MECS
Modern Energy Cooking Services

MECS - TRIID
Exploring Futures of Alternative Cooking in Cambodia

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CONTENTS

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EXPLORING FUTURES OF ALTERNATIVE COOKING IN CAMBODIA

01. EXECUTIVE SUMMARY

The goal of this study was to uncover aspirational pathways for people to adopt modern energy cooking services (MECS) in Cambodia. To achieve this, the iDE Innovation Lab built a comprehensive understanding of the barriers preventing the adoption of modern energy cooking solutions in rural, peri-urban, and urban regions. Utilizing this understanding, a number of ideas were prototyped, then tested with people in-field to understand future strategies and solutions that could enable the MECS transition in rural households. This report summarizes end to end learnings from inception to research, to prototyping, and user testing. In doing so we hope to create a unique foundational body of knowledge on that will provide inspiration to try new approaches for delivering affordable, efficient and modern cooking solutions to customers.

Cambodia experienced rapid development within the past two decades, and although 97.2% of Cambodian households have access to some form of electricity, in terms of energy for cooking, a large percentage still use biomass for cooking. Innovation in modern/clean cooking is still largely focused on traditional or improved cook stoves, and stakeholders in the cooking sector are struggling to provide sustainable solutions at scale. With limited existing literature framing an understanding of the Cambodian context, this study attempts to provide an in-depth view of the current knowledge, perceptions, and triggers/decisions that influence the shift towards modern energy for cooking.

RESEARCH SUMMARY

Currently, the declining access to firewood coupled with a decrease in per unit

prices of LPG products is influencing people towards it. LPG is seen as a modern fuel source for cooking. Stocking of multiple fuels is common in Cambodian households due to reasons that include reliability of the primary fuel source, accessibility, and preference. Biomass, specifically charcoal, is most frequently stacked as a secondary fuel source for cooking preference. Household fuel mixes are characterized by high of use small-LPG, high use of charcoal for grilled meat and electric rice cookers. A sharp increase in adoption of electric rice cookers is a common trend. Rice is a staple of the Cambodian diet, and cooking using these devices is both as affordable and aspirational.

However, various barriers prevent wider adoption of MECS in Cambodia. Low income households on the fringes of the economy often have firewood as the only affordable choice. For these households, other immediate needs take precedence over cooking with clean fuels. Dwindling incomes and unplanned financial constraints (ex: unexpected health expenses, loans) encourage stacking of biomass. For most households, the key challenge tends to be a combination of the factors: access, a lack of understanding of modern technology and established perceptions/ preferences on traditional cooking methods.

The health risks of using firewood for cooking are not completely understood beyond a basic understanding of the immediate (short-term) effects, such as irritating to the eyes and lungs. At a community level, the discussion or dialogue talking about health and environmental risks of biomass, and adopting cleaner cooking is critically lacking. Lack of convenient, affordable, accessible cooking alternatives in villages

still prevent people from using modern forms of cooking.
With only about 8-10% of Cambodia's roads paved, access is a key challenge in rural regions, even with the emergence of last mile distributors (LMDs). Further, limited distribution capacities, poor infrastructure, low capital and no manufacturers with proprietary distribution networks restrict their potential to reach more communities.

A widespread negative connotation towards LPG canisters/tanks is restricting adoption. Majority of incidents go unaddressed due to a lack of after sales service from distributors. A mis-trust toward LPG suppliers perpetuated through social media and word of mouth is a significant influencing factor for people to avoid using LPG.

Apart from safety concerns, fragmented LPG value chains, with unregulated service providers, multiple middlemen and isolated retail channels drive costs up for customers. Customers want guarantees that the stoves they buy can last longer and are easy to use in the long term. After sales services for cooking products are a critical need and the lack thereof, is a key barrier to adoption with customers left with no options of repairs in case of breakdowns.

In rural Cambodia, purchasing habits are characterized by a high preference to upfront ownership (one time payment) over payment installments which tend to create skepticism. Low financial literacy and weak sales arguments to convince customers of flexible financing underpin this phenomena. An example of this is observed in the preference amongst people to own biogas systems upfront.

A small customer base in close proximity with active government initiated or biogas businesses limit adoption. Customers able to afford biogas are satisfied with the quality and reliability of the system. For those who cannot, high up front investment is the most cited barrier to adoption. PAYGO (Pay-as-you-Go) is an innovative payment scheme used with certain biogas systems to aid adoption, but the transition to completely move away from biomass is likely to be characterized by the stacking of an affordable backup fuel. Gaps in understanding the use and maintenance of the technology is likely to encourage revert backs to traditional fuels.

The general perception of electricity is of a utility for powering appliances, but options for cooking beyond the use of electric rice cookers are rarely considered due to low awareness. Cost perceptions and unreliable supply of electricity limits cooking applications. Beyond using electricity for cooking rice, the attitude of conserving electricity, and economical use is common. Most rural households are yet to achieve a higher sophistication of energy needs beyond lighting and small electric device. Cooking with an electric device is often associated with a dread of the electricity bill at the end of the month, without an understanding of consumption patterns. A gap in understanding unit costs for cooking enforces this perception.

When viewed through a gender lens, the voice and agency of women to make decisions for the family to purchase/adopt MECS is inhibited to varying degrees depending on family dynamics. Cooking responsibilities are mostly done by the women in the household with occasional help from the man. Businesses and sales teams fail to acknowledge true cooking needs of women. Targeted, tailored and

comprehensive communication aimed at creating interest for women to adopt MECS is lacking. The language and format of the pitch from sales agents of LPG/ Biogas companies does not speak to the cooking needs of women or working women. Further greater emphasis is placed on closing sales over educating customers.

CO-CREATION SUMMARY

Research findings were introduced in a co-creation workshop to generate informed ideas that met well defined community needs. Through a collaborative, participatory process that involved stakeholders in the clean cooking sector, a variety of ideas were generated around four key themes(as emergent from research):

- Cooking with Electricity
- Behavior Change and Demand Creation
- Quality of Product and Service Deliveries
- Gender Equity

PROTOTYPE TESTING SUMMARY

The final phase focused on building the outputs of the co-creation workshop into design, prototype and test innovative solutions that could demonstrate an early stage market potential. We evaluated desirability, feasibility and viability with a small sample of households, retailers, food vendors, restaurants and value chain actors.

.Five prototype sets were taken into the field:

• Electric Cooking Product Packaging Mockups

• Smart Energy Meters

• LPG Safety Labels

• MECS Product/ Service Scenarios

• Facebook Groups

Findings from testing show that except for the late majority and laggards profiles of adopters (see section 7.2) people are not opposed to cooking with electricity.

A significant majority of participants indicated a preference to adopt the electric cookstoves. Preferences towards electric cooking with were are driven by taste, the biggest factors mentioned by households were cost and convenience, highlighting the potential for future adoption when the benefits are appropriately marketed.

Transparency in payments, and transparency from businesses in assuring quality is key to ensure customer retention and buy in.

Families want control over their energy consumption patterns and currently do not have the means to track this for themselves. Early findings indicate that smart energy meters are a powerful behavioural nudge that could encourage HHs to adopt electricity. They have the potential to open up greater pathways for different applications of electric cooking.

People want to create control mechanisms that reassure them that they're cooking safely. LPG labels nudge people towards safe practices and in doing so provide people the necessary control mechanism.

Community based interventions are novel ideas to bring knowledge and access to MECS products closer to the community. However, implementing these ideas often requires high investment and capacity building which may not always fit with business models of organizations. In rural and peri-urban regions, online channels(Facebook groups) are seen as sources of information only - not as channels to purchase new products as customers prefer seeing their purchases first hand in order to assess quality.

BEYOND THIS PROJECT

Beyond this project, iDE will continue to engage in sector networks, building on and expanding existing relationships to share knowledge emerging from the project and encourage synergies and cross-sector collaboration.

Every household – to varying degrees – cooks and aspires for ease, access, quality, efficiency, and reliability in cooking solutions. What are the opportunities for you to leverage this research, and create new products and services that match those needs?

02. GLOSSARY OF ABBREVIATIONS

MECS	Modern Energy Cooking Services
HCD	Human-Centered Design
HH	Household
LPG	Liquified Petroleum Gasoline
LMD	Last Mile Distributors
KWh	Kilowatt-hour
BCC	Behaviour Change Communication

03. TYPOLOGY OF KHMER FOOD

RAW/ PARTLY COOKED

បុកល្អុង | PAPAYA SALAD

ញាំ | VEGETABLE-MEAT SALAD

SHALLOW FRYING

ឆាបន្លែសុទ្ធ | STIR FRIED NOODLES

ឆាដាក់សាច់ | STIR FRIED MEAT

ឆាគ្រឿង | HERBAL STIR FRY

DEEP FRYING

ត្រីបំពង/ចៀន | DEEP FRIED FISH

មាន់បំពង/ចៀន | FRIED CHICKEN

GRILLING

ត្រីអាំង | GRILLED FISH

សាច់ជ្រូកអាំង | PORK BBQ

សាច់ | GRILLED DRY BEEF

BROILING

សម្លម្ហូរ | SOUR SOUP

ស្ងោរ | SOUP

SLOW COOKING

ស៊ុបគោ | BEEF SOUP

សម្លការី | CURRY/MEAT STEW

STEAMING

បាយ | RICE

ចម្អុយប្រហុក | FERMENTED FISH

ចម្អុយផ្អក មាំ ត្រីប្រម៉ា | STICKY FISH

04. INTRODUCTION

The Modern Energy Cooking Services – Technology Research Innovation for International Development (MECS-TRIID) is an initiative being implemented under the Modern Energy Cooking Services (MECS) programme funded by the UK Department for International Development (DFID) and led by Loughborough University.

By integrating modern energy cooking services into the planning for electricity access, quality, reliability and sustainability, MECS hopes to leverage investment in renewable energies (both grid and off-grid) to address the clean cooking challenge. The programme aims to break out of a "business-as-usual" cycle by investigating how to rapidly accelerate a transition from biomass to genuinely 'clean' cooking (i.e. with electricity or gas).

As part of the challenge fund granted to iDE Cambodia, **the goal was to uncover strategies/pathways that could transition customers away from biomass towards modern energy, enhancing reliability, affordability and sustainability**. This involved exploring how modern cooking products and services could be positioned as the next aspirational alternative. This report summarizes end to end learnings from inception to formative research, to design, prototyping, and user testing. .

PROJECT GOALS

The key goal was to uncover aspirational pathways for people to adopt new forms of modern energy cooking in Cambodia. To best achieve this, we focused on building a comprehensive understanding of challenges and barriers to the adoption of modern energy cooking solutions in Cambodia. Beyond this project, a broader end goal is to inform and inspire others innovating in the clean cooking sector: ensuring future adoption strategies for using modern energy in Cambodia to promote inclusive, equitable access to energy for cooking among households.

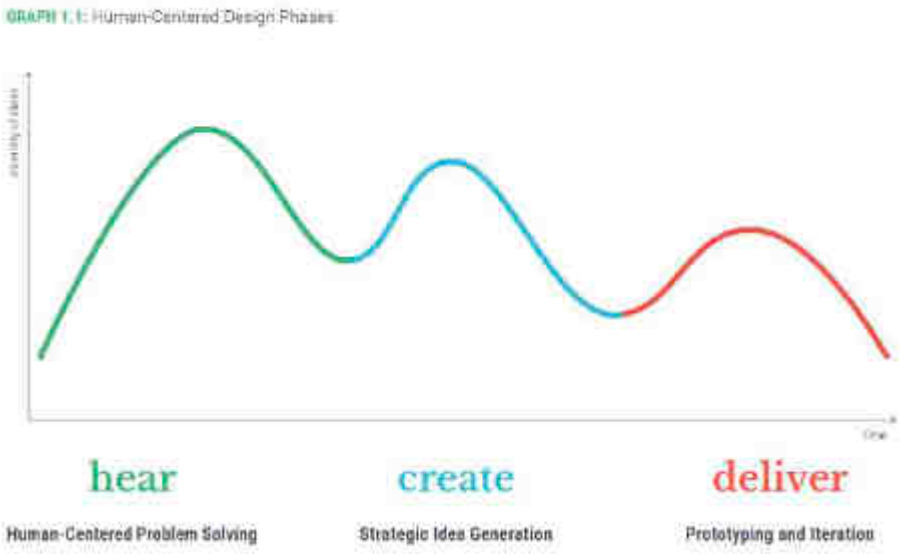
SPECIFIC OBJECTIVES:

• Assess current knowledge, attitudes, and perceptions of Cambodians in urban, peri-urban, and rural areas about MECS
• Understand the key enablers and barriers to transitioning towards MECS
• Uncover the state of present delivery models (related to aspects such as business, finance, etc.) and their successes and failures in penetrating the clean cooking sector
• Develop and test emergent solutions with rural households

05. METHODOLOGY

05. METHODOLOGY

To achieve these goals, iDE applied a Human-Centered Design methodology (HCD). HCD is a systematic method for acquiring a deep understanding of people, their environment and their routines in order to create innovative solutions. HCD is not a closed or linear process. Each project invariably has its own challenges, and being both iterative and responsive, HCD can be tailored to meet these challenges.



Whatever the design challenge, the starting point is always to listen carefully to people and start with a blank slate, setting aside any preconceived assumptions of the challenge. The Hear Phase was about defining the enablers and barriers that prevent a greater use of MECS. Employing ethnographic research methods we built an in depth understanding of our target communities and the actions, beliefs and attitudes central to their cooking practices.

In the Create Phase, we utilized this understanding to explore opportunities, and generate solutions that address needs, whilst balancing technical feasibility and economic viability.

Lastly, in the Deliver Phase we prototyped then tested these solutions with people considering the entirety of the user experience to comprehensively determine how solutions need to be designed and delivered - to generate a sustainable and impactful product or service.

Research and synthesis were conducted over an eight-week period from October to November 2019. All interviews conducted followed ethical research practices ensuring confidentiality and prior consent from all of individuals interviewed and photographed.

Over four weeks in January-Februrary 2020, a large variety of ideas generated from an interactive co-creation workshop, were refined and prototyped. The final prototypes were tested in-field with households, retailers, businesses and value chain actors to validate the potential of the most promisiong product/service/business pathways aimed at promoting cooking using MECS.

5.1 DESK RESEARCH

Over a two-week period, the team conducted a literature review of available evidence/ prior research on the Cambodian context attempting to uncover present realities of access, cooking behaviours, barriers to adoption, and supply and distribution challenges.

5.2 EXPERT INTERVIEWS

The team spoke to five business heads of social enterprises, and organizations actively engaged in selling/distributing modern energy cooking products to Cambodian customers at scale. Treating the interviewees as subject matter experts, we established an early understanding of the clean cooking landscape in Cambodia, including challenges faced by businesses trying to innovate solutions in the clean cooking sector, and the barriers to adopting MECS for customers.

No	Interviewee Details
1	Ben Jeffreys, CEO, ATEC* Biodigesters
2	Otteh Etubio, Regional Business Manager, African Clean Energy
3	Sun Mao, Founder, EcoSun Cambodia
4	Navuth, CEO, Made for Life LPG Social Enterprise
5	Tim Waterfield, Director, Naga Earth

5.3 ETHNOGRAPHIC DESIGN RESEARCH METHODS

Homestays with families: Embedding ourselves in the everyday environment and cooking cultures of rural Cambodian households, we conducted observations and semi-structured interviews to understand peoples needs, constraints and barriers to adopting MECS.

In-depth Interviews: In-depth Contextual Interviews (60-90 mins) held inside the home focused on households that match our research criteria

Each interview session was accompanied with card sorting activities aimed at digging deeper into perceptions, associations and triggers for certain types of cooking, fuels, energy and cookware to understand.

Observations and Rapid Interviews: The team also embedded itself in the local context by conducting observations and rapid interviews at other places of interest including but not limited to; local markets, fuel distribution hubs/ shops, other cooking appliance shops, food vendors, gas stations and stove retailers.

