Most interviewees in both locations learned about the advanced stove at a demonstration. In Kiambu, the demonstrations happen at the monthly meetings of VEP, or in a marketplace, reaching both women and men. Demonstrations by the companies in Lusaka similarly target

social settings such as workplaces and church groups. A few interviewees learned about the stove when passing by a sales place, such as a petrol station or community sales “hubs”. In both locations, product demonstrations are brief: the salespeople display more than one product, typically cookstoves and other energy-saving household appliances. Attendees seldom get advance information on the products to be displayed, and they typically do not get to try the advertised technologies.

All the women and men we spoke with expressed a strong appreciation for cookstove demonstrations, but several mentioned that they would have liked to try out the stove before deciding to buy it. This would provide a deeper understanding for what it means to cook different staple dishes on the stove, and how to load fuel and charge and maintain the stove. Despite the brevity of the product demonstrations, a majority of interviewees in both locations expressed a strong appreciation for them and said they believed they had all the information they needed to make the decision to purchase a stove. As one woman in Lusaka put it: “I started to trust the new stove after the demo. It didn’t give off any smoke – I could see the difference.”



An interviewee in Kiambu County is presented with a mock brochure for an advanced stove. Photo by Fiona Lambe. Drawing by Per Brolund.

In both locations, many respondents said that they would have appreciated having more information, including technical details such as stove’s expected lifespan, how to clean and maintain it, fuel compatibility, fuel consumption (e.g. fuel needed per meal), etc. Several respondents mentioned that being able to compare different stoves (e.g. upfront cost, running costs, aesthetic appeal, etc.), would be useful support in the decision-making process. In Kiambu, we used trigger material to explore this in more detail. We sketched a mock-up of a brochure showing different stoves and comparing these various parameters. We tested this brochure with seven interviewees and all responded positively, saying that this would be a helpful tool to support decision-making.

The perceived lack of information did not discourage the people we interviewed from buying a stove. Still, our study results suggest that letting people try cooking on the stove themselves, and giving them access to considerably more information than is now the norm, could lower the barrier to purchase. It would help customers feel confident that they have as much information as they need to make the right choice. However, the perceived “right” amount of information will of course vary across customers, and will likely depend on the type of cookstove being sold. The need for hands-on testing and active guidance on how to use it is likely more important when the stove operates in a way that is significantly different from conventional ways of cooking.

The expressed willingness to objectively assess information suggests that the interviewees were willing to apply more deliberate, high-effort thinking to the purchasing decision.

### ***Opportunity: paying for the stove***

Our data confirms that access to finance is crucial to start the adoption process. In both locations, the wholesalers acted as financial enablers, actively intervening to make the stoves affordable. In Kiambu, VEP members were invited to sign up for the stove and the accompanying loan on the spot. All women interviewed had signed up for the loan, and none reported having to consult her husband first. In Lusaka, all men and women interviewed who had been given the opportunity to pay in instalments made use of that possibility. Many also reported having factored the free bag of pellets into the purchasing decision.

A few interviewees, both women and men, reported consulting their spouse before making the purchase, as this is what they normally do when buying something for their home. By lowering the financial hurdles for acquisition, sellers spare prospective customers from having to save money for a long time before being able to access the stove. This allows for “spontaneous buying”, a behaviour reinforced by automatic thinking.

### ***Motivation to buy the stove***

Information about how money can be saved really works as a motivating factor for purchase. In both sites, the stove vendors had successfully created a mental frame of the advanced stove as a “money-saving device”. Almost all respondents in Kiambu and half in Lusaka reported that the No. 1 factor motivating their purchasing was the prospect of using less fuel and thereby reducing their expenditure on cooking fuel.

To the women in Kiambu, savings primarily meant less money spent on fuels that supplemented collected fuelwood, such as charcoal or kerosene. It also meant that the (collected and purchased) fuel lasted longer. In Lusaka, all men and women interviewed habitually purchased cooking fuel, and trusted the sales message that the stove could help them reduce fuel expenses. In both locations, several interviewees cited product specific design features, such as high efficiency, suggesting that information about how the stove can achieve savings in fuel consumption or fuel spending is important to motivate purchases.

The second most common reason for purchase cited in both location related to various aspects of convenience – in short, that the stoves would make life easier. In Kiambu, convenience primarily meant flexibility in terms of which type of fuel to use. The stove is useful for women who normally only cook with collected fuelwood, but use charcoal as a backup if the wood is damp, which often happens during the rainy season. Many respondents mentioned that if charcoal became more expensive, as it does during the rainy season, they would consider using pellets as an alternative.

Several women also mentioned the fact that the stove reduces smoke as a key reason for purchasing. This was considered a convenience, as it allows for cooking inside the house without the kitchen/living room becoming smoky and sooty. None of the respondents explicitly mentioned health as a factor motivating the decision to purchase, though that benefit was mentioned frequently during the demonstrations.

In Lusaka, convenience was sought to free up time for other activities, such as leisure and rest, or time to pursue income-earning activities. Many respondents specifically referred to the convenience of being able to cook “independently of charcoal” at any point in the day, even when the electricity was out. As one said: “Finally I will not be in the hands of charcoal vendors.” This suggests that some users in both locations, at least at the point of purchase, were motivated by the prospect of departing from their “known” way of cooking and establishing a new habit.

