Transforming the care economy through impact investing case study:

ATEC

The Care Economy Knowledge Hub

the-care-economy-knowledge-hub.org

CONTENTS

FOREWORD

Vital for our society to function, the care economy – domestic work and caring for children, elderly people, and people with disabilities – as it is now, operates as one of the most pervasive structural barriers to women's economic autonomy and gender equality.

Erin Tansey

Across the world care work is mostly done by women and girls, who perform three-quarters of unpaid care work. Representing more than 11 percent of total global employment, paid care work is also a significant source of employment, particularly for women. However, these jobs are poorly paid, in positions that fall outside of formal employment structures, and insecure due to ingrained gender and racial biases and the work's perceived value. The precariousness of paid care work and the unequal distribution of unpaid care work restricts women's time and mobility, as well as their equal participation in social, economic, and political life. And this dynamic is unlikely to change without collective action. The climate crisis is increasing the demand for care and domestic work globally, while the COVID-19 pandemic generated a care crisis that exacerbated pre-existing gender inequalities.

Catherine Cax

Both formal structures and informal structures (norms) hold care economy inequalities in place. Gendered norms also shape national policies on how care work is recognized and valued, and how the responsibilities between families, governments, and the private sector are distributed.

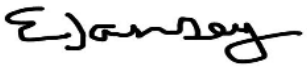
While public investment and policies must be at the core of the solution, a renewed role for the private sector is crucial. Announced as a commitment at the Generation Equality Forum, in 2021 Canada's International Development Research Centre (IDRC) and the Open Society Foundation's impact investment arm, the Soros Economic Development Fund (SEDF), launched an action-oriented research initiative to help Transform the Care Economy through Impact Investing (TCEII). Through this partnership, IDRC continues to build on its commitment to transform the care economy and mobilize finance for gender equality.

Since its launch, a global consortium of partners has built an extensive knowledge and evidence base to mobilize capital and impact investment to address the care economy's challenges in emerging markets. The program is now launching a collection of 20 case studies on care economy social innovations and impactful businesses, which complements 59 business profiles and mapping of 165 market-based solutions operating in emerging markets in Latin America, Africa, and Asia. The TCEII program also involves care-economy businesses incubation and acceleration, research on regulatory frameworks and policies, awareness raising, and industry policy dialogues.

As we witness growing momentum and understanding of the urgency of addressing the care crisis, we hope these case studies on pioneering companies will help advance concrete strategies to move from awareness to action. These case studies help to demonstrate viable and impactful business models, ranging from building social security infrastructure to labor-saving products and services. They offer a unique and nuanced understanding of the businesses' theories of change and impact journeys. The case studies also help to share the lessons these innovators have learned on their pathways to scale, and it is our hope that they will attract more capital into the care economy for deepened impact.

We invite you to read this collection of case studies and engage with them, and the other resources and tools developed by the TCEII program, to mobilize investment into the care economy.

Together we can advance towards a care society where social innovation, entrepreneurship, and investment can be part of the solution for economic justice globally.



Erin Tansey

Sustainable and Inclusive Economies Director
International Development Research Council

Catherine Cax

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INTRODUCTION

The care economy consists of paid and unpaid labor and services that support caregiving in all its forms. In Africa, Asia and Latin America, women spend between 3 to 5 times as many hours on unpaid care and domestic work as men. This represents 80 percent of a household's total hours devoted to unpaid care work.

Care economy enterprises can help recognize, redistribute, reduce and reward – also known as the 4 Rs – unpaid and paid care and domestic work in the following ways:

Recognize: Initiatives that increase visibility and recognition of paid and unpaid care and domestic activity as "productive" work that creates real value and contributes to economies and societies.

Redistribute: Services and initiatives that redistribute care work from individuals to public and private sector entities, and redistribute care and domestic work within the household.

Reduce: Products and initiatives that reduce the time spent on and burden of unpaid care and domestic work.

Reward: Products, services, and initiatives that ensure that care and domestic workers are paid fairly and have professional growth potential. This provides them with financial reward and security.

The Care Economy Knowledge Hub – the research pillar of the Transforming the Care Economy Through Impact Investing Program – aims to address the knowledge gap around care businesses by showcasing various business models and creating a resource base for relevant stakeholders. It also aims to raise awareness and increase knowledge of the state of impact-driven care economy business models and attract a broad range of funders to invest in care economy solutions by showcasing opportunities.

A curated set of 20 business case studies, of which this case study is one, has been researched and written between October 2021 and January 2024. The case study businesses were selected out of a set of 165 businesses that were mapped between October 2021 and August 2022, and then a further 59 that were profiled between September 2022 and May 2023. They present a wide variety of different ways in which care work can be recognized, rewarded, reduced, and redistributed, from different sectors and different geographies, from different stages of the growth journey and different business models, from different products and services and different impact pathways. Each case study was

written based on extensive desk-based research, including a literature review; a review of key business documents; a series of deep conversations with founders, CEOs, and key staff; and impact-focused qualitative research with 8 - 15 consumers of business products and services.