To maximize time and learnings, two research teams covered different villages capturing data and information employing human-centered design research techniques

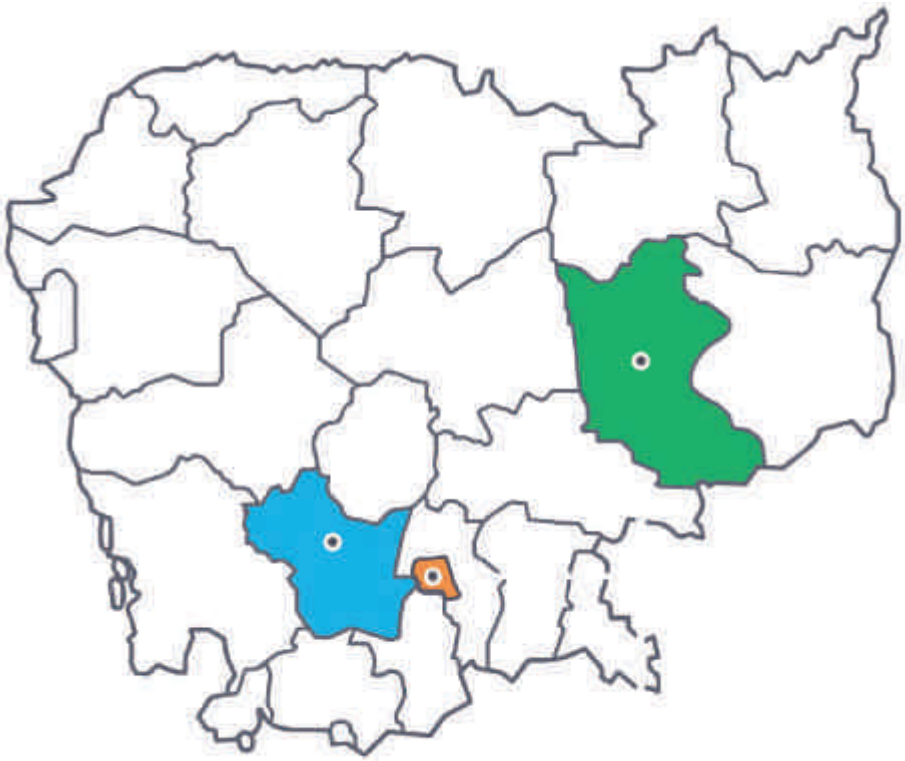
We conducted four ethnographic homestays with families to gain first-hand experience of the why's, what's and how's behind different households cooking practices

During homestays, we observed and participated in household activities including cooking and food preparation with the host family members

During in-depth interviews, cards were introduced to help people think visually and imagine modern cooking possibilities in their households

5.4 FIELDWORK LOCATIONS

Key factors in determining the geographical areas of focus included: different types of cooking energy available to households, extent of urbanization (rural, peri urban and urban), grid connectivity (off, weak or reliable grid), and diversity of work (agriculture, garment factory workers, business owners etc.)



KAMPONG SPEU PROVINCE

RURAL:
Village 1: Tranpeang Chhunk
Village 2: Damnak Trach

PERI-URBAN:
Village 1: Muk Khet
Village 2: Borey Kamakor

KRATIE PROVINCE

RURAL:
Village 1: Kohn Riel
Village 2: Sandan

PERI-URBAN:
Village 1: Kbal Koh Trong
Village 2: Ou Russey Mouy

PHNOM PENH (CAPITAL)

URBAN:
O Russey Market
Central Market
Boung Trabek Area
Toul Tom Poung Area
Households within city limits

Provinces were selected in order to maximize the variety of household's cooking environments and the types of work. These geographies are representative of driving economic forces in Cambodia that influence cooking behaviours in unique ways. Kampong Speu is in the south of the Mekong region, not far from Phnom Penh, with several garment factories that employ the largest female workforce in Cambodia. Kratie is rural and partly remote; and the cooking environment/work type is influenced by farming and tourism.

5.5 RESEARCH PARTICIPANTS

Our research aimed to contrast the variation in cooking knowledge, attitudes, and practices across different profiles of users. We spoke with early adopters of MECS, already using a type of modern energy for cooking, drawing comparisons with late majority profiles to gain an in-depth understanding of needs, constraints, and barriers to adoption of MECS. Beyond HHs, a number of additional profiles (Retailers, Fuel Suppliers, Electric Shops, Restaurants, Food Vendors) of potential MECS users/ service providers were interviewed.

	Families/Households/ Others Cooking With:	**Sample Households**	**Shops/Restaurants**
1	Biomass	16	6
2	LPG	27	10
3	Biogas	7	1
4	Electricity (People who use more than just rice cookers)	6	2
5	Retailers/Distributors	15	
TOTAL		**90**	

5.6 PARTICIPANT RECRUITMENT

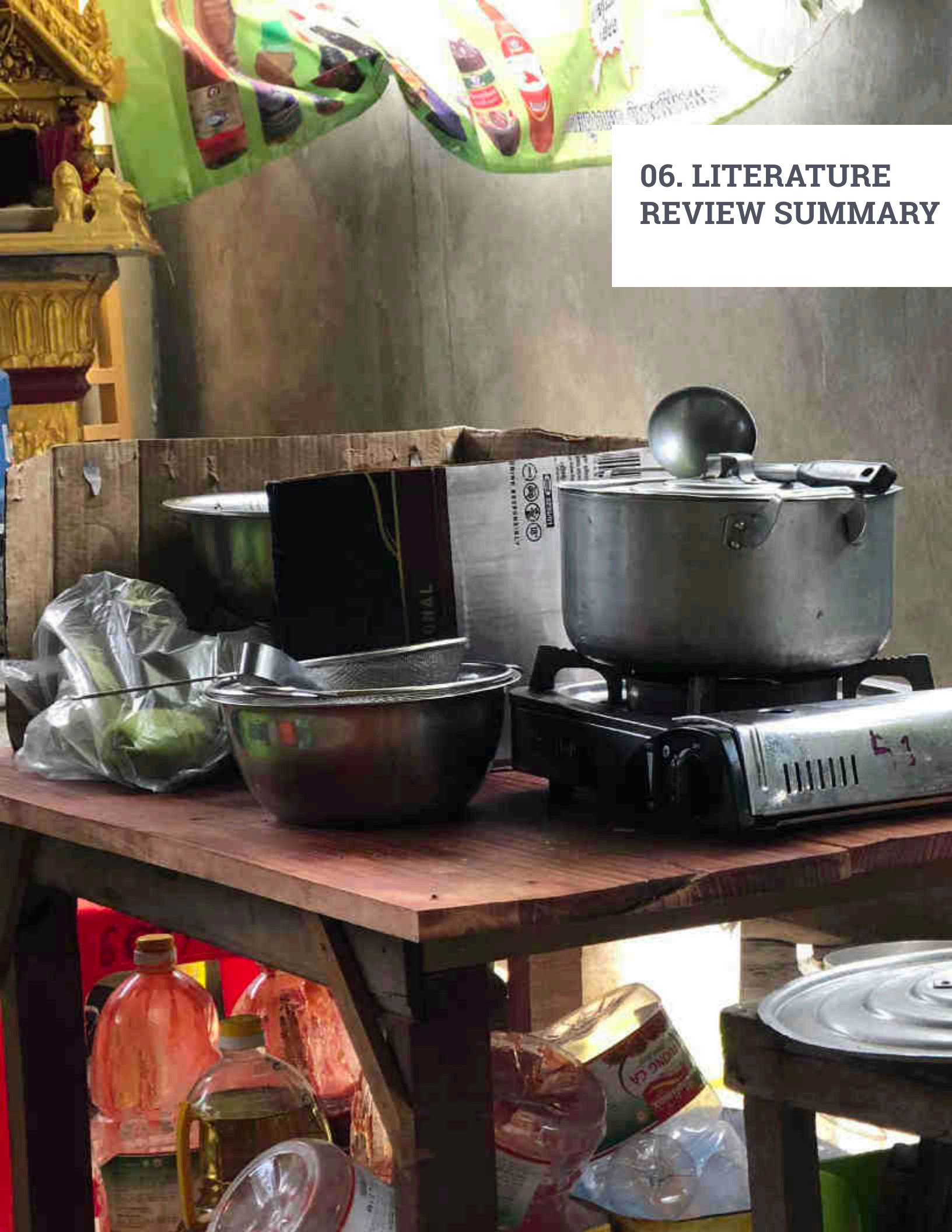
In-depth participant recruiting of households was based on prior logistics and permission from local community leaders. The team aimed for five or more in-depth participants in each location, and 1-2 were fixed ahead of time; with this being a relatively easy research subject matter to snowball recruit participants. Our exploratory research approach allowed for refinement of the protocol for interviews and data collection over time and to develop more nuanced questions as we acquired more knowledge of the context.

5.7 CO-CREATION

This phase involved using emerging research insights from the 'HEAR' phase to develop new ideas and interventions that addressed various barriers households faced to adopting MECS. Learnings were introduced in a Co-creation workshop to generate informed ideas that met well defined community needs. Co-creation is the act of creating ideas together - a process where people with different expertise are invited into a session (designers, researchers, engineers, subject matter experts, end users, etc.) to co-design solutions on a specific topic. Through a collaborative, participatory process that involved stakeholders in the clean cooking sector, a variety of ideas were generated.

5.8 CONCEPT DEVELOPMENT AND RAPID TESTING

Following the co-creation workshop, ideas around themes of behaviour change communication, promoting cooking with electricity, promoting energy literacy, and approaches to enhancing gender equity were prototyped; then tested. These ideas were prepared into tangible mockups and low fidelity prototypes which were rapid tested with end users, retailers, service providers and value chain actors. Learnings from testing were analyzed and offer guidance on future piloting of MECS solutions in Cambodia.



06. LITERATURE REVIEW SUMMARY

06. LITERATURE REVIEW SUMMARY

As per Energy Sector Management Assistance Programs (ESMAPs) report on cooking in Cambodia, approximately 67% of households (HH) rely on biomass cook stoves as their primary cooking appliance, of which 35% use an improved cook stove (ICS), 27% use a traditional cook stove, and 5% use a three-stone stove. Approximately 62% of this population uses traditional firewood as their fuel source, along with 5% relying on charcoal (Rutu Dave, 2018). Rural Cambodians spend up to 20 hours a week collecting firewood, and approximately 1.5 hours a day on cooking. With biomass being the primary source for cooking fuel in rural HHs, this poses various risks to human health and issues with environmental degradation. Cambodia experienced about a 33% loss in total forest cover in the past 40 years from logging for cooking purposes, and an estimated 11,900 deaths annually due to solid fuel use in the HH (ATEC, 2018). Although these figures are relatively high, data indicates a steady shift away from traditional biomass cooking over the past decades.

There has been a steady growth of about 7-10% annually in the consumption of liquid petroleum gas (LPG) and although it is mainly available in urban and peri-urban areas, 18% of rural HHs rely on it as their primary fuel source and 54% use it as a secondary or back-up fuel source (ATEC, 2018). The availability of LPG at local gas stations, ease of refilling, and various product sizes offered – 220g canisters up to 48kg tanks – are beneficial in the Cambodian market for users to utilize as needed.

The cost of electricity per kWh in Cambodia is among the highest in the Southeast Asian region. With the country recently being shifted towards lower-middle income status, prices for electricity can vary between USD $0.20 per kWh up to almost $1.00

per kWh in specific rural regions (EDC, 2018).

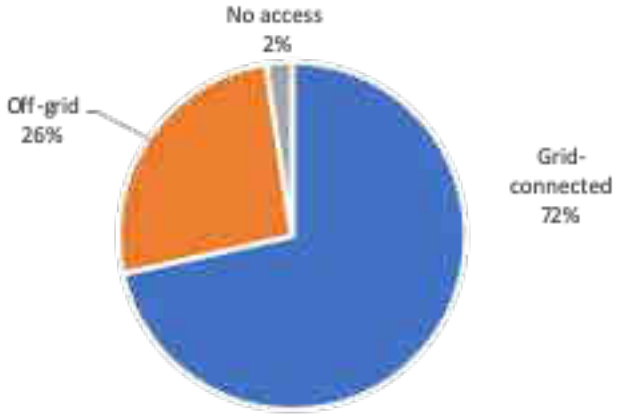


Figure: The comparison of Cambodian HHs connected to the national grid vs. HHs relying on off-grid and/or mini-grid electricity supply. Source: (World Bank, 2018).

For biogas, the National Biodigester Programme (NBP) is an initiative through the Ministry of Agriculture, Forestry and Fisheries (MAFF) implemented since 2006 which is operating in 14 provinces to date. The objective of the program is to establish a sustainable source of energy in selected provinces in Cambodia, and promote the use of biogas for activities such as cooking and creating natural fertilizer. Although more than 25,000 biodigesters have been constructed in the various provinces to date, only about 2% of the HHs with clean fuel stoves use biogas as their primary energy source for cooking (Rutu Dave, 2018).

In conclusion, Cambodia has experienced rapid development within the past two decades, and with increased competition from emerging companies/businesses offering new products, a slow shift away from traditional biomass cooking can be

observed. Renewable energy generation is at a nascent stage but opening new windows of opportunity for new businesses. There are businesses attempting to improve the reliability and distribution of existing fuels, namely LPG and Biogas. Cooking with electricity is projected to become increasingly affordable in the future as the reliability and quality of the grid improves over time- government/NGO funded projects to improve access to electricity are still ongoing (World Bank, 2017).

However, literature indicates numerous challenges that prevent a wider adoption of modern energy for cooking. For retailers and service providers (for both fuel and cooking devices) in reaching HHs outside of densely populated regions is poor infrastructure. As of 2017, only 8% of Cambodia's roads were paved. Innovation in clean cooking is still largely focused on traditional or improved cook stoves in Cambodia, leading to an entrenchment of investment and innovation pathways. New social businesses, for profit companies and startups attempting to research and develop modern cooking technologies are facing various challenges to provide sustainable solutions at scale. Further, context specific challenges unique to Cambodia make customer acquisition and last mile distribution a significant challenge.

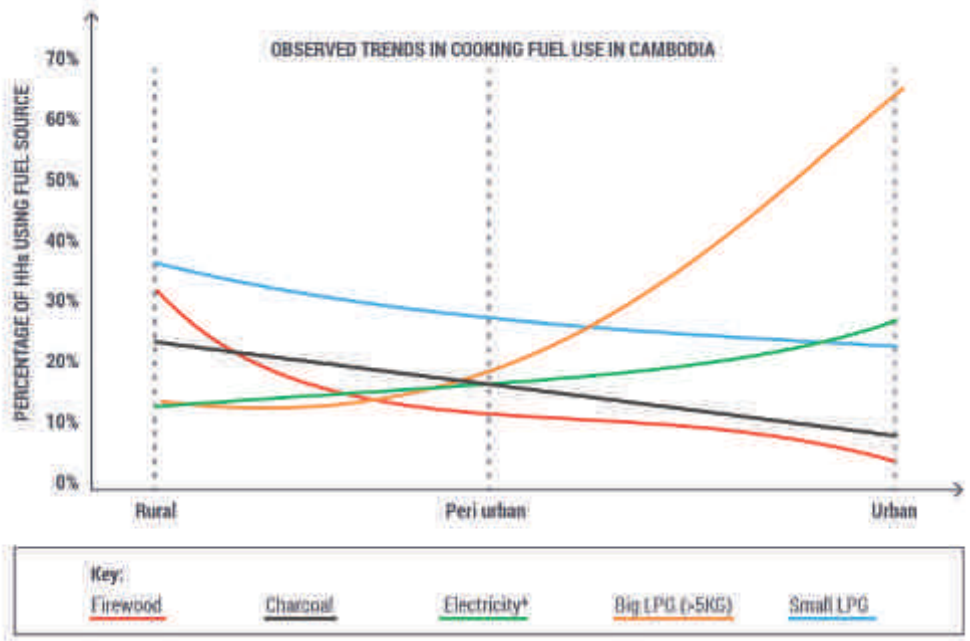
Our research aimed to create an in-depth understanding of these challenges, utilize the new knowledge and build on emergent opportunities to break out of business-as-usual approaches and rapidly accelerate the transition from biomass to modern energy cooking services.

06. KEY FINDINGS

7.1 PRESENT REALITY OF ENERGY USE/ACCESS

7.1.1 Current Trends in Household Cooking Energy

According to data reviewed from research literature, approximately 67% of Cambodian HHs still rely on biomass as their primary source of cooking fuel. The research teams observations in rural Cambodia indicate a consistent shift away from using firewood and charcoal for cooking purposes. This shift is underpinned by the declining access to firewood and charcoal and has caused rural HHs to change their cooking behaviors, and begin adopting small-LPG cook stoves for cooking. Field observations across rural villages shows a 50/50 split between biomass and LPG as the primary fuel for cooking. The trend mapped below shows shifting patterns of fuel use across rural, peri urban and urban locations.