The third most common reason cited related to the modernity and aesthetic appeal of the stove, associated with personal goals and aspirations for social mobility. One woman in Lusaka put it thus: “Philips is good quality and a strong brand. It gives people hope when they get into this segment of products.” Several interviewees in Kiambu gave similar answers, noting that the stove reminded them of modern stoves used in Nairobi, in particular since it needs to be charged for the forced draft fan to work, and it has buttons for regulating the heat. Other women, in both locations, said they purchased the stove because it gave them elevated social status. As said by one woman in Lusaka: “I bought it because it felt smart. It would make me the smartest person in my neighbourhood.” This shows that tapping into people’s collective aspirations and understanding of what constitutes a life improvement can be a powerful motivator for change, and can trigger the purchase of new products.



An interviewee in Lusaka explains her motivations for buying an advanced stove, adding a hand-drawn card to indicate her desire to experiment with a new technology. Photo by Per Brolund.

In Lusaka, this category of answers – personal drivers related to the aesthetic appeal of the stove – was not included in the pre-made trigger materials, which only included pictures of situational motivating factors, such as savings in electricity, charcoal, time and money. The lack of pictured aesthetic appeal drivers seemed to trigger “aspirational” answers. For instance, one woman spent a long time trying to rank the different motivators for purchase. It was only when she was strongly encouraged to choose between a range of pictures of her own choice (save time, avoid charcoal, save money, etc.) that she said: “Actually, it was none of these reasons. I bought the stove because I wanted to experiment.”

It is also clear from our data that comparisons between peers matter greatly. VEP, Vitalite and Emerging Cooking Solutions all promote their products through social channels, such

as women's groups and workplaces. Several respondents in both locations described signing up for the stove on the spot following the initial demonstration and marketing pitch because "that's what the others did". The number of purchasers at a demonstration did not seem to matter as greatly; sometimes it was a majority of those present, sometimes a minority. One salesperson interviewed in Lusaka stressed that it is crucial to convince the "right" person within the community, as this will have a spillover effect within a larger group: "Schools are important because parents look up to teachers. ... Ministers are also important within women's church groups." This suggests that there is an element of peer effect implicit in all three business models, where social thinking encourages one to replicate the behaviour of others.

Social thinking can also take other forms, such as widespread trust in a local partner, which can reinforce collective behaviours, such as group purchasing. In Kiambu, all interviewees shared the "mental model" of VEP as a trustworthy partner that would only promote high-quality products, thereby validating the purchase for them. Indeed, all women interviewed in Kiambu said that the fact that it was VEP, and not an "unknown" sales agent promoting the stove, was factored into their purchasing decision. Many respondents described the savings group as a safe and trusting environment, where problems could be shared and members actively look out for one another, for example, paying members' hospital bills. VEP is seen as a moral compass, similar to the church, founded on truth and decency. The power of this trusting relationship cannot be overstated as a key driver influencing women to purchase the stove. In Lusaka, we did not find a similar level of trust in either of the stove distributors.

In Lusaka, it was evident that changes in the surrounding environment can add to the motivation to purchase a stove. A majority of interviewees referred either to load shedding or the high and fluctuating price of charcoal as a key reason for purchasing the stove. The main reason for looking for other cooking options was that they wanted to be able to control when they could do "fast cooking" – i.e. cooking of similar speed as provided by electricity. Many also believed that charcoal had become more expensive since load shedding started. Social thinking becomes important to understand why external events can trigger people to become more open to change, as this makes the experience of looking for alternative options a shared venture.

### **3.2 During: How did households start using the stoves and establish a new routine**

Acquiring the new stove is only the first step. What the user experiences when getting started with the new technology is critical. It is at this point that the user's journey toward adoption really begins. It is now that he or she starts assessing whether the stove makes sense, whether it can deliver on the expectations set in the "before" phase, and whether there are other reasons for using or dismissing it.

In the "during phase", the cook needs to be convinced by the functioning of the stove, not the arguments presented in the sales pitch. It is also in this phase that users have to "conquer" established patterns of thinking and decision-making. While automatic, social and mental models thinking can serve as a trigger for purchase when presented with the necessary supporting tools, this pattern of thinking makes it challenging to develop a new habit. Learning something new means repeatedly choosing "what you don't know" over "what you do know", and requires deliberate, high-effort thinking. This is demanding, especially for

people who are living in poverty and may have limited “bandwidth” for tasks beyond basic subsistence.<sup>7</sup>

Our data tells us that developing a new habit is easier if one has access to the necessary information on how the stove works (shaping knowledge), and can get in-person support from a trusted person (social support). Key supporting mechanisms are also crucial, such as easy and reliable access to the new fuel (change in physical environment), continued financial incentives (reward and threat), and reinforcing aspirations that the stove can help meet personally defined goals, such as an everyday life improvement. Most of the findings in this section point to areas for improvement in the operations of the three cookstove sellers, by identifying behaviour change techniques that could be used to support the formation of a new habit.

**Table 2: ‘During’: behaviour change techniques observed and opportunities missed to support the formation of a new habit**

**Main behaviour change determinants:** *Opportunity:* Can individuals acquire the stove? *Ability:* Do they know how to use the stove? *Motivation:* Do they want to use the stove?