Each case study starts with a 1-page executive summary that provides "at a glance" information on the business and Section 1 provides an introduction. Section 2 describes the ecosystem within which the business operates. The business deep dive can be found in Section 3. Section 4 presents an impact deep-dive, including customers' own experiences of the care economy solution, and a unique set of qualitative impact data. Section 5 outlines the business's future plans in their look forward.

Shifting attention towards and investment in the care economy is one of the single most important actions that policy makers, investors, and community leaders can take to achieve gender, racial, and climate justice. We hope that these case studies contribute to the much-needed transformation in our economic and social systems.

Rebecca Calder
Principal Investigator, Transforming the Care Economy Through Impact Investing
Co-Founder and Co-CEO, Kore Global

This project is supported by Canada's International Development Research Center, in partnership with the Soros Economic Development Fund at the Open Society Foundations. Building on their track record and commitment to transforming the care economy and mobilizing finance for gender equality, they are jointly supporting this action research program to help transform the care economy through impact focused business and investment. This case study is a joint research product, developed by a consortium led by Kore Global, including Intellecap, Core Woman, Busara, Sagana, and Volta Capital. Copy editing and graphic design were done by Big Blue Communications.

This particular case study should be cited as follows:
Intellecap, Busara Center for Behavioral Economics, Kore Global. (2024). *Transforming the care economy through impact investing: ATEC case study*. Kore Global, International Development Research Centre, and Soros Economic Development Fund

1 - EXECUTIVE SUMMARY

ATEC is a for-profit enterprise headquartered in Australia that provides clean cooking solutions to rural, peri-urban, and urban households in Bangladesh and Cambodia. ATEC assembles, distributes, and finances modern-energy Tier 5[1] cooking devices: electromagnetic induction stoves (branded 'eCook') and biodigesters (branded 'ATEC Bio') to low-income communities. A study conducted by ATEC shows that each eCook reduces 1.3 tons of carbon emissions annually, and each biodigester reduces up to 4 tons annually. The eCook stoves are equipped with Internet of Things (IoT) technology, which generates real-time data about usage and equivalent carbon credit data. The carbon credit is digitally certified as per standards developed by Gold Standard.[2] ATEC sells certified carbon credits in the voluntary carbon market.[3] In 2023, ATEC introduced a pilot program - Cook-to-Earn - to incentivize decarbonized cooking by payments to households from the carbon credits they generate. ATEC has served over 11,088 customers and saved 14,896,560 hours spent on cooking and fuel collection. ATEC has 70 full-time employees. In 2022, ATEC had a revenue of US$1,176,859. Since its inception, ATEC has raised US$4.4 million in equity and US$2 million in debt. ATEC is looking for US$3 million in debt and equity investments to execute carbon contracts, establish distribution partnerships, and invest in research and development to scale sales of eCook induction stoves.

ATEC

ATEC at a glance

Established	2016
Country of operations	Bangladesh, Cambodia (main markets); Zambia, Rwanda (recent expansions)
Offerings	Provides clean cooking solutions: electric induction stoves and biodigesters. ATEC deploys a pay-as-you-go ("PAYGO") method to finance consumers. ATEC provides Gold Standard digital MRV (monitoring, reporting, verification) carbon credits sold in the voluntary carbon market.
Reach	Served 11,088 customers (80% are women) to date
Staff	70 full-time employees
Revenue	US$1,176,859 (2022)
Investment to date	US$4.4 million in equity, US$2 million in debt, and US$10 million in grants.

Leadership	Ben Jeffreys, Chief Executive Officer and Founder
Contact for partnerships	bjeffreys@atecglobal.io
Website	www.atecglobal.io

2 - ECOSYSTEM

2.1 Bangladesh: statistical snapshot

Demographic information	**Total population** (World Bank, 2022): 171 million **Female population** (World Bank, 2022): 86 million **Urban and rural population** (World Bank, 2022): Urban (40%) | Rural (60%) **Population in different age segments** (World Bank, 2022): 0-14 years: (26%) 15-64 years: (68%) 65 and above: (6%)
Unpaid Care Work	Women and girls spend 5.9 hours daily on unpaid domestic and care activities, compared to 0.8 hours for men. (UN Women, 2021)
Social and Economic	**Literacy level** (Global Gender Gap Report, 2021): Females (71.2%) | Males (76.7%) **Poverty** 12.9% of the total population lives in extreme poverty (less than US$ 2.15/day), compared to the global poverty rate of 8.9%. (World Bank, 2023) Urban poverty rate: 18% | Rural poverty rate: 26.4% (World Bank, 2017) **Formal & informal employment** 70.78 million people were employed in the country (Bangladesh Bureau of Statistics, 2022). 87% worked in the informal sector, and 13% worked in the formal sector (ILO, 2010). **Gender-based violence** (UN Women, 2016): 54.2% of married women aged 15+ have experienced physical or sexual intimate partner violence in their lifetime. 3% of non-partnered women have experienced sexual violence in their lifetime. 51.4% of partnered women were married before the age of 18.
Women's work, labor, and entrepreneurship	**Labor force participation** *(% of total labor force)* (The Global Economy, 2022): Females: 37.7 % | Males: 80.6%. **Unemployment** (World Bank, 2022): Total: 4.7% Males: 3.5% | Females: 7.1%