Observed cooking fuel trends across rural/peri-urban/urban geographies. Percentages are approximate, based on qualitative observations during ethnographic research in 12 villages (not calculated statistically)

A decline in the use of firewood and charcoal across the urban-peri-urban-rural spectrum on one hand is marked by an increase in adoption of LPG and electricity.

These trends are influenced by the following factors:

• **Declining access to firewood** is pushing more people towards modern fuel sources for cooking. People now travel longer distances to collect firewood(resulting in increased collection time) or pay more to purchase than they previously did.

• **A rise in small-scale family run business** providing LPG cook stoves and refilling services that are closer in proximity to the community.

• **Increased access to information** through digital media and word of mouth, households are becoming more aware of new alternatives to cooking.

• **Decrease in per unit price of LPG** makes it affordable and cost competitive compared to wood or charcoal.

• **Increased economic opportunity** and disposable income creates aspiration to adopt modern forms of cooking fuels and technology.

• **Increase in adoption of electric rice cookers** is another significant trend. Speed and convenience in cooking are acknowledged as the common drivers to consider their purchase. They are seen as affordable and aspirational cooking technology for cooking rice.

"In our area, it is easier to use firewood for cooking. But it is getting very expensive, especially if I have to cook for a lot of people. The smaller LPG is a cheap solution for us to use now."

Ms. Tuy Tha, 26, Small Vendor and Food Seller Adopted Small-LPG 1 year ago

"Only my children use the big tank (LPG). I'm afraid of it. I prefer to use the small LPG because it is easier."

Mrs. Pann Saret, 39, Garment factory worker

Adopted Big-LPG 6 months ago and Small-LPG 2 years ago

"I'm lazy. I don't want to start fires anymore so, I bought the LPG stove"

Mrs. Yun Sochea, 39, Farmer

Adopted Small-LPG 1 year ago

7.1.2 Household Fuel Combinations

These trends influence use and storage of fuel combinations in each household in different ways:

• Fuel stacking* is commonly observed in Cambodian households for reasons that include reliability of primary fuel source, accessibility of fuel year-round, and cooking preferences. A belief that wood or charcoal are better suited for slow cooking specific foods is a common driver for stacking these fuels. (These are further illustrated in section 8.0)

• Large households (over 6 members) often cite small pot sizes, low heating from LPG flame as reasons to cook larger batches of food over wood fires.

• Stacking of charcoal is observed commonly in rural HHs, and observed to a lesser extent in peri-urban and urban HHs. Charcoal use in urban locations is primarily associated with specific cooking preferences (Korean BBQs, parties/ceremonies, etc.).

• Stacking of charcoal is driven by established taste preferences and perceived health benefits. Further, charcoal makes food tastes better and is associated with being a healthier method for cooking meat as it requires less oil.

*Fuel stacking is a concept defined in the energy sector as households that use a mix (or menu) of more than one fuel source to address their energy needs. In the context of cooking, this term addresses the multiple fuels used at home for cooking purposes – i.e; LPG for cooking + charcoal for grilling + electricity for boiling water

• The most common fuel+cooking device combinations in rural, peri-urban and urban are:

USAGE	RURAL	PERI-URBAN	URBAN
Primary (Used everyday for cooking whole meal(s))	Firewood, Charcoal	Small LPG, Big LPG, Charcoal,	Big/Small LPG, Electricity (Rice Cookers)
Secondary (used in addition for small cooking and reheating)	Small LPG	Electricity (Rice Cooker, Kettles)	Electricity (Kettles)
Occasional (Observed deviations in small number participants)	Electricity (Rice Cooker)	Firewood	Other e-cooking devices (stoves, microwaves, ovens)

• Although it's use is on the decline, firewood is predominantly used as the primary fuel source for cooking in rural locations. A growing percentage of rural HHs with higher- than-average incomes adopt a fuel mix of small-LPG, whilst charcoal is used for grilling or as backup fuel in instances when firewood is unavailable (or wet/ damp).

• Peri-urban HHs tend to stack a mix of small-LPG, charcoal, and occasionally firewood for cooking. Charcoal is mostly only used for grilling food, and the firewood is collected by HHs situated further away from the main road, to be used mainly as

a backup fuel source in instances LPG is available or unaffordable. Electric devices such as rice cookers and kettles are more common in HHs of these regions.

• Majority of urban HHs use big-LPG as their primary fuel source for cooking. Most urban Cambodian HHs see big-LPG as the preferred method to cook. A small percentage of high income families who aspire to live a modern lifestyle use electric cooking devices (oven, microwaves, sandwich makers, etc..).

• In urban HHs, rice cookers are widely used and a standard part of every kitchen. The cooking fuel mixes of urban HHs are predominantly utilizing modern energy.

7.1.3 Cooking Energy Access in Cambodia

As mentioned previous sections, firewood is becoming hard to collect or access for the rural population. Wood collection services – chopping down trees, cutting them, and delivering through truck transport – have decreased. Shops in the village stacking firewood bundles are increasingly few in number. As a response to an unmet need, small-LPG is leading the adoption of modern energy cooking, trailed by large-LPG and rare instances of biogas. In villages, small grocery shops are the key touchpoint for cooking fuel, stocking cooking fuel options of charcoal and small-LPG (220g) canisters.

A high density of grocery shops stocking easily accessible supply of refillable small-LPG canisters are facilitating a transition away from biomass in rural locations. Small businesses running LPG refilling services for under 25 cents per canister have allowed customers a greater reliance on LPG than observed in previous years. LPG is steadily becoming the primary source of cooking fuel for households in villages with adoption expected to further rise.

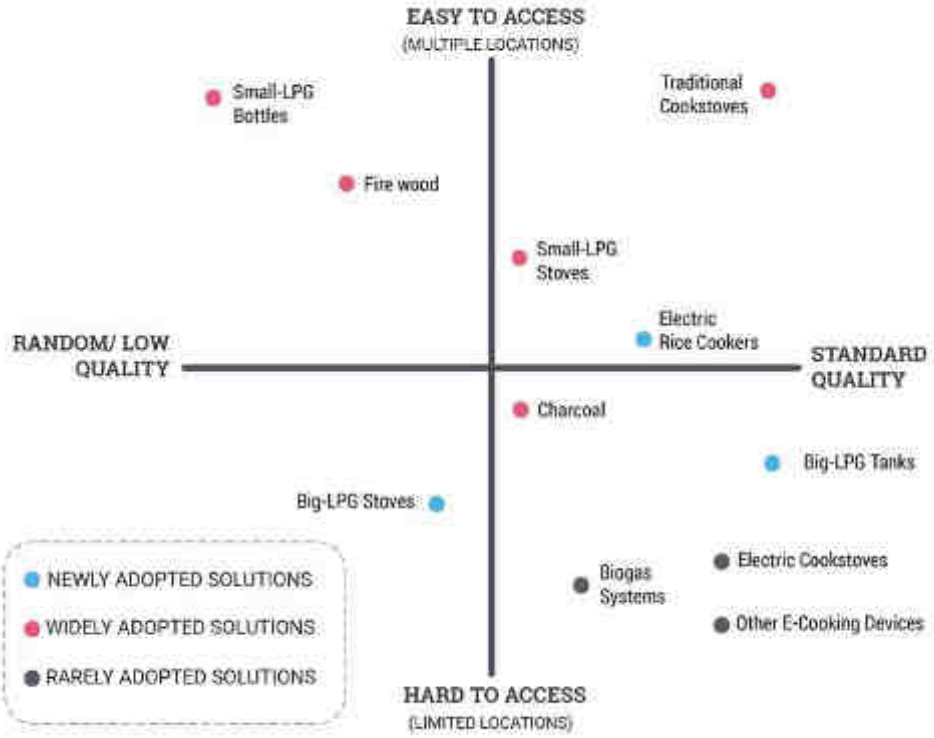
Apart from the available options of cooking fuels, electric rice cookers are an affordable and aspirational cooking technology. Rice is a staple of the Cambodian diet and rural households are prioritizing purchases of electric rice cookers even before they consider changing their choice of primary fuel. This trend is observed even in rural households cooking with firewood as a primary fuel, but also using/ aspiring to use rice cookers.

Inspite of these enabling factors, access to marketplaces is a significant barrier to adoption in villages is. Very few locations to purchase cook stoves/ new devices exist and the process of purchasing a small-LPG cook stove or rice cookers requires customers to make their way to the markets in the nearest town.

Peri-urban households are typically closer to markets and exposed to new ways of cooking(LPG, new electric sevices). These locations often have limited availability of cooking products, limited post sales service, and few options for customer finance. Low-income households on the fringes of the economy, often have firewood and charcoal as the only affordable choice. Challenges in access and affordability, combined with a lack of understanding of modern technology, and established perceptions/preferences on traditional cooking methods inhibit adoption of MECS. These are further illustrated in the next sections.

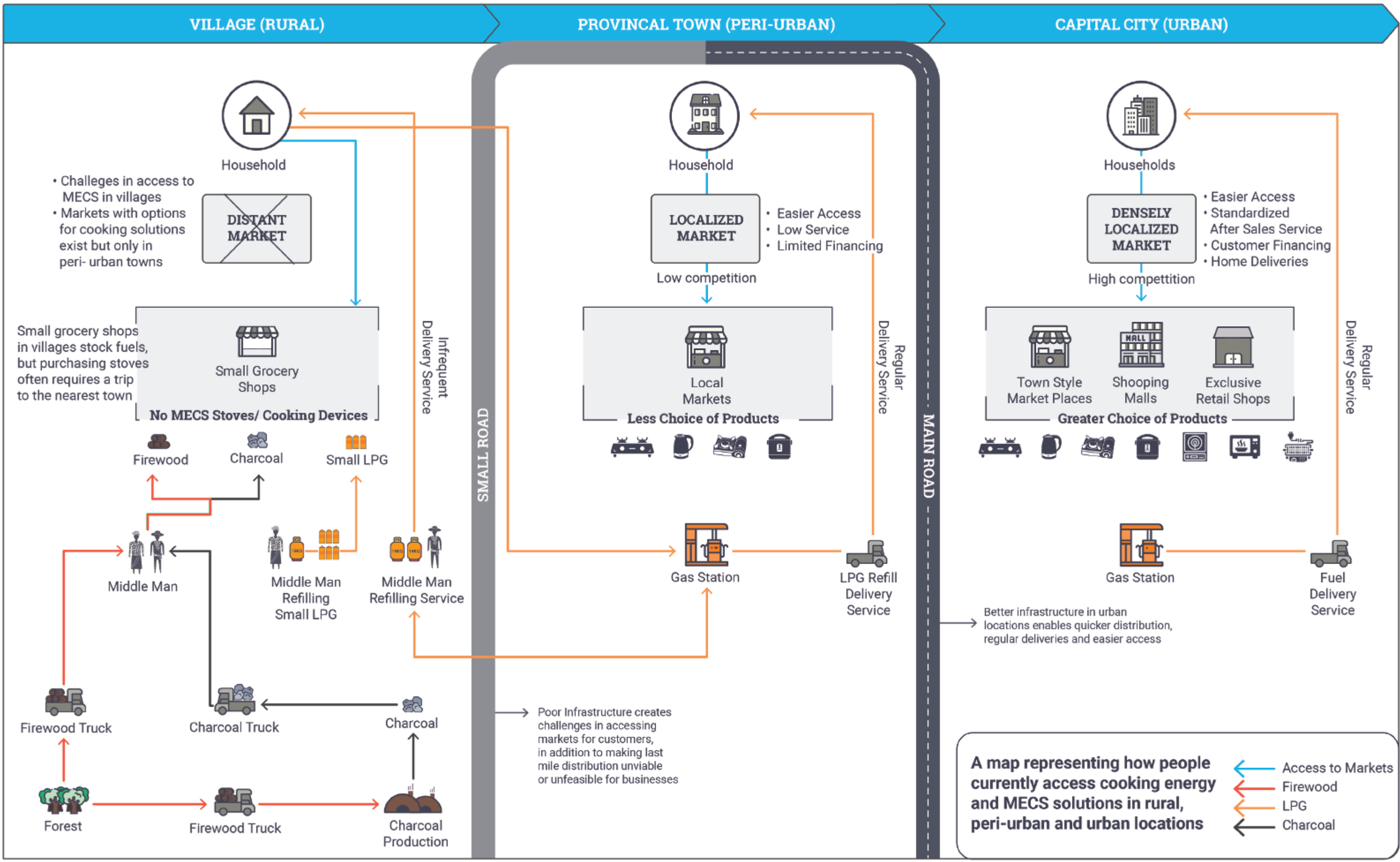
Urban locations are in a stark contrast to rural Cambodia. High rates of adoption of LPG and electricity for cooking characterize urban households. A dense market with high competition offers multiple price points for all customer segments, good quality and after sales services, payment installments and deliveries. Cooking with electricity is aspirational, and a majority of households in urban centers use clean fuel mixes.

Accessibility framework of various cooking fuels and cook stoves across rural, peri-urban, and urban regions

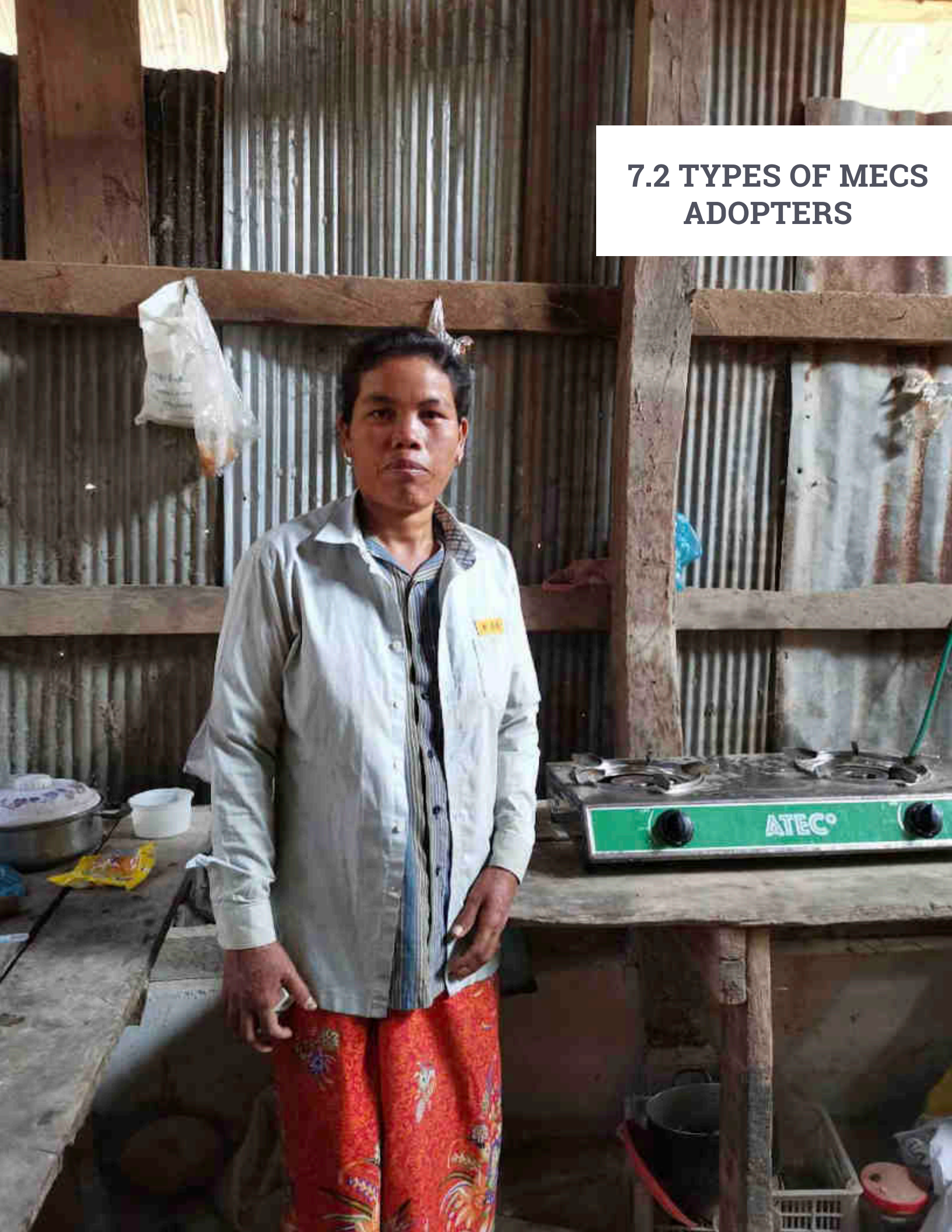


The framework of accessibility categorizes cooking energy solutions on a scale of accessibility(in terms of limited/multiple locations) and quality (low/standardized) Accessible solutions enable easier adoption, however the solutions that are commonly accessible to rural, peri-urban households are not always of a reliable quality. On the other hand, quality reliable solutions such as modern biogas systems, electric cooking retailers, and large LPG distributors are yet to reach a scale and distribution capacity that enables a significant rise in MECS adoption.