**Red** = observed technique to support formation of new habit

**Green** = technique not yet used that interviewees said could support a change in cooking practices

Main behaviour change determinant(s)	Behaviour change technique observed	Location	Evidence
Ability	<b>Social support</b> , e.g. cooking demonstrations, home visits, etc.	Kenya	Some self-proclaimed ambassadors who taught others how to use the stove
Ability	<b>Social support</b> , e.g. cooking demonstrations, home visits, etc.	Zambia	Personal contact valuable for peer support when learning to use the stove
Motivation	<b>Changing the physical environment</b> , including better design, fuel switch	Zambia	New stove meets user’s expectation, demonstrated through regular use
Motivation	Regulation	Zambia	Ongoing power outages motivated use of the stove
Opportunity	<b>Reward and threat</b> , e.g. financial incentives	Kenya & Zambia	Extended trial period for pellets
Ability	<b>Shaping knowledge</b> , e.g. information on how to use the stove	Kenya & Zambia	More information to better understand how to use the stove, conveyed through different channels (person-to-person, legible instruction booklet, etc.)

<sup>7</sup> There is a growing body of evidence that living in poverty imposes a substantial cognitive load that can limit people’s ability to handle other cognitively challenging tasks (see, e.g., Schilbach et al. 2016; Mani et al. 2013). For example, if a mother has to constantly struggle to provide enough food and basic supplies for her children on a meagre income, she may not have the mental “bandwidth” left to do long-term financial planning. Although we do not know of research exploring the issue of “bandwidth” in the context of household cooking, it is likely that learning to use a complex new technology, and adapting recipes and cooking practices to work with that technology, will be particularly daunting for a person whose cognitive abilities are already taxed by the effort required to live in poverty.

Ability	<b>Changing the physical environment</b> , including better design, fuel switch	Kenya & Zambia	Several design features differ markedly from the old stove, need to “re-learn how to use it”
Ability, motivation	<b>Changing the physical environment</b> , incl. including better design, fuel switch	Zambia	Change of fuel too cumbersome to motivate continued use (price, distance to travel, size of bag)
Ability	<b>Social support</b> , e.g. cooking demonstrations, home visits, etc.	Kenya	Formalize role of ambassadors embedded within the community
Motivation	<b>Shaping knowledge</b> , e.g. information on how to use the stove	Kenya & Zambia	More information on <i>why</i> to use the stove, e.g. quantified cost savings
Motivation	<b>Goals and aspirations</b> , e.g. modern technology	Kenya & Zambia	Reinforcing aspiration to motivate users to keep using the technology
Motivation, opportunity	<b>Peer impact</b> , e.g. friends and neighbours also purchase stove	Kenya	Many reported feeling left out when waiting a long time (up to six months) for the stove to be delivered

### **Ability and opportunity to use the new stove: Learning to use it**

The functioning of the stove is critical at this point in the user journey. In order to get started with a new product, users must know how to use it. While most interviewees in both locations said they had all the information they wanted when buying their stove, almost all were hindered by insufficient information when they started to use it. Our data also suggests that the large amount of learning required to cook on the new stove will bring both positive and negative surprises, regardless of how much information has been gathered during the “before” phase.

Roughly half our interviewees in both locations set out to use their stoves as they soon as they had them, while the other half waited until external events “forced” them to try it – for instance, not having other fuels available. In Kiambu, many women had to wait for a very long time before the stove was delivered. Consequently, their enthusiasm waned, and when they received it they did not remember how it worked. One woman reported feeling left out because her friends’ stoves had arrived while she was still waiting. Another reported that her husband was so annoyed with the long waiting time that he wanted to withdraw from the purchasing agreement.

The surprises experienced were similar in both locations. The positive surprises related primarily to the functioning of the stove, including the speed of cooking, being able to cook indoors without filling the house with smoke, and the ease of lighting the stoves. A few also pointed out that the stove looked very nice in their homes, and that the advanced stove is more physically comfortable to use than traditional options. One woman in Kiambu explained one reason: the base can be kept so clean that the stove can be used up on a table top, instead having to be kept on the floor.

The negative surprises involved disappointment with one or more of the technical aspects of the stove. In Lusaka, the most frequently cited “pain point” was not being able to refuel while

cooking without excess smoke coming out. Other common complaints were that the new stove gives off more smoke than their charcoal *mbaula*, that it is not suitable for cooking all types of dishes, that it blackens the pots during cooking, that it goes off quickly, doesn't generate enough heat, is difficult to light, doesn't accommodate large pots, and has to be actively monitored throughout the cooking duration.

In Kiambu, many reported that they did not realize the stove had to be charged once a week, that pellets had to be added correctly, and that the stove can't be left unattended. Almost all reported not remembering how to clean and maintain the stove. Several described having difficulty measuring how much fuel to use per meal, and many reported feeling that they wasted fuel each time they used the stove. In the absence of objective information or guidance, a small number of users reported experimenting with the stove in the beginning to work out the optimal amount of fuel to use per meal.

This perceived lack of information at the time of learning to use the stove demonstrates that customers need active support in the "during" stage of the user journey. This is particularly important if the person who buys the stove is not the person cooking on it. One helpful approach is to provide an easy-to-understand user manual, written in accessible language, printed in a large, legible font. Most users in Kiambu did receive a brochure with the stove. In Lusaka, more than half did not know whether a user manual existed. Around a quarter had seen one, but only a few said it had been helpful. Others said the font was too small, the language was too complicated, and there were too few pictures.