ACCESS TO COOKING ENERGY IN CAMBODIA

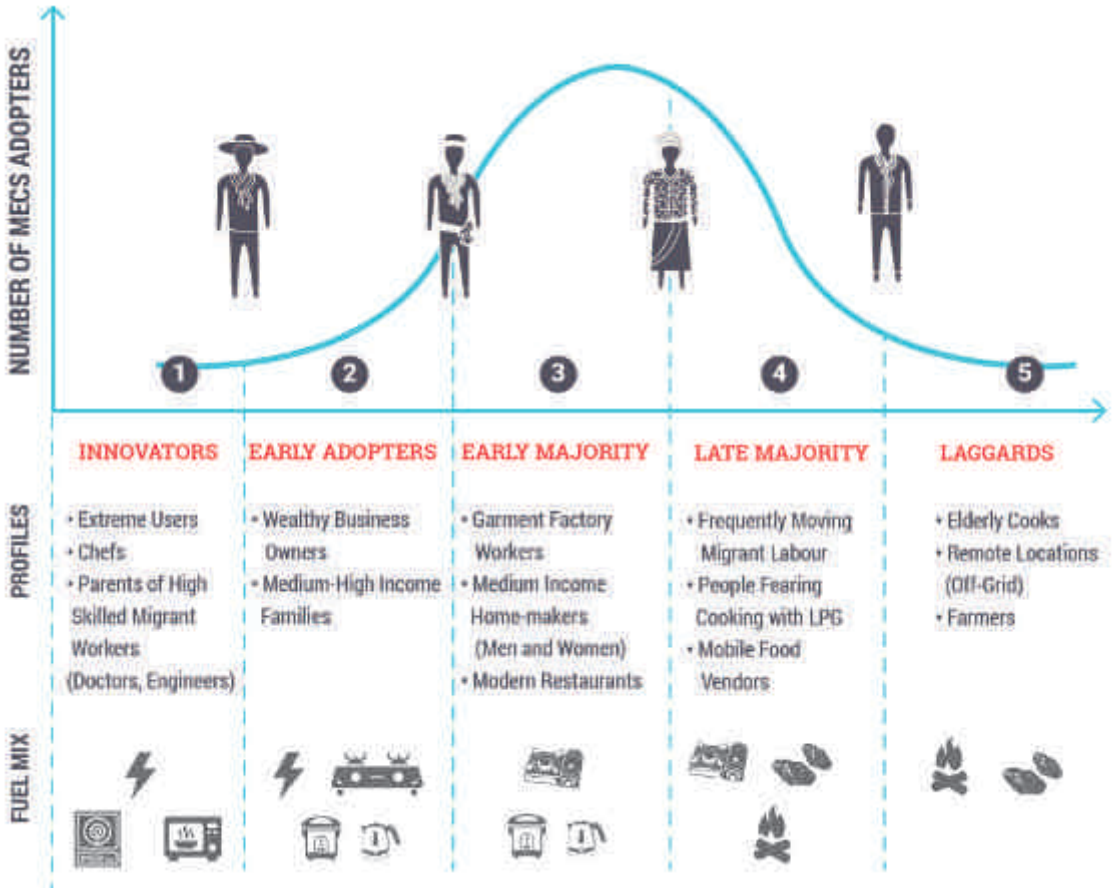


7.2 TYPES OF MECS ADOPTERS



DIFFUSION AND THE TYPES OF MECS ADOPTERS

Diffusion is the process by which an innovation is communicated or adopted through certain channels over time among the members of a social system. Despite obvious benefits, not everyone will immediately adopt an idea due to macro and micro socio-economic, political, cultural, environmental, behavioural and psychological factors. In the context of MECS, adoption profiles of users with varying people's knowledge, attitude and cooking behaviors can be mapped within the five adopters on the diffusion curve. These profiles emerge from having met with 90 research participants, across 12 villages and three provinces.



The framework above has been adapted from the Diffusion Curve of Innovations developed by Everett Rogers

Innovators: Profiles that fit this type typically are extreme cases who are exposed to modern cooking solutions through one-off instances. Innovators are also chefs/ home cooks with a strong interest in cooking. They are willing to take risks, have high social status, have financial liquidity, are social and have closest interaction with other innovators. Their risk tolerance allows them to adopt technologies are not known to others in the community. The solutions they adopt may ultimately fail, but their financial resources help absorb these failures.

Early Adopter: Profiles that fit this type are the urban middle-upper class, wealthy business owners, and parents of high-skilled migrants working in urban centers. Currently, most early adopters are using either electric cooking appliances or large-LPG systems, or a combination of both. Individuals in this profile have fully adopted MECS and are positively inclined towards cooking with electricity. Early adopters are savvy information seeking individuals with high agency and interest towards finding new and efficient ways to cook.

Early Majority: Emergent profiles from research in the early majority were low-skilled factory (textiles, garments, shoes) workers, and middle-class home makers (men and women). They mostly use small-LPG systems in combination with smaller electric devices, such as rice cookers and/or kettles; and they aspire to adopt the large-LPG systems. The early majority are individuals that are slightly above the average social status, and are willing to try new and efficient forms of cooking. However, they spend a significantly longer time to adopt the change towards MECS.

Late Majority: Low income families, people fearing the use of LPG, frequently relocating migrant workers, and the older generations are indicative types of this user profile. They mostly use a combination of biomass and small-LPG systems with an aspiration to adopt electric rice cookers and kettles for quicker, more efficient forms of cooking. The late majority are individuals that are more skeptical about change, and approach new innovations after the majority of society has adopted to it. They usually either constitute fractions of elderly populations reluctant to break the status quo or have a below-average social status and low incomes: hence adopting to an innovation significantly later than the average individual.

Laggards: Off-grid households and traditional elderly cooks are examples of categories that fit this indicator type. Laggards are stuck at the bottom of the energy ladder, predominantly relying on biomass for cooking with the majority aspiring to adopt small-LPG systems. They typically tend to be focused on traditions and culture, have the lowest social status, and commonly avert change. Laggards are individuals that are the last to adopt an innovation.

7.3 MECS ADOPTER PROFILES

MECS ADOPTER PROFILES

Illustrated in this section are some of the key profiles selected that fall within the diffusion adoption curve, highlighting aspects of their energy usage, cooking behaviors, drivers, and challenges to adopting modern forms of cooking.

Various factors that influence the way people cook in different regions around Cambodia. These include food traditions, migration, local economy and income, changing lifestyles, social proofing, religion, geography, infrastructure and accessibility. These factors in combination with their current stage on the adoption curve create unique household cooking scenarios that provide deeper understanding into what enables and prevents families to adopt MECS.

Name: **Ms. Hea Saray, 37**
Occupation: **Small Food Shop Owner**
Household Size: **4 people**
Family Income: **USD $325**
Grid-connected: **Since 2016**
Geography: **Peri-urban**

Monthly Energy Expenses
Electricity: **USD $17**
LPG: **USD $6**
Charcoal: **NA**

P1: INNOVATOR

"My neighbour owned a bakery and my kids love bread. If I can bake bread, I can sell it and make more money. I want to learn to bake. My sister will support me to study baking in the future."

Ms. Hea Saray grew up on the outskirts of Kratie Town relying completely on biomass for cooking. She moved to the town center after getting married, and lived there for 9 years with her husband and two kids. At the time, her neighbour owned a bakery selling freshly baked muffins as their main source of income. Fascinated by the wide range of cooking appliances her neighbour owned and the income potential, Hea aspired to become a baker and made it a goal to adopt electric cooking appliances.

A few years after her husband passed away, Hea remarried and moved back to the outskirts of town. She lives with her family in a small tin roof house with her shop attached to the front. She is an aspiring bakery owner and currently owns a low-power electric oven, small-LPG cook stove, electric rice cooker, and electric kettle. Hea learned to bake muffins for her children and wants to buy additional electric devices for cooking. She says she will not stop using her oven to bake, and is now actively searching for an electric grill to barbeque meat.

HOUSEHOLD COOKING MIX

PRIMARY
Small LPG
Electric Oven

FUEL MIX
Clean

SECONDARY
Electric Rice Cooker
Electric Kettle

EVERYDAY COOKING TIMELINE

BREAKFAST

6:00 am
Start cooking:
Rice porridge
Grilled meat/fish

7:00 - 8:00 am
Eat breakfast

LUNCH

10:00 am
Start cooking:
Rice
Soups, Stir fry

11:00 am
Eat lunch

4:30 - 5:00 pm
Start cooking:
Rice
Soup, Stir fry, Grilled fish

DINNER

6:00 pm
Eat dinner

Rice is stored for reheating the next morning for breakfast or to cook rice porridge

P1: INNOVATOR

The shop attached to the front of Hea's house on the outskirts of the main town.

The main cooking area in front of Hea's house, where she cooks using her small LPG stove

The electric oven/slow cooker that Hea purchased for USD $90 in 2018 from the main town.

Name: **Ms. Vat Channy, 34**
Occupation: **Chef**
Household (HH): **1 person HH**
Mopnthly HH Income: **USD $450**
Grid-connected: **Since 2016**
Geography: **Rural**

Monthly Energy Expenses
(Paid for by Employer)
Electricity: **NA**
LPG: **NA**
Charcoal: **NA**

P2: INNOVATOR

"I do not pay my electricity bill. The resort pays everything and gives us a place to stay."

"I bought these devices myself. The hotel gives us food for all three meals, but sometimes I like to cook my own food."

Ms. Vat Channy grew up mostly using small-LPG in her HH, occasionally relying on biomass when LPG was unavailable. She currently works as a chef on an island 10 minutes off the main town. Prior to moving to this island, she worked in another province where she was completely reliant on LPG for cooking at work and at home. Vat is highly knowledgeable about electric cooking appliances and has used these in previous restaurant kitchens. At work, she prefers to use LPG over electricity due to her perception of cooking faster over a flame.

She currently lives in staff housing provided by her employer; with all electricity expenses covered. This made her open to purchasing electric cookstove for her herself. Vat's busy schedule at work leaves her with minimal time at home to prioritize cooking for herself, and she mostly uses her electric cook stove to make breakfast only. Being located on an island, she has noticed the inconvenience of refilling and transporting LPG tanks, and as a result will continue to use all-electric cooking appliances at home.

HOUSEHOLD COOKING MIX

PRIMARY
Electric Cookstove

FUEL MIX
Clean

SECONDARY
Electric Rice Cooker
Electric Kettle

EVERYDAY COOKING TIMELINE

BREAKFAST
6:00 am
Start cooking:
Rice, Stir fry,
Boil water for coffee

6:30 am
Eat breakfast

LUNCH
12:00 pm
Eat lunch

DINNER
6:30 pm
Eats dinner

Meals cooked and consumed at the restaurant kitchen

P2: INNOVATOR

Few of the LPG stoves she uses in her the home stay resorts kitchen

Other than the large-scale rice cooker and microwave, she also uses an electric grill/oven in the kitchen.

Name: **Mrs. So Sarah, 62**
Occupation: **Home maker/ Primary caregiver for grandchildren**
Household Size: **8 people**
Family Income: **USD $450**
Grid-connected: **Since 2015**
Geography: **Rural**

Monthly Energy Expenses
Electricity: **USD $14.50**
Charcoal: **USD $1**

P3: INNOVATOR

"Since april I've been using electricity to cook a lot of food for the family, it's my daughter who brought me the electric cook stove. In the beginning I was scared to use it but she showed me how to use it and after time I felt comfortable to use it everyday."

Sarah is a homemaker and provides primary care to her grandchildren aged 2,5, 6 and 12. Two youngest children are from her two daughters who migrated to Phnom Penh for work. Her daughter in Phnom Penh has been cooking with electricity since 2016 and wants to transform her mother's kitchen by providing her with safer, more convenient cooking appliances. In order to support the grandmother to take care of the children one of her daughters purchased a fridge, microwave, electric cookstove, kettles and a bunch of electric appliances.

The idea of using electricity to cook is not new to Sarah as her daughter was previously in Korea and bought her an electric rice cooker which she has been using since 2011. She was taught to use the electric cookstoves by her daughter and having used it for over 6 months finds it a quick and convenient way to cook for the family. She cooks soups using electricity everyday, but prefers to use LPG for stir fries as it's faster for her to have two stoves running at the same time. She also uses charcoal once a week to grill some fish because her husband loves grilled food.

HOUSEHOLD COOKING MIX

PRIMARY
Electric Cookstove
Electric Rice Cooker

FUEL MIX
Clean

SECONDARY
Electric Kettle
Charcoal

EVERYDAY COOKING TIMELINE

BREAKFAST

6:00 am
Start cooking:
Rice Porridge
Grilled fish
Boil water

6:30 am
Eat breakfast

LUNCH

11:00 am
Start cooking:
Soup
Rice

12:00 pm
Eat lunch

5:00 - 6:00 pm
Start cooking:
Rice
Stir fry

DINNER

6:30 pm
Eats dinner

Little/No reheating done through the day

P3: INNOVATOR

The electric cookstove that So's daughter purchased for her to use to cook for her grandchildren.

The layout of So's house. In addition to her electric cookstove, she also owns other appliances such as a microwave, rice cooker, and fridge.

Name: **Mrs. Nov Kea, 47**
Occupation: **Restaurant Owner**
Household Size: **5 people**
Family Income: **USD $500**
Grid-connected: **Since 2016**
Geography: **Rural**

Monthly Energy Expenses
Electricity: **USD $20**
LPG: **USD $12**
Wood: **USD $7**

P4: EARLY ADOPTER

"I think people of my age really like this idea of biogas. For the people who can afford it, we pay once and we have unlimited gas to cook with."

Nov Kea runs a small restaurant right outside her home. Her shop is a popular go-to breakfast and lunch spot in the village as she believes she adapts her recipes to her customer's preference. On average, she cooks for about 20-25 people everyday. A typical day starts early and is mostly spent being at the shop either preparing dishes or cooking food.

She recently purchased an ATEC biogas system for USD $700 and has been using it regularly. She believes it is a good alternative to LPG, but since she runs a food shop she tends to use LPG more for customers and uses it to cook meat and frying vegetables, before moving the pot onto a slow wood fire and letting it simmer until lunchtime. Efficiency and preserving taste of food that customers know and like are factors that underpin the way she cooks.

HOUSEHOLD COOKING MIX

PRIMARY
Biogas, LPG
Wood

FUEL MIX
Clean

SECONDARY
Biogas Rice Cooker
Electric Kettle

COOKING TIMELINE

BREAKFAST

5:00 am
Start cooking:
Stir fry,
Soup, rice
Big batch of rice is made for the day - kept warm (or reheated on firewood)

7:00 am
Cook porridge from soup & rice
Slow cook soup till lunch

LUNCH

11:00 am
Serves & eats lunch at shop
11:30 am
Customers arrive to eat at shop

2:00 pm
Start cooking:
Grilled fish

DINNER

6:00 pm
Serves & eats at shop
Customers arrive to eat at shop

P4: EARLY ADOPTER

The front of Nov's restaurant, that sits along the main road in her village.

The ATEC biogas system that has been installed and setup near the back of Nov's restaurant.

Three firewood stoves that Nov uses to keep her soups warm all day for her customers.

Name: **Ms. Pat Sowly, 35**
Occupation: **Farmer & Beauty Product Seller**
Household Size: **3 people**
Income: **USD $350**
Grid-connected: **5+ years**
Geography: **Peri-urban**

Monthly Energy Expenses
Electricity: **USD $20**
LPG: **USD $5**
Charcoal: **NA**

P5: EARLY MAJORITY

"Everyone has different desires. Unlike my sister, I want to have the large LPG stove in the future as it is more convenient, cheaper, and I do not have to refill it every week."