In both locations, many interviewees also struggled to get started with the stove because they did not know how or whom to ask for help. In Kiambu, while most respondents knew that they could theoretically contact VEP, staff were not always available or did not show up for planned visits. In Lusaka, many interviewees did not have the contact number of the sales agent who had sold them the stove; one reported feeling abandoned and betrayed. Because people are prone to take shortcuts, it is easier for many to reject the stove if they find it hard to use, especially if they do not have *easy access* to the necessary support mechanisms. For some, the journey ends here – they stop using the stove.

#### **Motivation: establishing a new routine by staying motivated**

None of the Kiambu interviewees was using the advanced stove exclusively for all cooking tasks; at best, households were "stacking" the new stove alongside the charcoal Jiko, a three-stone fire, and/or an LPG or kerosene stove. We observed a similar pattern in Lusaka, though here a handful of interviewees said they used the advanced stove as their only cooking device. This usage pattern does not suggest that new habits have not formed or that the stove has not been adopted. It only shows that in most cases it has not replaced all the other cookstoves in those households.

Many of the households that cited saving money as their main motivator for purchase said that they use their stove regularly for at least one or two specific tasks, such as boiling water or preparing simple meals. In Lusaka, it was particularly evident that these households invested the necessary time to learn how to use the stove. As one man said: "It has to work and we have to adjust; the circumstances demand that of us." These households driven by savings were also the ones that seem to experience the biggest "life change". As another man put it: "This stove has changed my life, because I can save money." It was also within that user group that new habits had begun to change. One woman said that while she now cooked mostly on her advanced stove, it was too expensive to cook foods that require long-time

simmering on the pellet stove. Therefore, she only cooked beans (which require a long simmer) when electricity was available.

In Kiambu, saving fuel was posited as a key motivation for using the stove. However, if cooks do not use pellets, they have to chop their fuelwood into small pieces. That means there is a trade-off between convenience and fuel saved: the stove does save fuel, but for most users this requires additional work. One woman said the chopping took up a lot more time than she previously spent on fuel, but since for her household, time was less scarce than money, she still perceived the stove as an improvement on the previous stove.

In Lusaka, the households that used their new stove primarily as a convenient alternative only cooked on it sporadically. Their choice of cooking technology seemed primarily to be determined by habit, behaviour sustained by automatic, social and mental model thinking. As one woman said: “I prefer to cook on electricity because I am used to it. I also like charcoal, but it has got more expensive.” Her final choice of cooking technology was determined by whether electricity was available. She opted for the advanced stove over the *mbaula* because it allowed fast and clean – “electricity like” – cooking when the power was out. Another woman said that her family appreciated being able to have dinner earlier, as cooking on the pellet stove is quicker on than the *mbaula*. This tells us that changes in the regulating environment were a contributing factor for reoccurring use of the stove in Lusaka.

A similar pattern was seen in Kiambu, though convenience here meant flexibility in terms of what fuel could be used. A majority of the women genuinely appreciated having a backup stove that could be used with different types of fuels, allowing them to adjust as circumstances demand, such as in different seasons, during rainy weather, when their disposable income varied, etc.

In both locations, the users that cited reasons related to the aesthetic and aspirational appeal of the stove as their main motivator for purchase were the least frequent regular users. Indeed, many of the interviewees confirmed that they only cooked on the stoves when others could see them, such as outside their homes or when they had visitors. This often led to sporadic use of the stove for simple tasks such as making tea or preparing simple snacks. One woman in Lusaka confessed that she had quite quickly become bored with her new purchase, and that she was already looking for new products to buy: “I would like my next stove to be a gas stove, because that is what they have in the UK,” she said. Interviews with sales staff of both companies in Lusaka confirmed that customers drawn to the aesthetics of the stove seldom came back to buy pellets.

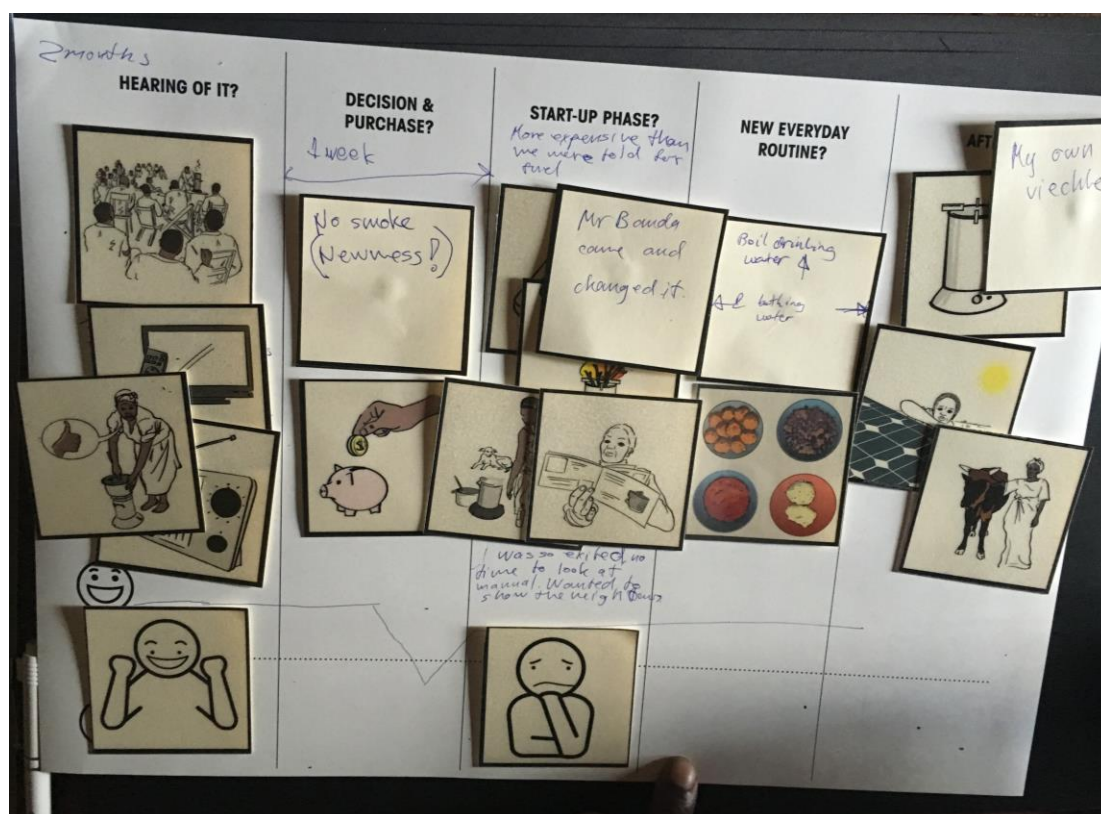
In both locations we identified a need for users to be continually reminded at this point in the journey of how the stove works, why it should be used, and how it can help them achieve their goals and aspirations. Our interviewees gave several suggestions of how this could happen, including events where they could get tips to make the cooking experience smoother, such as rubbing the pot with soap to avoid blackening, recurring demonstrations in places where stoves are sold, provide financial incentives for continued pellet purchase (e.g. get one bag free for every five purchased), providing two-way support hotlines, and training ambassadors who could work informally in the neighbourhood.

Our interviews suggest that the needed support during this phase is best delivered face-to-face and by a trusted source. Several interviewees in Kiambu said they would be most comfortable receiving after-sales support directly from a friend/neighbour, or from VEP. In Lusaka, many said they went to friends or colleagues for help, while others expressed frustration with the sellers not being available or not knowing how to contact them. This suggests that stove

vendors are more likely to be successful if they manage to build a trusting, personal relationship with their clients.

### **Tailoring appropriate responses to meet high and low points in the user journey**

Our interviews in Lusaka tell us that many users had strong emotional reactions as they starting to learn how to use their new stoves. For some, the negative surprises completely discouraged continued use. During the interviews we asked all interviewees to map how they felt at various points in their journey with the stove. Several indicated that their “low point” came during the start-up phase, when they couldn’t get the stove to work, or the stove did not perform as anticipated. This suggests that the expectations built during the acquisition period are seldom in alignment with the actual cooking experience.



An interviewee in Lusaka traces her emotions through the user journey, including her worries in the start-up phase. Photo by Sophie Andersson. Graphics by Per Brolund.

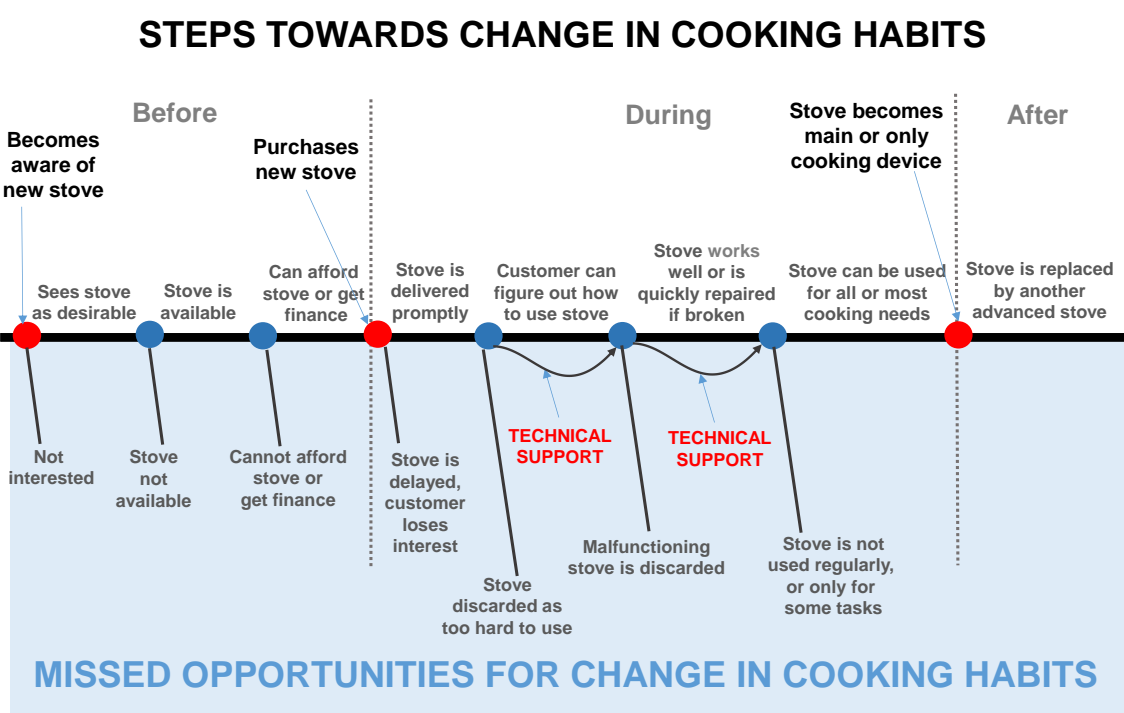
While most interviewees said they had not known about the negative aspects of the stove prior to purchase, some stove sales and headquarters staff interviewed said that most or all that information was available to customers before purchase. Other sales staff said they were working hard to bridge the alleged information gap by presenting customers with “full knowledge”. This suggests two things that are key to understanding how adoption can come about: 1) information does not necessarily stick with the customer from the point of purchase to the start-up phase; and 2) the user’s main driver for purchase may not function as a primary motivator during the start-up phase. At this point in the user journey, “low-threshold” factors, such as ease of use, are considered more important than potential long-term benefits, such as savings. It is critical to make sure the user’s first few encounters with the stove go smoothly.