Ms. Pat Sowly is a widower and mother of two children, aged 5 and 9. The kids take up majority of her time every day making it difficult to balance her daily activities. Concerned for her children's health, in 2016 she purchased two small LPG cookstoves; prior to which she was using biomass.

Pat is aware of electric and gas cooking appliances, and the associated negative health impacts of using biomass. Her sister lives in Phnom Penh, and owns an all-electric kitchen for her cooking needs.

She was the primary influencing factor for Pat to change to cleaner forms of cooking - however, was a timely process to adopt change and Pat was reluctant to purchase a big LPG system or electric cooking appliances. She cited her current needs at home could be easily satisfied with small LPG as it is easier to cook smaller meals on separate stoves. Given her financial situation as a single mother, her long-term goal is to save money for a big LPG system as she does not want to increase her monthly electricity bill with additional electric appliances. Although she would like to live a similar lifestyle as her sister in Phnom Penh, it is not something she is capable of affording currently.

HOUSEHOLD COOKING MIX

PRIMARY FUELS
(x2) Small LPG
Electric Rice Cooker

FUEL MIX
Clean

SECONDARY
Electric Kettle

EVERYDAY COOKING TIMELINE

BREAKFAST
6:00 am
Start cooking:
Quick Stir Fry, eggs,
Rice

6:30 am
Eat breakfast

LUNCH
11:00 am
Start cooking:
Stir Fry,
Rice

12:00 - 12:30 pm
Eat lunch

DINNER
5:00pm
Start cooking:
Stir Fry or Shallow Fry,
Reheat or Cook
Fresh Rice

6:00 pm
Eats dinner

P5: EARLY MAJORITY

Layout of Pat's kitchen that is connected to back of her house.

P6: LATE MAJORITY

"I have a small LPG stove for cooking. My family and I are always moving from one rental room to another, so having a small LPG is easy to carry and helps to cook the food faster as compared to using only firewood back in the village."

Name: **Ms. Chom Trob, 36**
Occupation: **Migrant Saleswoman**
Household Size: **3 people**
Family Income: **USD $220**
Grid-connected: **Continuously moving**
Geography: **Peri-urban/ Urban**

Monthly Energy Expenses
Electricity: **USD $5**
LPG: **USD $5**
Charcoal: **NA**

Chom Trob is a door-to-door saleswoman who works for a company selling mosquito nets and bedding materials. Dwindling incomes from farming in her village and few opportunities for alternative income generating work led to the decision of taking up her current job. Along with her husband and their 3 year old child, they move every month from one province to another in search of new villages to sell their products.

She uses a 6kg LPG Stove-top to cook two meals a day and the family observes a religious fast every morning. Being Muslim, the family prefers consuming halal meat, which limits options to eat food outside in shops or restaurants. Additionally, a belief that the food in the markets is typically cooked or served with some bacon or pork - prohibited in her religion - underpins her decisions to cook both meals at home. Two years ago, when she was at the company warehouse picking up mosquito nets to sell, she came across an electric rice cooker and decided not to buy it because it did not suit the family's on the go lifestyle, and would be hard to strap onto a motorbike.

HOUSEHOLD COOKING MIX

PRIMARY
6 kg LPG Stove-top

FUEL MIX
Clean

SECONDARY
NA

EVERYDAY COOKING TIMELINE

BREAKFAST
6:00 am
Buy food
Quick meal

No cooking

Buy meat in the morning to cook for lunch
7:30 am

LUNCH
11:30 am
Start cooking:
Chicken/Fish, rice

12:00 pm
Eat lunch

7:00 pm
Start cooking:
Rice, stir fry

DINNER
7:30 pm
Eats dinner

P6: LATE MAJORITY

The 6kg LGP tank with stove attachment that Chom uses for cooking. As seen, it is wrapped with a damp cloth as a safety precaution due to her fear of the tank "heating up" and exploding.

P7: LAGGARD

"I have to burn the wood for a long time to make it into charcoal to grill. I will try to get the small LPG again in the future. My husband and kids don't care about the taste. They just want food."

Ms. Pom Sreymol and her husband are rice farmers and live with their 2 children on a small off-grid island. They are not connected to the national grid, and invested roughly USD $100 on a solar home system (SHS) in 2017; prior to which they had no access to electricity. Pom's husband travels daily to the main town selling boiled chicken eggs as a mobile food vendor to supplement their HH income. At home, the family relies completely on firewood for cooking and her husband uses charcoal to boil the chicken eggs as it is easier to transport on his motorbike.

Considering they lead very busy schedules, Pom wants to adopt faster methods of cooking. If given the opportunity, they would prefer to ugrade their current SHS in order to run additional electric appliances. Pom would love to adopt small-LPG and an electric rice cooker, however she has no access to these technologies living on the island. In addition, the current electricity supply from her SHS is insufficient to operate multiple electric devices and is primarily used to charge phones and power a few lightbulbs. With firewood becoming harder to collect on the island and no potential for LPG distribution in their village, she fears not being able to sustain her family with basic cooking needs in the future.

Name: **Ms. Pom Sreymol, 30**
Occupation: **Rice Farmer**
Household Size: **4 people**
Family Income: **USD $175**
Grid-connected: **Off-grid; Solar Home System**
Geography: **Rural**

Monthly Energy Expenses
LPG: **NA**
Charcoal: **USD $5**
Firewood: **USD $15**

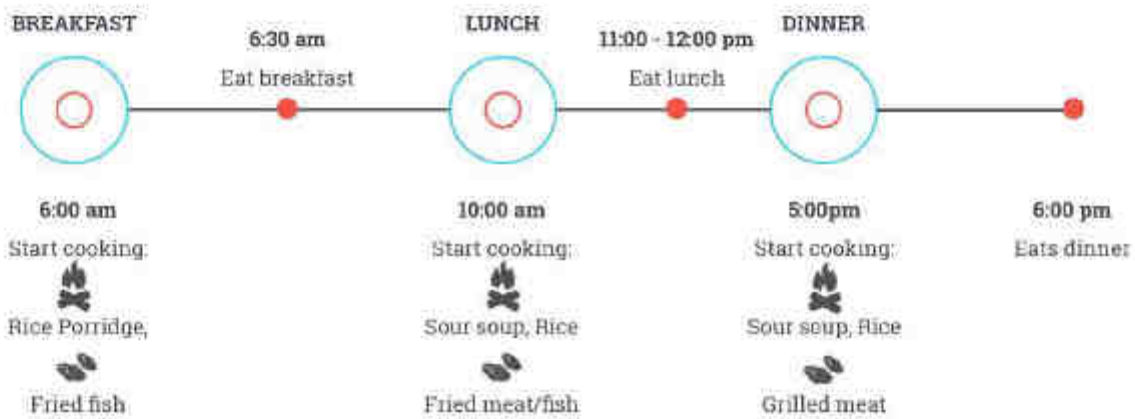
HOUSEHOLD COOKING MIX

PRIMARY FUELS
Firewood

FUEL MIX
Unclean

SECONDARY
Charcoal

EVERYDAY COOKING TIMELINE



P7: LAGGARD

Layout of Pom's kitchen, where she uses firewood for cooking indoors.

Pom's house, with a small 70W Solar Home System installed on the edge of the lower roof.

A range of electric devices that Pom uses in her household. Unfortunately, rice cookers and kettles consume more power than her battery can store to operate.

Name: **Mr. Som Chulsa, 30**
Occupation: **Charcoal Reseller**
Household Size: **6 people**
Family Income: **USD $500**
Grid-connected: **Since 2018**
Geography: **Rural**

Monthly Energy Expenses
Electricity: **USD $17.50**
LPG: **NA**
Charcoal: **NA**
Firewood: **USD $2.50**

P8: LAGGARD

"When I renovate my house, I want to use LPG. Firewood is hard to collect and charcoal is very heavy to carry."

Mr. Som Chulsa lives in a 6-person household - including his wife, one child, brother, mother, and grandmother. He works as a vegetable dealer and charcoal reseller, being one of the rare high-income earners in his village. His extremely busy schedule consists of collecting vegetables from his village and selling them to the main town, pickling vegetables and selling them to supplement his income, and delivering charcoal.

Although his HH income is relatively high, his wife still relies completely on firewood for cooking. The location of their house makes it easy for Som's wife to collect firewood, dead branches, and sticks nearby; and since the charcoal is sold to supplement income, they rarely use it for cooking purposes. Som and his wife are knowledgeable of electric and gas cooking appliances, however have no desire to adopt them anytime soon. Running a large household results in a relatively high electricity bill, and Som does not want to increase those expenses for cooking purposes. They aspire to adopt a small LPG stove for cooking, however this will only become a reality upon renovating their house which is in the unforeseeable future.

HOUSEHOLD COOKING MIX

PRIMARY FUELS
Firewood

FUEL MIX
Unclean

SECONDARY
Charcoal

EVERYDAY COOKING TIMELINE

BREAKFAST
6:00 am
Start cooking:
Rice, Stir Fry,
Grilled Fish

6:30 am
Eat breakfast

LUNCH
11:00 am
Only reheat for lunch
Rice, grilled meat/fish, stir fry

12:00 - 1:00 pm
Eat lunch

DINNER
5:00pm
Start cooking:
Soup

6:00 pm
Eats dinner

P8: LAGGARD

Som purchases charcoal in bulk from the main town to sell in his village. Alongside his vegetable trading business, this brings additional income for the family at a rate of roughly USD $1 profit per bag.

Som and his wife also make pickled vegetables to sell in their village and the town market.

7.4 ENABLERS & BARRIERS TO ADOPT MECS

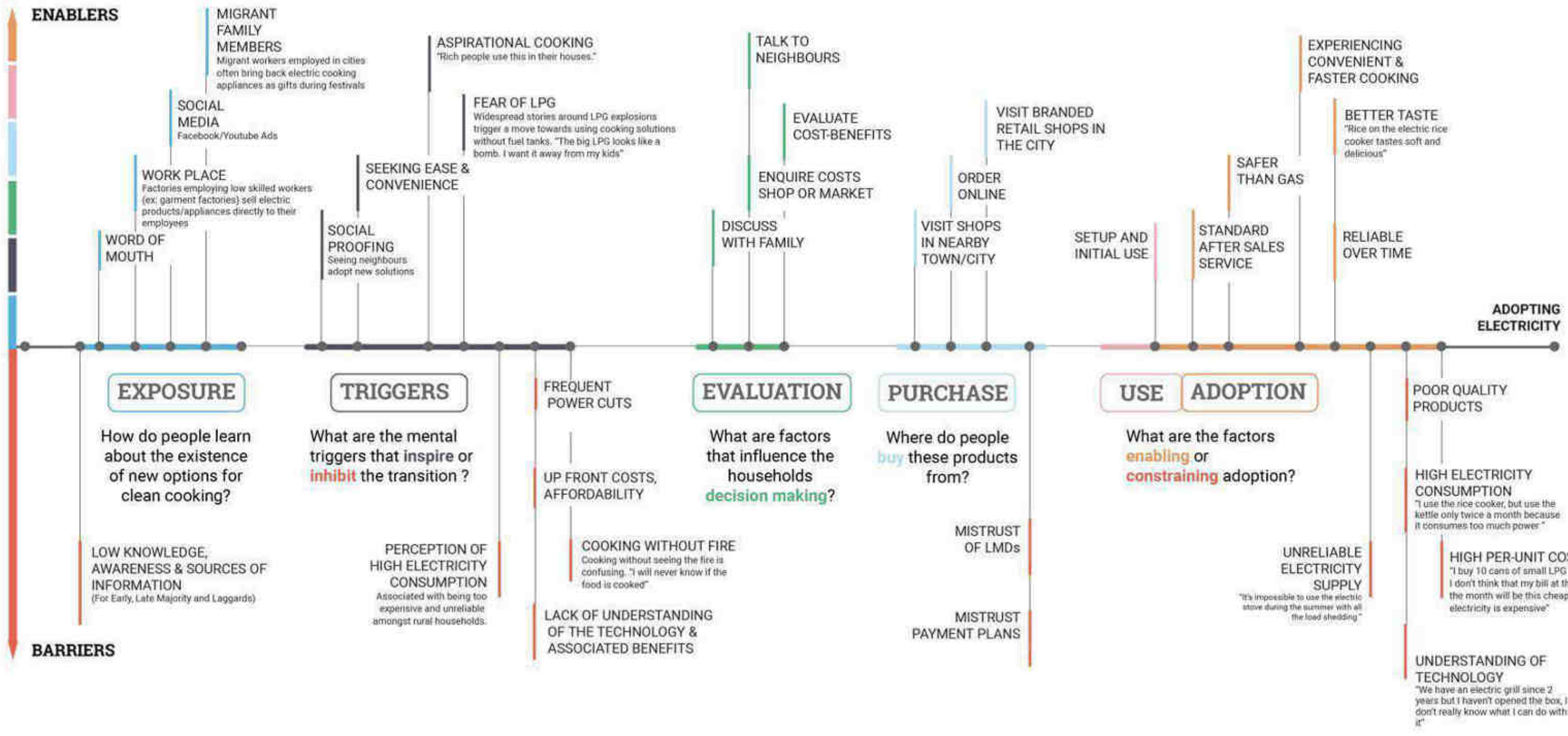
Key Enablers and Barriers to MECS adoption

What makes people shift their cooking behaviors away from traditional biomass?

A mapping of the adoption process outlines six key stages that lead to adoption of widely available modern energy cooking solutions, namely LPG and electricity. Each stage is characterized by unique drivers that influence the shift towards or away from using biomass.

USER ADOPTION JOURNEY (Electricity)

Mapping enablers and barriers that influence adoption of Electric Cooking solutions

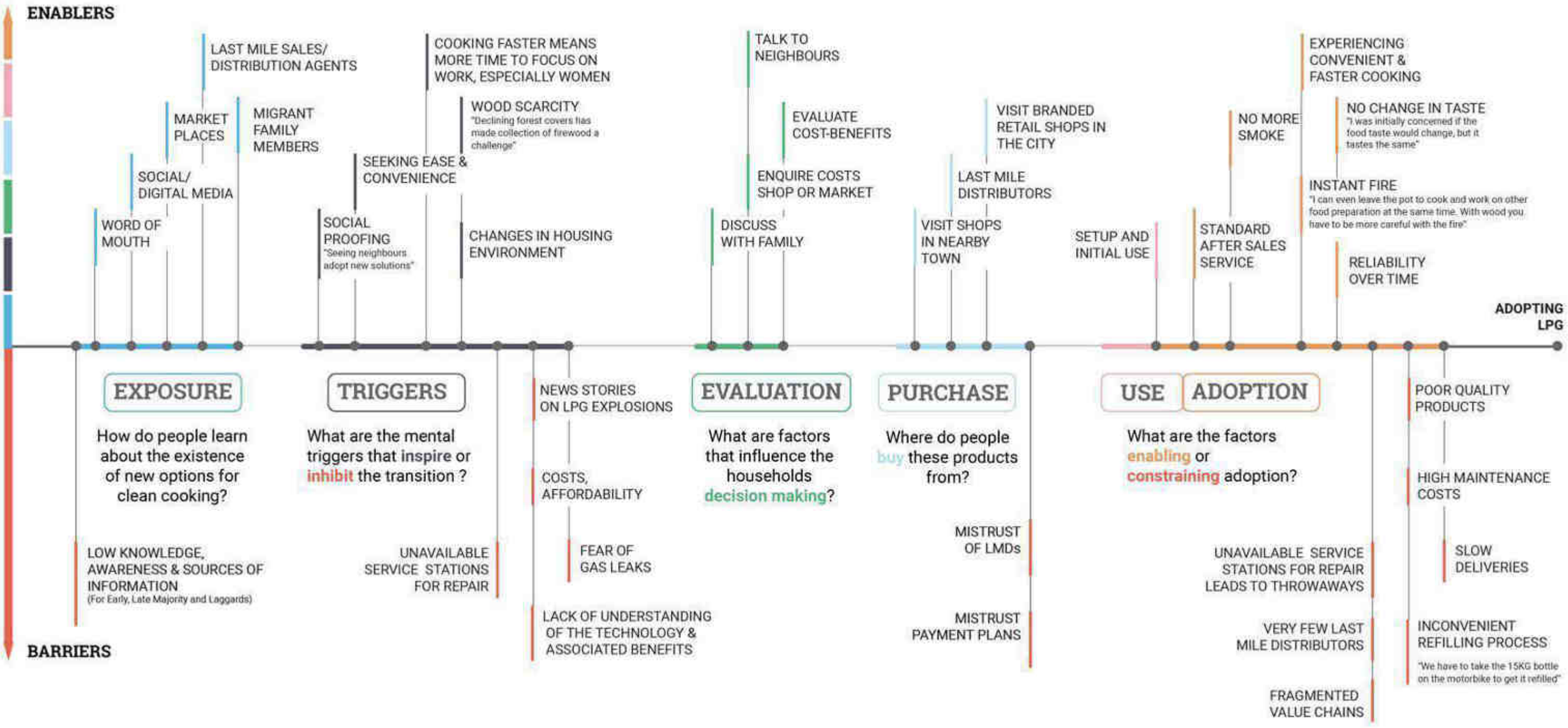


ENABLERS: Positive triggers and motivators along the 6 key stages of adoption- which create an interest and willingness to adopt MECS

BARRIERS: Challenges and constraints that prevent wider adoption of MECS

USER ADOPTION JOURNEY (LPG)

Mapping enablers and barriers that influence adoption of LPG solutions



ENABLERS: Positive triggers and motivators along the 6 key stages of adoption- which create an interest and willingness to adopt MECS

BARRIERS: Challenges and constraints that prevent wider adoption of MECS

7.4.1 FACTORS ENABLING MECS ADOPTION

When vewing the two user journeys collectively, the following factors create interest and willingness to adopt modern cooking solutions:

INCREASED EXPOSURE

• A large percentage of Cambodia's workforce employed in garment factories is in the age groups of 21-39. Garment factories often sell modern cooking products directly to employees

• Word of mouth, and social media are responsible for promoting awareness of these solutions.