In Lusaka, many user journeys seemed to end when the pellet supply ran out. All interviewees complained about pellets only being sold in large bags, up to 16 kg, whereas charcoal is sold in bags of all sizes, even just enough to prepare one meal. This meant that users not only had to learn to cook with a new type of fuel, but also develop a new habit for purchasing fuel,

which could involve both saving up the needed money and travelling long distances. Users also found it close to impossible to compare the cost of one bag of charcoal to one bag of pellets. Selling pellets in a bag size similar to the format of charcoal, starting at the equivalent amount needed to cook one meal, would likely make it easier and more straightforward to mentally account for and quantify the savings on a daily basis. This could serve to reinforce the drivers of the decision to purchase the stove, which in turn motivates the continued change of habits.

Figure 1 below summarizes the combined insights of both case studies. The red dots are key milestones: becoming aware of advanced stoves, buying a stove, and making it the household's main or only cooking device. The blue dots are points where, if conditions are unfavourable, the opportunity to induce a change in cooking practices can be lost. Notably, in the "during" phase, technical support can make the difference between a missed opportunity, and continued progress.

**Figure 1: Simplified depiction of user journey towards adoption of advanced stoves**



#### 4. SYNTHESIS AND RECOMMENDATIONS

Our study shows that people decide to purchase and begin to cook on an advanced cookstove for a number of different reasons, which include having the opportunity, ability and motivation to purchase and use the stove. These ways of acting are reinforced by automatic, social and mental model thinking. Importantly, however, the mechanisms that trigger purchase may not reinforce the development of a new cooking habit. Therefore, it is important to understand the process of adoption as a "user journey" that involves several steps. We used two case studies to examine two key steps of that journey: the "before" phase – which involves finding out about the stove and deciding to buy it, and the "during" phase – which involves getting started with the technology and establishing a new cooking routine. It is only by breaking down adoption into these phases that we can deepen our understanding of how to support the formation of new cooking habits.



A woman in Kiambu County uses twigs and kerosene to light her Philips cookstove. Photo by Fiona Lambe.

The people interviewed for this study had bought and started to use advanced cookstoves for a mix of different reasons. The enabling factors for purchase were largely the same in both case locations: prospective users need to get the opportunity to purchase the stove by having access to financing options. They also need to be presented with information about how the stove works, to get an initial sense of the amount of learning required to use the stove correctly. Crucially, users also need information about the benefits of adopting advanced stoves.

The three main motivating factors were similar in both case locations. A majority of users purchased the stove due to the prospect of saving money and/or fuel. The second most-quoted motivating factor related to convenience, such as spending less time on cooking and freeing up time for other activities. The third related to the aesthetic appeal of the stove, and was associated with personal goals and aspirations that could be realized by owning a modern technology. As different drivers motivate different people, nuances in design and implementation are important.

Such nuances can be achieved by combining a range of behaviour change techniques to support users in the “before” phase of their user journeys. These include financial incentives and enabling schemes such as paying in instalments; information about how the main motivating factors can be achieved, i.e. adequate technical information about how to use the stove correctly, and an appealing design. Our findings also suggest that people are strongly influenced by their peers when making purchasing decisions, and that embedding sales in an existing social network can help to this effect.

The Kiambu County case study shows that strong trust in the sales agent can act as a motivating factor for purchase, as this bolsters people’s social thinking and behaviour. The Lusaka case study tells us that external changes in regulation, such as planned power outages, can motivate people to look for alternative cooking options, and thus spark (initial) interest in advanced stoves.

A key insight from both case studies is that the factors that motivate the purchase of a stove may not continue to motivate people as they begin to use it. At that point, the decisive factor is whether the stove works well and as expected. The cooking experience needs to reinforce that purchasing the stove was a good choice. Most users also need to use the stove several times before realizing, and experiencing, its “true value”. It is therefore crucial that users get the support they need to learn how to use the stove, so they do not abandon it in frustration.

Our findings show that quick sales pitches, such as those used by the vendors in both Kiambu and Lusaka, are unlikely to meet users’ needs. While people may listen selectively at a sales demonstration, and forget about the negative aspects when they are keen to buy the new product, it is harder not to notice these traits when one tries a technology hands-on. Some expectations can likely be managed if prospective customers get a more holistic picture of the product before purchasing, and get active support in bringing information from the demonstration to their homes, so it is readily available when needed.