> *"When I search for new recipes on youtube, I get these kind of advertisements of the modern products. It's how I first found out about them. If I have enough money in the future, I will try to buy an electric grill." Food Vendor, Kratie*

MARKET PLACES STOCKING NEW COOKING SOLUTIONS

• In the past decade, expansion of local markets stimulated entry of Vietnamese, Thai, and Chinese products and electronics granting people increased choice and access, enabling adoption of MECS.

MIGRANT FAMILY MEMBERS

• Migration to urban centers is changing how working families/people cook, with a marked increase in easy to access, affordable, and safer solutions. Further,

migrants influence cooking practices of their families in the villages.

• Migrant workers travel to the city with their culinary practices and habits, while acquiring new food customs that they adapt naturally to in their new life. Adapting and remixing food and cooking through old and new techniques also includes a change in the way people cook. And when migrant workers go back home for holidays, this mixing takes place, therefore, in both directions, with their families being exposed to MECS.

> *"My daughter who now lives in Phnom Penh is very modern. She has a big TV in her house, and she also cooks with electric devices. She got a rice cooker for me so I enjoy using it." Stay at Home Caregiver, Kratie Province*

• A slow cascading effect of MECS options such as the adoption of electric rice cookers and kettles is observed in rural and peri-urban towns across Cambodia It marks a turning point in consumer behavior - opening the door to new ways of cooking based on convenience, ease, etc. This can be attributed to gradually improving access over time and influence of migrant family members on the cooking practices/preference of their families back in the villages.

NEW LAST MILE DISTRIBUTORS

• A large majority of potential customers are in the 'last mile', those that are underserved by the mainstream private sector because they are low income, live in rural; remote areas, or both. In spite of significant challenges, small-scale retailers are recognizing the market opportunity and attempting to create new distribution networks to reach customers in rural Cambodia. Traveling salesmen employed by

small-scale retailers move from village to village, and conduct door to door pitch and sales. Villages are commonly referencing the awareness of double-burner LPG cook stoves to the last mile distributors who visited them at their homes.

> *"There are some sales people who come and promote this(double burner LPG). The product was from Thailand and looked to be of good quality." Stay at Home Caregiver, Kratie Province*

SOCIAL PROOFING

• As observed from homestays, people in rural Cambodia prefer to adopt a wait and see approach to purchasing expensive cooking solutions. Seeing neighbors adopt new solutions without any issues instills a willingness to adopt these technologies.

> *"My sister was the first in the village to buy the biogas system. I saw her use the system without any problems, she really liked using it. This made me want to purchase it for my house too." Farmer, Kampong Speu*

ASPIRATIONAL COOKING

• People are aspiring to become modern consumers which is leading to a rising demand for electric appliances (TV, microwaves, ovens, etc.) in the cities is generating in-roads market pathways for businesses and entrepreneurs to meet this demand.

SEEKING EASE AND CONVENIENCE

• Increased employment opportunities were accompanied by changes in lifestyle with people moving away from farming. Increased time spent working has created

a change resulting in less time for cooking at home, especially for women who work; and more meals being consumed outside. These changes bring greater awareness of new cooking solutions and increased willingness to break away from traditional cooking methods.

• Adopting efficient, time saving cooking solutions means more time dedicated to income generating work, especially for women.

> *"These modern products(electric stoves, slow cookers etc.) are for the city people who are busy with their work and business. They need these so they don't have to be away from their shops for too long." Stay at Home Mother, Kampong Speu Province*

• The adoption of electric rice cookers is a significant trend across Cambodia. Affordability, time saving, and convenience in cooking an everyday staple are factors that have led people to widely adopt electric rice cookers.

> *"I would estimate that more than 60% of the people in this village use rice cookers. It is very easy to use it and saves time for them." Village Chief, Kratie Province*

CHANGES IN HOUSING

• Field observations indicate that the move from a wooden house to a concrete house is often associated with greater status and respect in the community. Families typically save income or draw on housing loans from micro-finance institutions to build an aspirational house. Moving into a new concrete house becomes a trigger for families to reconsider the use of their cooking fuels in two main ways:

Upgrading to a new house triggers the idea that moving to a new house should naturally accompany a shift to using modern cooking methods.

> *"When I build my house properly, I will definitely get the big LPG for my family because it's how people cook if they're in those types of houses." Stay-at-home Father, Kratie Province*

Families want to preserve the appearance of the newly constructed house and smoke from burning firewood indoors blackens the walls.

> *"My grandmother next door uses wood to cook food. For her it is ok, but if we used wood in the new house our house wouldn't look beautiful anymore." Factory Worker, Kampong Speu Province*

FEAR OF LPG

• A widespread fear of using large-LPG (over 12 KG) due to cases of leaks and explosions, fueled in part by news media and stories in the village, triggers caution for families with newborn or young children. As a consequence, families either downgrade to a small-LPG or consider using electricity.

> *"My neighbors told me to be careful with the LPG tanks, so after my child was born I decided to give it away to my sister to keep my family safe." Farmer, Kratie Province*

> *"It's hard to keep an eye on my children when I'm at the shop outside my home. I was really worried they will play with the LPG tank so I stopped using it." Grocery Shop Owner, Kampong Speu Province*

INCREASE IN PURCHASING POWER

• Following strong economic growth, Cambodia attained the lower middle-income status with a GDP of 7% in 2015. Previously nonexistent employment opportunities in manufacturing, services and tourism significantly boosted household incomes for Cambodians; especially people in the countryside. This is resulting in increased asset ownership of a range of consumer goods (motorbikes, TVs, refrigerators, cooking appliances, etc.)

NO SIGNIFICANT CHANGE IN TASTE

• Ease and convenience are more valued factors for households that adopt modern cooking solutions, as long as there are no significant changes to the taste

> *"I make rice everyday on the electric rice cooker. The taste is certainly not the same but it's so quick and automatic that we all use it." Construction Worker, Kampong Speu Province*

> *"When there are many mouths to feed, I don't really care about how the food tastes, I just want to cook all the food as fast a possible." Grocery Shop Owner, Kratie Province*

RELIABILITY OVER TIME

• As referenced previously, if the technology proves to be useful people (rural/peri-urban) want to consider purchasing it so long as there are no strong negative connotations (Re: LPG Fears)

• Offering a good user experience through professional sales techniques, timely product delivery, and good after sales service builds trust with communities and aids the adoption of MECS in the long term.

> *"I am quite satisfied with the biogas system from ATEC. I've only ever had one problem with it in the past 8 months and the technician was here to repair it within the same day. He was very friendly and inspected the biogas rice cooker and fixed a problem I didn't know about."*

7.4.2 BARRIERS TO MECS ADOPTION

LOW KNOWLEDGE AND AWARENESS

•The health risks of using firewood for cooking are not completely understood beyond a general understanding that smoke from firewood is bad for health. HHs understand the immediate, short-term effects (such as "harmful to the eyes and lungs") however understanding of the long-term effects are not known to communities.

> *"The smoke bothers us, but there's nothing we can do about it. I don't want to use the stove outside, it's not comfortable cooking out there." Shop owner, Kratie Province.*

• In rural Cambodia, people have rarely considered what/how might be the best, most efficient way to cook due to low sources of information/awareness of new cooking options. Innovators and Early Adopters per the diffusion curve are notable exceptions.

• At a community level, the discussion or awareness around health and environmental risks of biomass, and adopting cleaner cooking is critically lacking. At present, awareness building is only confined to sales agents from companies trying to encourage people to buy new things. The emphasis on educating communities about the health risks of traditional fuels is missed.

> *"Right now, we don't have any laws around talking about not using firewood or educating people on how to use LPG in a safe way. I think the big focus on advising the community right now is around sanitation, health, and vaccinations. I think this would really help many people to be safe and healthier if your organization could help make with this policy." Commune Chief, Kratie Province*

CHALLENGES IN ACCESS TO PRODUCTS AND MARKETPLACES

• Lack of convenient, affordable, accessible cooking alternatives in villages still prevent people from using modern forms of cooking.

> *"Wood is taking longer for me to collect nowadays. But I have to accept my situation, what can I do? I don't have money to buy the expensive stoves." Farmer, Kampong Speu Province*

• Distance from fuel markets, poor infrastructure and bad roads further prevent people from accessing cooking energy or stove alternatives..

> *"In the past year there is one man who is providing an LPG refilling service for 2.5 USD extra. I don't mind paying him because otherwise I would have to carry the*

big bottles on my motorbike for 10 km to get them filled." Stay-at-home Mother Kampong Speu Province

CHALLENGES IN REACHING LAST MILE CUSTOMERS

•The actual number of active last mile distributors selling clean cooking products are few in number. Further, limited distribution capacities, poor infrastructure, low capital and no manufacturers with proprietary distribution networks restrict their potential to reach more communities.

• Mistrust in the last mile distributors is due to two factors: a lack of recognition and legitimacy, and missing persuasive sales training that helps people understand the benefits of adopting these technologies..

> *"We never really know who these people are, sometimes they're in truck trying to sell things by announcing on loudspeakers, sometimes they knock on the door and ask to speak with my husband. I would never buy something from an unknown person no matter what they tell me." Farmer, Kratie Province*

• Physical shops are seen as more trustworthy but when there are no shops available in the village, the only available touchpoint for purchasing clean cook stoves are markets in nearby towns:

> *"If the salesman has invested money to run a shop, they are honorable and will give us good quality." Customer at an electronics store, Kampong Speu Province*

> *"I value quality of my products to build trust and keep customers coming. If I don't*

have customers, I don't have money." Shop Owner, Kratie Province

MISTRUST OF FINANCE PLANS

People prefer saving up money and purchasing whole assets through up-front, in-cash payments. Negative experiences of previous loans drawn from micro-finance institutions perpetuate a mis-trust of payments over time. High interest rates on equal monthly installments (EMIs) have created a fear towards payment installment plans. The implications of these preferences on the PAY-GO business models require further exploration.

> *"I don't want people from the company to come every month and constantly ask me for money. The people from the MFIs did the same and everytime I they cam I lost face/ respect in the community."*

LOW FINANCIAL PRIORITIZATION FOR COOKING

• For low income households, other immediate needs take precedence over cooking with clean fuels. Dwindling incomes and unplanned financial constraints (ex: unexpected health expenses, loans) encourage stacking of biomass. This encourages a mindset of keeping less expensive backups.

> *"I'm paying 30 USD a month in an installment plan for the biogas system right now. But I know that next year when my daughter has to get married, we might have to temporarily stop the payments because we need to save for the marriage." Farmer, Kampong Speu Province*

FEAR AND SAFETY CONCERNS SURROUNDING LPG

• A widespread negative connotation towards LPG canisters/tanks is restricting adoption. Stories from nearby villages, markets, and from neighbors on LPG explosions change people's attitude towards the use of this fuel for cooking.

• In the backdrop of these incidents, people do not trust LPG suppliers and are reluctant to bring canisters and tanks inside their homes.

> *"The 15KG tank looks like a big bomb. I'd rather just use a small can for use so it's not going to explode."*

• To offset the fears around safety, some people adopt LPG "work-arounds" with innovative tactics.

> *"I've been tying a wet cloth around the cylinder to make sure it doesn't heat up too much. I get worried if the cylinder is hot and wonder if it will lead to an explosion."*

> *"I've constructed a metal enclosure around the LPG tank and with this I think that it's safe to keep in the kitchen now. My wife feels safe to use it now. Most people who want to use it now are keeping it outside the house so there is no fire risk."*

FRAGMENTED VALUE CHAINS

• For large-LPG(cylinder 6KG and above), the lack of after sales services is a key barrier to adoption with customers left with no option of repairs in case of breakdowns.

> *"If there was a shop that sold the LPG double burner stove and was able to fix any problems then I would've bought. Right now, nobody can repair in these shops." Food*

Vendor, Kampong Speu Province

• Customers want guarantees that the stoves they buy can last longer and are easy to use in the long term. After sales services for any cook stoves are a critical need.

ESTABLISHED PERCEPTIONS OF ELECTRICITY

• Electricity is perceived as expensive and unreliable. Unreliable supply of electricity further enforces these perceptions.

> *"Only rich people can cook with things like these. I wouldn't be able to use electricity to cook because I wouldn't be able to afford it and the monthly bill would be very high." Grocery Shop Owner, Kratie*

• The general perception of electricity is of a utility for powering appliances, but options for cooking beyond the use of electric rice cookers are rarely considered due to low awareness. Though the average HH electricity bill is far under the monthly expense for cooking fuel, a lack in understanding unit costs enforces this perception.

• Cooking is not a priority expense for most rural HHs and is often seen as a separate experience from they prefer to use their electricity supply for other appliances.

• Some HHs are fitted with a limited (and low) supply of current, and these rural and peri-urban HHs connected connected to a weak grid do not benefit from using high-power appliances (i.e; electric cook stoves). Hence, people prefer to use LPG for cooking.

• Not knowing how much money is spent on cooking with electricity is a challenge. With other fuels it's easy to see the money spent on cooking (i.e; buying charcoal/ LPG) People cannot see how much is spent using electric cooking which triggers an attitude of conserving electricity and encourage cautious use, economical use.

• Cooking with an electric device associated with a dread of the electricity bill at the end of the month, without understanding the consumption patterns. A gap in understanding unit costs for cooking enforces this perception.

> *"I've seen the meter start to spin super-fast when I turn the kettle on. I think other appliances like the electric kettle and the microwave increase my electricity bill by a big margin so I try not to use them." Stay-at-home Mother, Kampong Speu Province*

7.4.3 GENDER NORMS IN DECISION MAKING AND ACCESS TO MECS

• Cooking responsibilities are mostly done by the women in the household with occasional help from the man. Businesses and sales teams fail to acknowledge true cooking needs of women. Targeted, tailored and comprehensive communication aimed at creating interest for women to adopt MECS is lacking.

• Most household decisions for medium or large purchases are typically collective in nature: i.e. family members(husbands, elders) are consulted for opinions on purchasing modern cook stoves. However, for women embedded in a society that values hierarchy and following the elders' decisions, agency to prioritize purchases may be restricted.

• Households where womens agency is restricted are far more likely to follow traditional cooking practices reliant on firewood.

> *"I live with my parents and we cook with firewood because they are old and prefer the food to be cooked in a traditional way. After my marriage, I will think about getting the LPG stoves as they are easier." Midwife, Kampong Speu*

• Men with traditional mindsets who are exposed to modern cooking may not always prioritize this as a need for the household.

> *"I think many men don't like to cook, but they also don't understand that it's hard work to prepare food for the whole family." Shop Keeper, Kampong Speu*

• Sales agents of LPG and Biogas companies are mostly always men equipped with generic messages on challenges in collecting firewood. The language and format of the sales pitch does not speak to the cooking needs of women or working women. Further greater emphasis is placed on closing sales over educating customers.

7.5 SHIFTS IN COOKING PRACTICES

As a result of the enablers and barriers that influence adoption of MECS, peoples everday cooking practices are changing.

SHIFTS IN COOKING PRACTICES

Traditional and culturally accepted associations to food, cooking and tastes are changing and can be observed through the following shifts:

• NUMBER OF MEALS CONSUMED AT HOME:

Villages with farming as the primary source of income generation/subsistence still cook three meals a day. Cooking sufficient quantities with few leftovers and a belief of consuming freshly cooked food is the most common cooking practice in rural Cambodia.

> *"We want fast and easy to cook food. We are very hungry when we come back from the field and don't like waiting to eat. The device [electric rice cooker] is amazing as the rice is ready to eat when we come home."*

However, in peri-urban and urban Cambodia, growing changes in lifestyle and work with increased income has shifted behaviors to consuming fewer meals per day and lesser cooking requirement.

> *"I have a very short break time. It's easier to eat outside than cook at home. I don't like to cook in the morning so I buy my breakfast."*

• **CHANGING PREFERENCES IN COOKING**

Traditionally, specific food types are associated with specific energy or specific ways of cooking, which also leads to stacking various types of fuels regardless of other factors (affordability, access, convenience, quality, reliability etc.) However, as we move from rural to peri-urban to urban households, shifts in cooking techniques and preferences are observed:

1. Traditional boiling vs. using electricity for boiling

Rural:

Using wood for boiling water is still a practice associated by the elderly with being "healthier" and the tradtion in rural households.

> *"It is my habit to use the metal kettle on firewood and not LPG. We use it to make the water medicinal by adding a tree bark in the water to boil. It is healthier and germ free this way."*

Peri-urban/ Urban:

Electric kettles are the more common method for boiling water, commonly being adopted for their efficiency.

> *"People in the towns are the busier people, they don't have farms at home, they have to go to work so they need everything to be fast. Especially with food preparation."*

2. A shift in preference; frying over grilling

Rural:

Grilling meat over charcoal is a traditional and a popular cooking method, and stacking of charcoal to use for grilling is common in rural Cambodia. This is also associated as a healthier form of cooking as the food doesn't have extra oil. Due to several factors highlighted in subsequent sections, grilling with LPG or electricity is rare.

> *"People in the countryside love to eat grilled fish every day, it's easy to catch in the river and easy to cook on coal"*

Urban:

As MECS (LPG, Electricity) is adopted in urban Cambodia, a preference of frying over grilling is observed commonly associated with quick cooking and convenience.

> *"I don't really care about the taste, for me it's important to cook food quickly and*

3. Reheating over Fresh Cooking

As observed from homestays with families in rural Cambodia, people do not prefer reheating food. They prefer cooking fresh meals at eating hours because options for storing leftovers are expensive or inaccessible. Very few families own refridgerators in rural Cambodia.

> *"I don't have an ice box to store the leftovers so I just cook fresh vegetables from the farm, rice and meat from the market, for each meal."*

Reheating is more commonly practiced in peri-urban and urban households where refrigerators or other storage forms enable families to keep food fresh for longer. Families are likely to cook a combination of soup and stir fries in small daily batches in the morning, reheating for lunch or dinner.

08. DESIGN PRINCIPLES

Design Principles are a set of considerations that form the basis for any good product, service or innovative solution.

These enable generation of strategic solutions that address real needs, whilst considering technical feasibility and economic viability.

DESIGN PRINCIPLES

A few simple principles/ constructive questions guide teams towards making appropriate decisions. All Design Principles are rooted in the main learnings from our fieldwork as regards to cooking needs, aspirations and behaviors of the different types of adopters. These are an integral part of the design process ensuring a greater chance of success by putting the human (the user) in the center of the process.

1. **Accessibility, Affordability, Reliability, Quality, and Efficiency**: Ensuring standard quality products and efficient delivery methods allow people greater choices to adopt MECS
2. **Ease and Convenience:** Simplifying the cooking experience, offering time saving benefits to adopters
3. **Inclusive and Equitable to people who cook** (women>men): Focusing on people involved in everyday household cooking (more women than men)
4. **Benefit Oriented:** Enabling HHs to understand all the benefits of the adopting MECS
5. **Avoid Cultural Barriers**: Messaging to HHs resonates with community values and solutions are designed keeping a Cambodian audience in mind
6. **Preserves Taste and Tradition**: Taste and traditional recipes are not compromised

Brainstorming in the co-creation workshop was guided by these principles to generate solutions that matched with community needs.

09. CO-CREATING SOLUTIONS

Co-creation is the act of collaboratively building solutions together. Involving experts, business leaders, engineers, and creative minds in a workshop setting, we uncovered new ideas responding to reasearch findings and design principles.

The goal was to obtain a wide range of creative ideas and solutions in order to refine and prototype the most desirable solutions.

THE CREATE PHASE

After the Hear Phase, where we focused on the research to uncover insights and new opportunities for the design, we moved to the Create Phase. The goal was to generate a wide range of ideas addressing real user /HH needs.

On January 16th, 2020 the iDE team engaged a set of interdisciplinary experts in a workshop setting (designers, researchers, engineers, subject matter experts, end users, etc.) to co-design solutions, that attempt to address the barriers to adoption of MECS in Cambodia. Participants were presented a summary of the challenges, and later divided into teams for brainstorming ideas. Through a collaborative, participatory process, a variety of ideas were generated around key themes.

Under each theme, challenges framed as How Might We statements were introduced to teams in order to generate a wide range of ideas. Four final themes were selected from a larger set of opportunities and introduced in the session:

- Cooking with Electricity
- Behavior Change and Demand Creation
- Quality of Product and Service Deliveries
- Gender Equity

Theme 1: Cooking with Electricity

Selected Solutions From Group Brainstorms:

- Customers hands on testing at MECS restaurants
- Community cooking clubs
- Mobile master chef competitions supported by stove manufacturers
- Advertising/ Marketing electric cooking products at Community Health Centres
- Build rapport with Village Chiefs to promote MECS products

Theme 1: Cooking with Electricity

- How Might We change people's attitudes and perceptions towards cooking with electricity?
- How Might We design community-based interventions to accelerate the uptake of electric cooking appliances?

WHY(Barriers being addressed)?

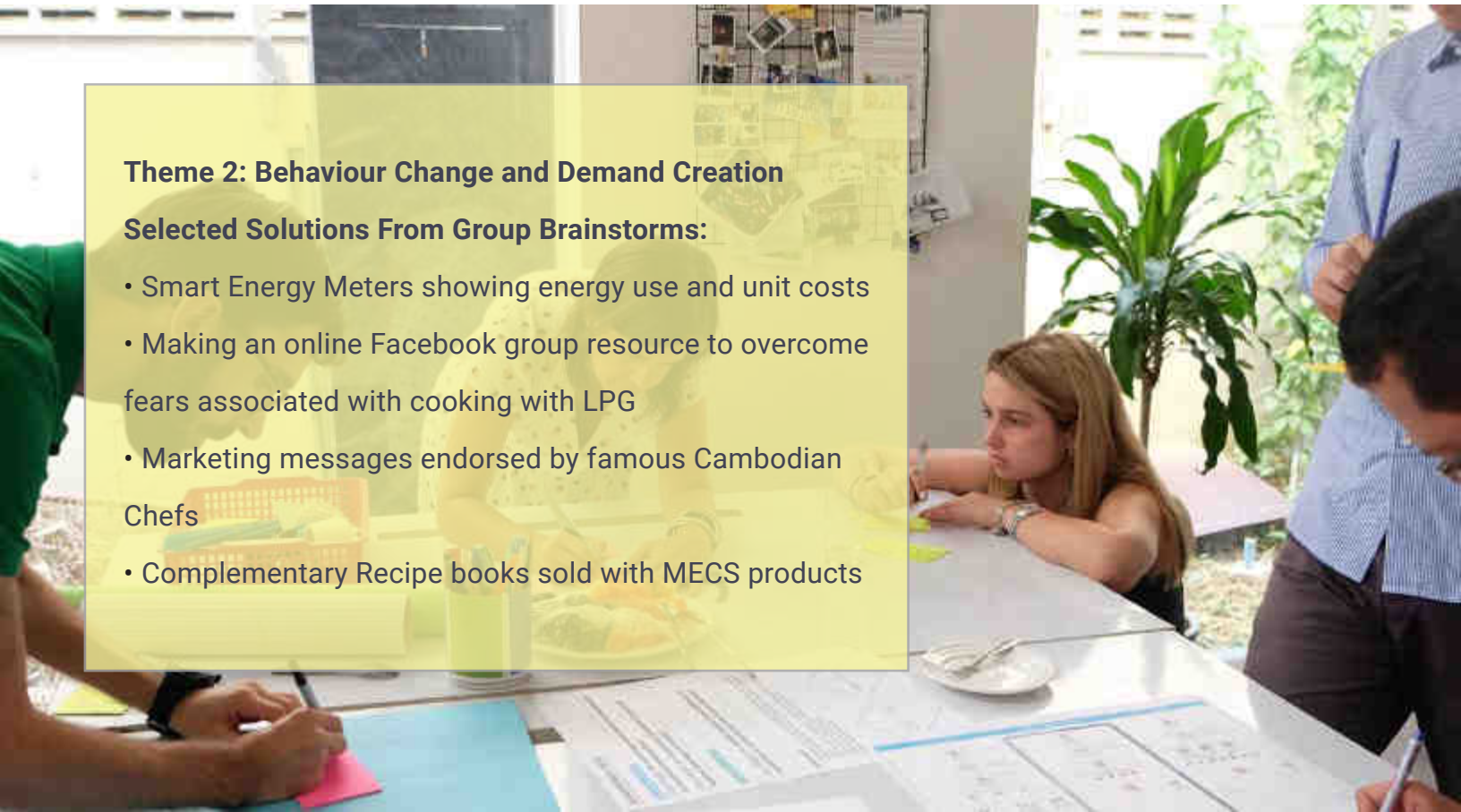
Established perceptions of electricity being expensive, unreliable, and unsuitable for cooking prevent adoption. Whilst these perceptions are well justified in some regions, grid variability(unreliable, irregular supply) is expected to further decrease in the future. At a community level, discussion and awareness around talking about health and environmental risks of biomass, or adopting cleaner cooking is critically lacking.

Theme 2: Behavior Change and Demand Creation

• How Might We get communities excited about using or adopting modern energy solutions?

WHY?

For rural communities, awareness building is only confined to sales agents from companies trying to encourage people to buy new things. The emphasis on educating communities about the health risks of traditional fuels is missed and creates a skepticism amongst communities to try new solutions



Theme 2: Behaviour Change and Demand Creation

Selected Solutions From Group Brainstorms:

• Smart Energy Meters showing energy use and unit costs

• Making an online Facebook group resource to overcome fears associated with cooking with LPG

• Marketing messages endorsed by famous Cambodian Chefs

• Complementary Recipe books sold with MECS products

Theme 3: Quality of Product and Service Deliveries

• How Might We unblock the after sales service and last mile distribution challenges in rural Cambodia?

• How Might We design nudges: product or service add-ons or incentives to aid the adoption of modern energy cooking solutions?

WHY?

Customers want guarantees that the stoves they buy can last longer and are easy to use in the long term. After sales services for any cook stoves are a critical need. At present HHs are left with no option for repairs in case of breakdowns.

Theme 4: Gender Equity

- How Might We incentivize businesses to provide tailored messages that match cooking needs and aspirations for women?
- How Might We encourage more women entrepreneurs in business/communities?

WHY?

Businesses and sales teams fail to acknowledge true cooking needs of women. Targeted, tailored and comprehensive communication aimed at creating interest for women to adopt MECS is lacking.

Theme 4: Gender Equity

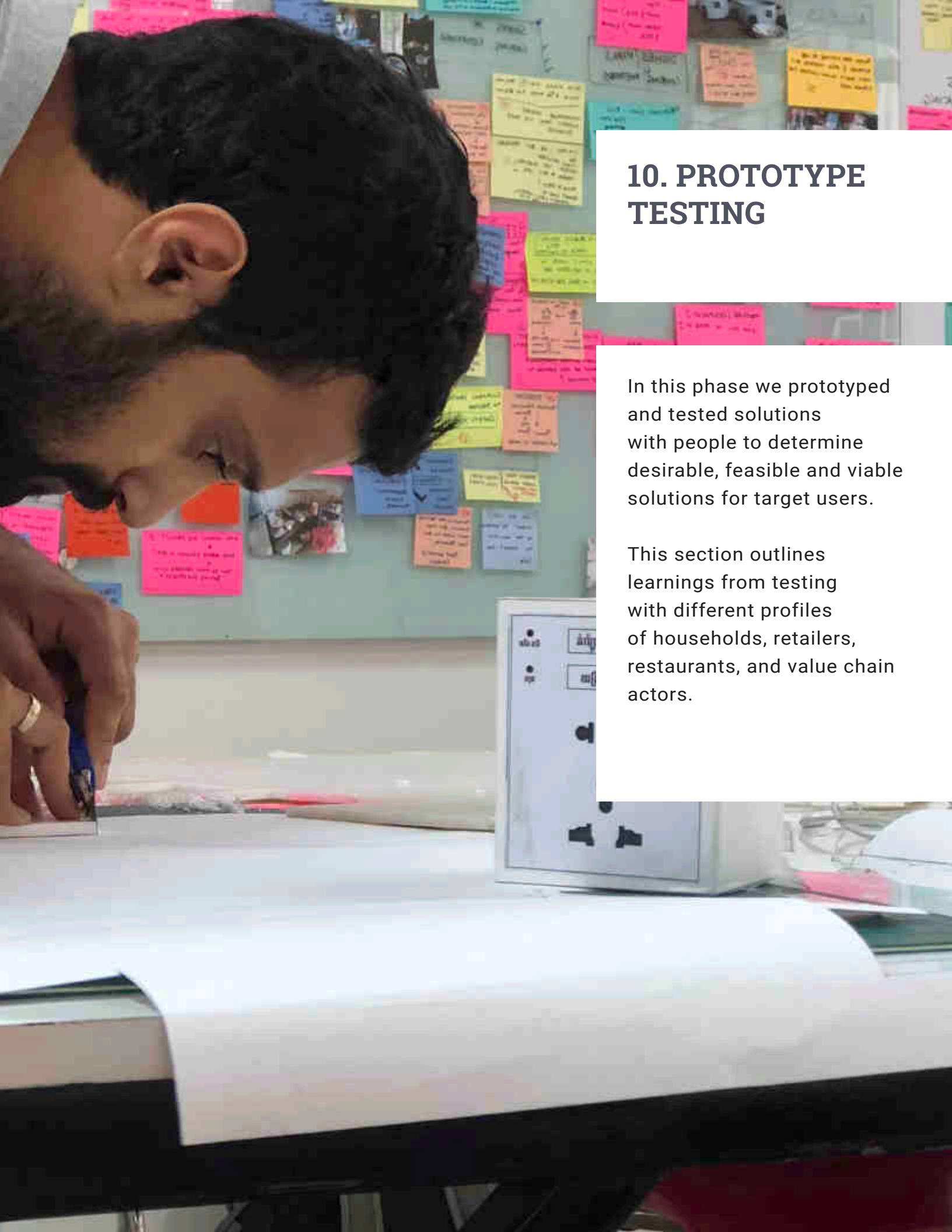
Selected Solutions From Group Brainstorms:

- Female sales agents trained as chefs
- Adding convenience triggers to marketing messages to customers

"It's easy for men to cook"

"Press a button, work at the farm and come back to ready to eat food"

- Marketing solutions at garment factories to reach more women



10. PROTOTYPE TESTING

In this phase we prototyped and tested solutions with people to determine desirable, feasible and viable solutions for target users.

This section outlines learnings from testing with different profiles of households, retailers, restaurants, and value chain actors.