Motivating users to get past the learning phase of their user journeys also requires making systematic use of several behaviour change techniques to support users to develop a new habit. At a minimum level, this means an easily readable and comprehensible manual, with clear instructions and supporting pictures. In terms of stove design, this means the stove has to be easy to figure out how to use, convenient and practical in daily operation. Given that the look and feel of the stove is an important factor for many buyers, the stove also needs to be easy to maintain – not only to keep working well, but keep looking good. If a small mishap with pellets or fuelwood can melt the plastic base, for instance, as several interviewees in Kiambu reported, the stove’s aesthetic value is greatly reduced.

When mishaps happen, and they likely will, it is vital that a system is in place to re-motivate users to keep choosing the stove. Our findings tell us that this is best delivered in the form of personal follow-up support, from a trusted source. It can take the form of regular follow-up visits, impromptu phone calls, and invitations to social cooking gatherings. Importantly, it also means ensuring that purchased fuel, such as pellets, is of consistent quality, affordable and easily accessible. Ideally, fuel should be made available in similar size bags as conventional options, to be able to reap the benefits of an already establishing purchasing behaviour. If this does not happen, the reasons for purchasing the stove can easily get lost and forgotten.

## **Recommendations**

For sellers of advanced cookstoves, it is crucial to remember that the job does not end with the sale. It is at this point that the behaviour change journey really begins for the user. Supporting the user in this phase requires thinking carefully about what type of information

the customer needs, at what point in the user journey. Stove sellers must recognize the vast effort that is required to develop a new cooking habit, and have a clearly developed plan for how this support scheme can be rolled out.

It is also important to recognize that people purchase advanced stoves for different reasons, and they may need an array of support mechanisms to meet their needs. Regular follow-up and, ideally, monitoring over time can reveal whether new habits are actually being developed, and if not, what support, if any, can be put in place to motivate a new cooking habit. While such efforts can be costly, they are important to help strengthen the credibility of the sector, the product design and reputation, and the aspirational value of cleaner cooking options, which have the potential to have positive impacts on people's health and livelihoods.

For governments that want to strengthen the enabling environment for advanced cookstove uptake, incentives that make advanced biomass stoves and fuels, such as biomass pellets, easily available to clients can play a very important role in lowering the barrier for initial purchase, as well as the formation of a new cooking habit. Of equal importance is a regulatory environment with a vision to favour clean technologies and fuels over less-efficient options. While such a transition requires a careful approach, to ensure no one is left behind, a long-term vision and associated implementation plan are crucial to achieving a household energy transformation.

For international donors interested in this sector, it is important to recognize that new cooking habits take a long time to develop. In order to understand the long-term benefits, ample funds must be put aside for regular, long-term monitoring and evaluation. Earmarked funds for interventions that have a clear strategy for how to support the formation of a new habit, such as follow-up visits by local implementers over several years, also hold promise.

### **Future research**

There is little evidence still of how interventions can aid the formation of new cooking habits in low-income countries. This study has begun to fill that gap, but we strongly encourage further user-centred, ethnographic studies focused on these questions, particularly on how to help people develop new cooking habits once they have bought an advanced stove. By taking a user journey approach – i.e. sequentially ordering the event that lead individuals to purchase and adopt an advanced cookstove – it is also possible to gain a better understanding of what factors might stop an individual from using an advanced stove and when these moments occur, and thus identify critical points for supporting interventions.

One way of further testing the reliability of the identified behaviour change techniques could be to use a semi-quantitative approach to test the acceptability of different interventions, for instance, by playing behavioural games. This method could also be used to assess the strength and weakness of specific interventions at different points in the user journey. It is also important to consider studies of similar kind that explore how gender dimensions, including intra-household relations and bargaining power, influence everyday decision-making on household energy.

Regardless of the approach, studies should aim to study the same households over several years, as there is now a lack of longitudinal studies. This would also help us get an understanding of what the “after” phase of the user journey could look like. What happens once an advanced cookstove reaches the end of its useful life? What technology does the household choose to replace it, and why? If the goal is to achieve lasting change, it is important to ensure that households stick with advanced technologies, replacing clean stoves only with other, perhaps even cleaner and more efficient stoves.

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## APPENDIX

### Interview guide Kenya

#### Background

- Tell me about yourself? Age? Your family? Income? Your home? Your neighbourhood?
- Can you tell us about an average day in your life (from when you get up in the morning)?
- Who cooks? When? What? What is your most common dish to cook? What is your favourite thing to cook? Where do you cook?
- Can you show me (how you prepare a meal)?
- Do you like cooking? Why/why not? What is your favourite dish? Do you ever cook it? Why/why not?
- What's the best part/most annoying part about preparing dinner?
- What happens after dinner?

#### Current cooking options

- What stoves do you have? Show me. Why do you use these stoves? When do you use them? How often? For What? Why? Which one do you like the most and why?
- *Observation: What type and manufacturer (three-stone fire, biogas, charcoal, pellets, gas stoves). Manufacturer: EcoZoom, Burn Design?*
- Why did you decide to purchase those?
- What do you do/would you do if any of them breaks?