THE DELIVER PHASE

After the analysis of the most relevant and innovative ideas from the co-creation workshop, the Deliver Phase of the HCD process involved creating tanglible low-fidelity prototypes which were tested with the target profiles. The following were the final five prototypes:

E-Cooking Product Packaging

1

Smart Energy Meters

2

Safety Labels for LPG

3

New Service Scenarios

4

Facebook Group

5

PROFILES:

• Prototypes were tested with a sample of 23 profiles which included:
• Rural Early Adopter and Early Majority Households in the medium income bracket
• Food Vendors, and Local Business Owners
• Cooking Product Retailers
• Sales Agents of ATEC* Bio-digesters
• Other Value Chain Actors in the Community (Repair men, LPG distributors)

LOCATION:

Tested was conducted in three rural villages in Kampong Speu provinces

PROTOCOL:

To mitigate bias, tests were conducted with the above mentioned profiles in randomized order - prototypes were tested in differing order. For households, test were conducted with people who had electric rice cookers, or had previously cooked with electric devices previously. Feedback was captured on a number of aspects of the solutions including, but not limited to: desirability, willingness to purchase, price points, sales strategy, marketing messages, branding, look and feel, financing, marketing channels, benefits etc.

PROTOTYPE 1:

Testing Desirability of Electric Cooking Products Through Packaging Design

WHAT:

We tested people's perceptions, preferences and willingness to adopt three electric cooking products. Mock-up packaging was designed for the following products:

- Electric Pressure Cookers (Branded as the Khmer Krock Pot)
- Baby Food Makers (Branded as Smart Electric Baby Robot)
- Electric Cook Stove (Branded as Smart Electric Stove)

Feedback was captured around memorable messages, unique value propositions, imagery, preference to use, change in cooking practices, preferred sales channels, and financing options

LEARNINGS:

• Except for the elderly, people are not opposed to cooking with electricity.

• An overwhelming majority of participants indicated a preference to adopt the electric cookstove over the other two products.

• Preferences towards the electric stove were not driven by taste. The biggest factor was cost and convenience, highlighting the potential for future adoption when the benefits are marketed appropriately.

• Other reasons cited were: familiarity with open pot cooking (comparable to LPG), and using existing pots and pans.

• Common concerns around electricity consumption, and frequent power outages were raised.

• People prefer seeing the product and experiencing it. Transparency in payments, and transparency in assuring quality is key.

• People develop a mistrust based on negative experiences of purchasing poor quality products from salesmen in the past. Group sales allow people the space to speak up about their concerns that they normally wouldn't have in a home setting.

“I wouldn’t mind purchasing this. This grandma(on the packaging) looks like she knows how to cook the modern way, she is smart.” Midwife, Kampong Speu

“People who have loans don’t like sales people from MFIs coming and asking for money to their house. They wouldn’t prefer to go for the payment installments.”
Garment Factory Worker, Kampong Speu

PROTOTYPE 2:

Testing Smart Energy Meters that Enable Better Unit Cost Understanding

WHAT:

Mockups for energy meters were created and tested with target profiles to understand customer perceptions of cooking with electricity if they were able to calculate costs.

Feedback was captured around unit cost desirability(is knowing the costs important), preference to adopt electric cooking devices, ability to track electricity usage, readability, and functionality

LEARNINGS:

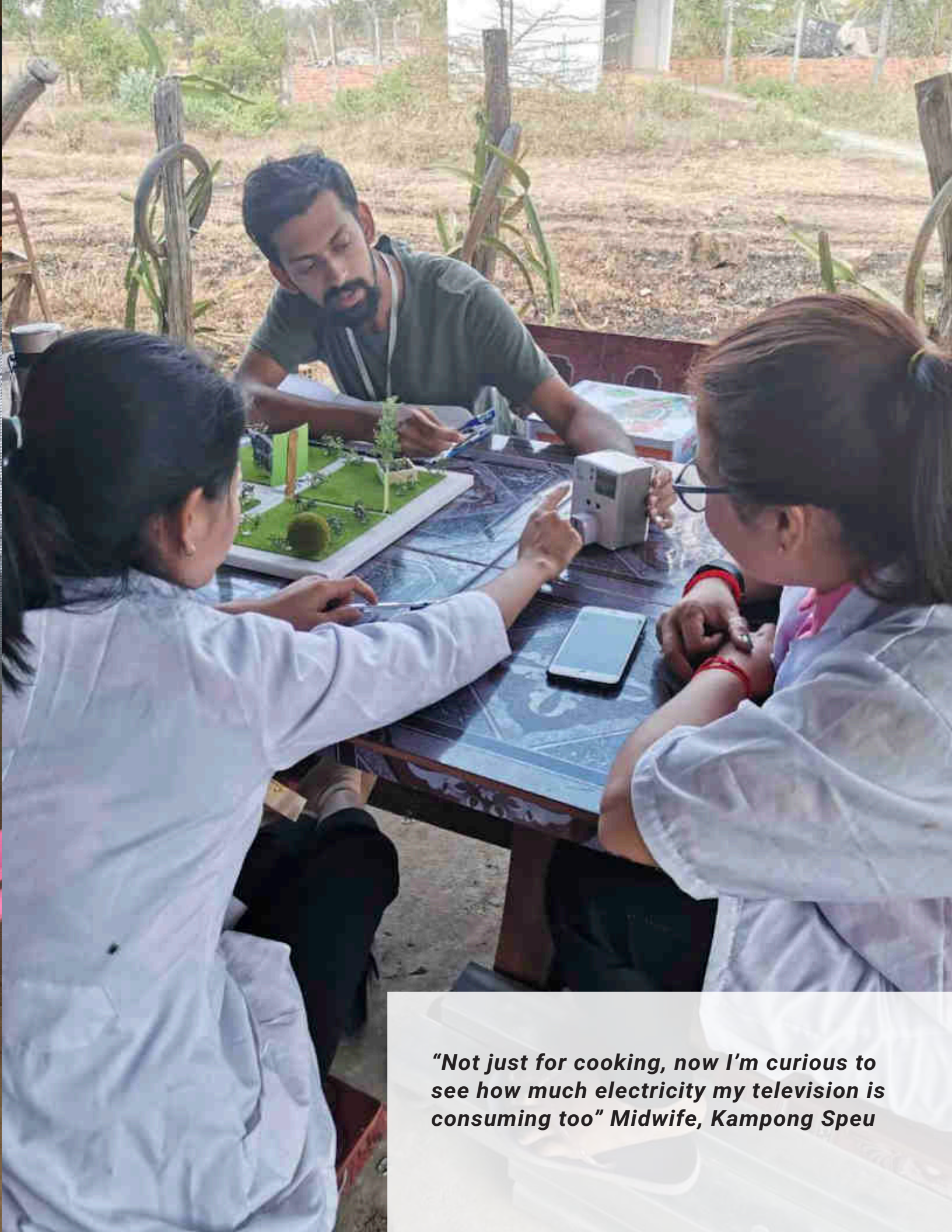
• Families want transparency and control over their energy consumption patterns and currently do not have the means to track this for themselves.

• Rural HHs often do not know how or where to capture their electricity meter reading, and having a tool that showed them consumption inside the house generated excitement

• A new technological solution that enabled knowing the cooking costs per meal was a new idea to people we tested with, and overall the prototype was well received with a majority of profiles requesting purchase of the meters.

• Early findings indicate that Smart Meters are a powerful behavioural nudge that could encourage HHs to adopt electricity. They have the potential to open up greater pathways for different applications of electric cooking.

“Now we can prove to the electricity company how much we’ve consumed. They won’t be able to cheat us.” Garment Factory Worker, Kampong Speu



“Not just for cooking, now I’m curious to see how much electricity my television is consuming too” Midwife, Kampong Speu

PROTOTYPE 3:

Testing Safety Labels Promoting Safe LPG Use

WHAT:

Mockups for LPG labels with instructional do's and don'ts, messages and visuals encouraging safe use and disposal; were designed, and tested with households, retail shops and LPG refillers.

We gathered people's opinions on the need for the label, necessary messages to include, imagery and application.

LEARNINGS:

• We learned through this test that when it concerns LPG, people want to create control mechanisms that reassure them that they're cooking safely. The labels nudge people towards safe cooking practices and in doing so provide them the desired control mechanism.

• Most target profiles are familiar with basic messages, but claim that having labels would make it easier to explain to their children or family members who are scared of using LPG.

• If promoted by LPG fuel and stove companies its potential to create a tipping point and accelarate widespread adoption of LPG requires further exploration.

“These are good reminders for people in case they are unsure or forget about how to cook safely with gas.” Construction Worker, Kampong Speu

“If I start to have these stickers on my bottles I’ll not only be able to tell which ones are mine when customers return them, but also inform them about the safety aspect.” Retailer, Kampong Speu

PROTOTYPE 4:

Testing New Service Scenarios that generate demand and adoption of MECS

WHAT:

We modelled a rural village to test the desirability of solutions related with community based interventions, and exploring the role of existing and new value chain actors. Three ideas tested were:

• **Service Repair Centre in the village:** An available on site repair technician for after sales service.

• **Female Sales Agents who are chefs:** Female sales agent dressed as a chef doing a cooking demo on-site. Pitching sales of electric/LPG products through live cooking demonstrations.

• **Experience Centre Style Modern Restaurants:** At well known restaurants, setting up open kitchens during lunch time and dinner time one day. Have customers witness their meals being cooked in front of them. Showcase easy-to-cook Khmer dishes on different MECS products (i.e; EPC, e-cook stove, LPG)

LEARNINGS:

• All three ideas require testing/ evaluation through piloting to realistically understand their potential to address sales and after sales challenges along the value chain.

• After Sales Repair services may not be suitable for niche products like biogas/ electric stoves for two reasons: investment required procurement of spare parts, technical training and support to technician.

"It may not work like this. Only our own technical staff can fix our system. These spare parts cannot be found anywhere else." ATEC, Sales Representative

• Community based interventions are novel ideas to bring knowledge and new MECS products closer to the community. However, implementing these ideas often requires high investment and capacity building which may not always fit with business models of organizations.

“Female Sales Agents giving live demos is a good idea, but for the sake of womens safety, I would suggest this to be done with the Village Chief ” Retail Appliance Shop, Kampong Speu

“Community kitchens offer a real experience to potential customers. A shop on the highway uses our biogas system and it attracts a lot of curious customers”
District Facilitator, ATEC

PROTOTYPE 5:

Testing Online Engagement and Interest in MECS through Facebook Groups

WHAT:

Branded and created a mock Facebook group and curated with videos demonstrating use of electric stoves, with links to online retailers.

We introduced the content to target profiles to gauge peoples interest in finding MECS products/ information about technology/ cooking recipes.

3,024 Views

EcoDavid Store is at EcoDavid Store.
September 25, 2016 · Stung-Meanchey ·

Like Page

LEARNINGS:

• In rural and peri-urban regions, online channels are seen as sources of information only - not as channels to purchase new products. Customers prefer seeing what they purchase first hand in order to assess quality.

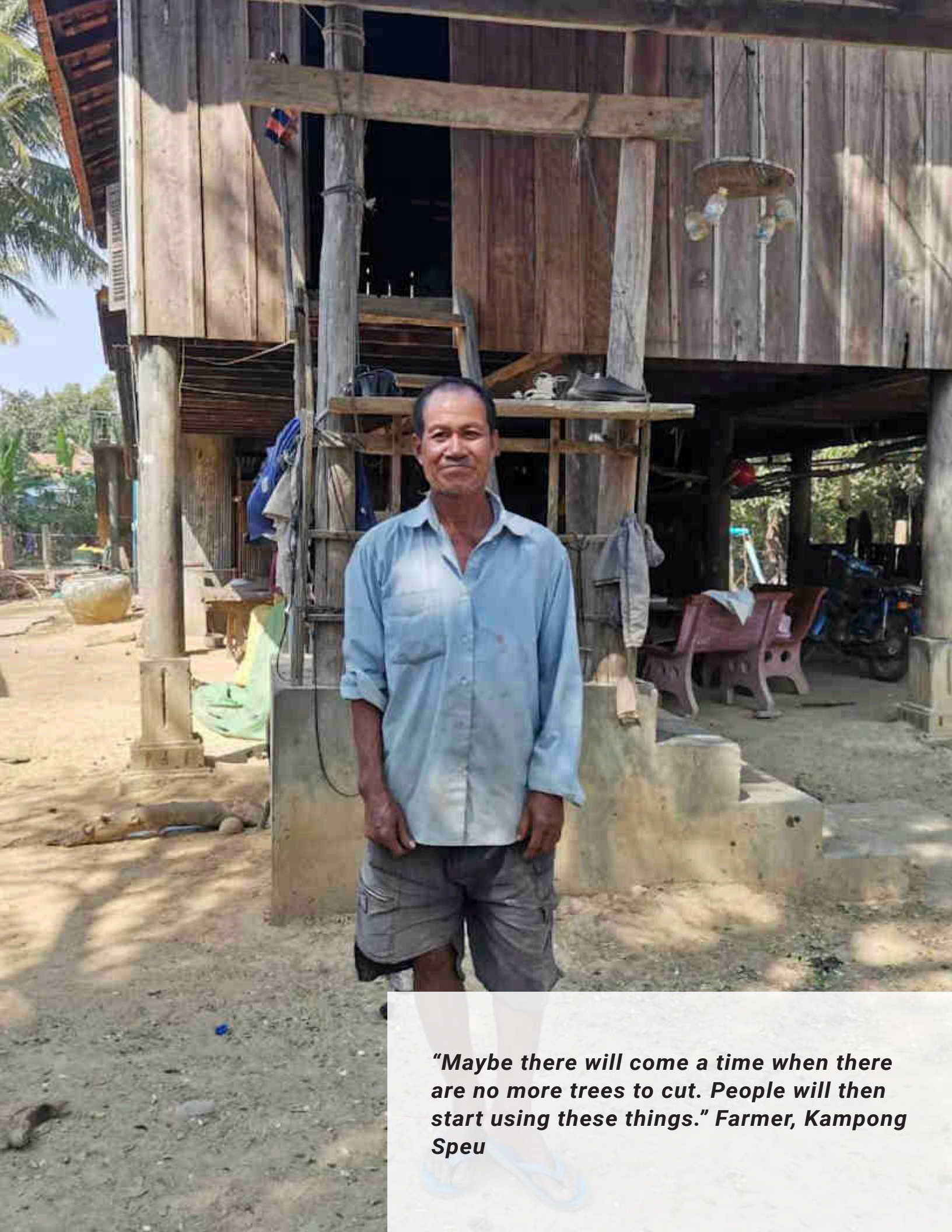
"There are a lot of fake products being sold online these days. I prefer seeing and observing what I am about to buy before handing over money. " Hair Salon Owner

• Facebook is a common platform for households to access information related to cooking new recipes. As a consequence, targeted adverts on MECS products/ suppliers are commonly seen by these households.

• Celebrity Chefs are the biggest online influencers. Their pitch to customers includes demonstrating cooking traditional recipes and talking about benefits (ease, convenience, modern lifestyle)

"She seems very confident in her cooking and knows what she is talking about. The food she made in the end looked very beautfiul"

“These products are so easy to use, easy to carry around. They are modern as there are no tubes or bottles. ” Midwife, Kampong Speu



“Maybe there will come a time when there are no more trees to cut. People will then start using these things.” Farmer, Kampong Speu

NEXT STEPS

Through the MECS-TRIID project, iDE has established a foundational understanding of key motivators and barriers that influence MECS adoption in Cambodia. We engaged with business leaders, technical experts, and aid programmes in the sector through a workshop that explored the potential of modern energy cooking in Cambodia. Through interactive dialogue/brainstorming, a wide range of solutions were generated by participants. Opportunities and funding - to pilot and scale up the most viable, desirable, and feasible solutions emergent from this project - will now be explored.

Beyond this project, iDE will continue:

- Operating in an open and collaborative manner with sector stakeholders to generate, disseminate, and embed knowledge and insights.
- Working with and through local private-sector partners with the capacity to build on project-generated knowledge and scale up promising solutions.
- Disseminating project reports within sector networks and making them freely available on the internet.

To further build on these results, iDE has submitted an application for the MECS ECO Challenge. In the course of the project, we will continue to engage in sector networks, building on and expanding existing relationships to share knowledge emerging from both the MECS-TRIID and the results of the MECS ECO projects and encouraging synergies and cross-sector collaboration.

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