#### Stove acquisition

##### User preference

- Tell me the last time you got a new stove. Why did you get a new stove? What did you take into consideration when getting the new stove?
- What factors are important for you when considering a new stove? (convenience, cost, fuel distribution/availability...)
- Where and how did you buy it?
- Did you choose from several different ones? Which ones? How were you aware of the range?
- Why did you choose that one in the end?
- Were you happy with your decision? Do you have regrets? If so, what?
- If you could change anything about the current cooking stoves, what would you change?
- What is the best part/biggest hassle when getting a new household equipment?
- Do people usually have a functioning stove in another model at home when buying this kind of stove? What do they do with them when buying a new one?
- What influenced your decision (describe the entire process)? If they have never purchased a stove, ask about another appliance/product.
- Do you think you will keep using it? Why/why not/for how long?
- Who made the final decision to purchase?

#### Financing

- Could you afford the full cost of the stove? If not, how did you afford it? (Microfinance, informal lending, etc.)

- If microfinance played a role – how did they interact with the household? Promotion, product demonstration, etc.? What did you think of that process? Where there any uncertainties/could it be improved in any way? Did you ever get microfinance for something (else)? What/why/how was it?
- How is a meeting usually carried out?
- What’s your best arguments to convince people?
- What do you personally think is the best part with the stove/the loan concept?
- What do you think is the biggest area for improvement with the stove/loan-concept?
- Do you have one yourself? Why/why not?
- What are the most common questions/worries/oppositions from people?
- Where do people usually go stove-shopping?
- How does the repayment work?

### **Fuel**

- Describe the process of getting the fuel (collecting wood, distribution of charcoal/pellets/gas).
- Have you encountered any problems about the fuel distribution/collecting the fuel?
- What are the biggest areas for improvement concerning the fuel distribution?
- What are the most common questions/worries/oppositions from people concerning getting the fuel/ the distribution?
- Describe how it could be as simple and practical as possible according to you.
- What influence does the type of fuel have on what type of stove you choose? (wood, charcoal, pellets, gas)

### **Support**

- What will you do if it breaks? (Is there some kind of support/service? Is there some kind of insurance?)
- Do you think people are happy with their stoves for a long time?

### **Peer effects**

- What kind of stove(s) does other families have? Your neighbour?
- Who, outside of your household, would you rely on for advice when it comes to making a financial decision? Why do you rely on that / those person(s)?

### **Perceptions of improved stoves (for those not familiar with advanced stoves)**

- If you would choose to get a new stove or something else for the household, what would it be? Why? (Or: What would make you start considering getting a new stove? How would you proceed?)
- If you would get a new stove, what would it be? Why? What would you take into consideration (maybe price, fuel, efficiency, style, type, health benefits etc.)? Would you get advice? From whom? Why? What?
- What would the “dream” stove be like? What features are most important?
- Have you seen an advanced cookstove? What did it look like? Which features were you most attracted to?

## Interview guide Zambia

**Intro:** Name, number of people in household, occupation, how earn income, rent/own house?

### Before: hearing of it?

**Stove:** Where did you first hear of the stove? What did you hear of it? Did you see it in use? Did you test it? Did you get all the information you wanted? Did you complement this with more information? How?

*Trigger material: Pick picture with more important information channel and place on customer journey map.*

### General:

- How do you normally hear of new products? Are neighbours/friends important for finding out about new things to buy? Did you ever buy something after hearing about it from a friend/neighbour? If yes, what was it?
- How would you go about if you needed a new production? Where would you go for information? For advice? For purchase?
- What was the last thing you bought? How did you get information about that purchase?

### Before: decision and purchase

**Stove:** How did you decide to buy the stove? Was it a direct choice or did you consult someone? What did you consider before buying it? Did you consider the price? Accessibility of fuels?

*Trigger material: Pick all reasons pictured, including any self-drawn, and put on customer journey map. At the end: pick the single most important reason.*

- Where did you buy the stove? How did you get it to your house?
- How did you pay for it? Did you find it affordable or expensive? How did you afford it? Did you have to give up something else in order to buy it?

**General:** Did you ever regret something you bought? What? Why?

### During: start-up phase

**Stove:** Once you got the stove, were there any surprises? How did you go about the first time you cooked on it? How did you know how much fuel to use? Did you require any more information to get started? If so, who did you contact, and why?

*Trigger: Pick most representative pictures, or draw your own, and place on the customer journey map.*

What fuels have you tried? Why these? What would make you change/try another fuel? How much pellets is required to cook a meal? How much charcoal? How does the new stove differ from the traditional one? In time? In price?

**General:** Whom do you ask for advice? (e.g. question on health, economic advice – family, experts, friends?)

### During: Establishing a new everyday routine

*Trigger: Day in your life picture*

**Stove:**

- Could you use this diagram to show when in the day you use what stove? What do you use them for? Why do you use this one?
- Could you describe the maintenance of the advanced stove (charging, getting fuel, payments, etc)?
- What is the biggest different from using your other stoves? Best? Worse?

*Trigger: Pick biggest different and draw/write on customer journey map.*

Could the advanced stove be improved? How? For what meal do it work the best? The worst? Why?

**General:**

- Is there any product that has mean a big change in your life? Why and how?
- Have you ever change a routine/developed a new habit after buying a product? What made you change?

**After:**

**Stove:**

- What would you do if the stove broke? How long do you think it will last? If you needed to get a new stove, how would you go about it?
- Which stove would be your next one? And dream stove? Why?

*Trigger material: 1) pick the most representative picture and put on customer journey map. 2) could you draw a line to trace your emotions throughout the journey. Why did you feel this way?*

**General:**

- Are there any other products you want to buy? Why?
- What do you dream of? Why? In general, what would improve your life?



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## Stockholm Environment Institute

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