Women-owned businesses

- Women-owned businesses account for 7.2% of all MSMEs (UN Women, 2020).
- Firms with female top managers (% of total firms) were 4.8% (Global Gender Gap Report, 2022).

Gender gap index score (Global Gender Gap Report, 2022):
Total: 0.714 (0=unequal, 1=equal)

Financial inclusion (Global Gender Gap Report, 2021):
36% of women have bank accounts, compared with 65% of men. (World Bank, 2018).
43.4% of women aged 15+ have accounts with a financial institution or a mobile money service provider. (World Bank, 2021).

2.2 Context analysis

Macro context in Bangladesh

Bangladesh's growth story is among the most remarkable developments in recent years. The Gross Domestic Product (GDP) per capita of the country increased from US$134 in 1971 to US$2,503 in 2021.[4] In addition to economic growth, Bangladesh has also made strides in human development. The female labor force participation increased from 21% in 1990 to 35% in 2021.[5] In 2021, 99% of households accessed electricity.[6] Bangladesh reduced poverty from 13.47% in 2016 to 10.44% in 2022.[7]

Exports from the readymade garment industry have driven the country's growth. While the cities have been the centers of economic development, they have also experienced inequality and extreme poverty. An estimated 5.4 million people (14.5% of the total urban population) live in multidimensional poverty, deprived of health, education, and decent living standards.[8] The magnitude of the rural population that lives in multidimensional poverty is much higher (an estimated 27.4% of people are poor). There is growing concern about poverty in urban areas, as a large number of rural poor migrate to urban centers in search of livelihoods. The climate risk, particularly in coastal Bangladesh, combined with multidimensional deprivation, poses a challenge to Bangladesh's growth story.

The Global Climate Risk Index rates Bangladesh among the most affected by extreme weather events.[9] Bangladesh mainly consists of low-lying land, over 230 major rivers and tributaries, and is close to the Bay of Bengal, making the population vulnerable to frequent storms and floods. Estimates suggest that 56% of Bangladesh's population (90 million people) live in high climate exposure areas.[10] [11] In urban areas, climate change vulnerability increases due to dense population and unplanned urbanization. Bangladesh is one of the

most densely populated countries in the world. Globally, the average population density was 62 people per kilometer square in 2023, compared to 1,330 people per kilometer square in Bangladesh.[12] Almost half of the urban population lives in informal housing,[13] which is highly vulnerable to disasters.

Women and children are disproportionately vulnerable to climate change risks. A study in northern Bangladesh showed that women-headed households are more exposed to floods, as men live away from their homes due to seasonal migration.[14] Furthermore, women-headed households in Bangladesh spend up to 30% of their total expenditure to protect themselves from climate change, by, for example, raising floors or building shelters for their livestock.[15] Studies show that adaptive capacity, i.e., the ability to overcome and recover from external stress, is gendered because women have a disproportionate care workload and limited access to capital, economic opportunities, and a voice in decision making.[16]

Care economy context

In Bangladesh, women spend at least 7 times more hours than men on daily unpaid domestic and caregiving work.[17] A Bangladesh Bureau of Statistics study showed that women spend 5.8 hours daily on caregiving, most of which is spent on food management. Simple and cost-effective clean cooking technologies can reduce the care workload of women and girls. However, Bangladesh lags behind in the adoption of cleaner and non-polluting fuels. A total of 80% (of 35 million households) of households do not use clean cooking solutions[18], and almost 74% of the rural population relies on cooking with biomass fuels, such as straw, leaf, husk, bran, jute stick, wood, and bamboo.[19] Usage of traditional cooking fuel has increased the care workload of women and girls and made them vulnerable to health risks, such as indoor air pollution, and violence.

Even though women and men are involved in firewood collection, women and girls often undertake the majority of this work.[20] A study in 3 South Asian countries, including Bangladesh, showed that women spent 374 hours on fuel collection annually, compared to the 286 hours spent by men.[21] Women sometimes carry heavy loads to reduce the trips required to provide fuel wood for their households. The large-scale deforestation in Bangladesh has reduced the availability of firewood. As a result, women and girls walk longer distances to collect firewood, exposing them to greater risks of gender-based violence. Fuel collection is even more difficult during natural disasters, such as cyclones and floods. A study showed that 45% of surveyed women in Bangladesh had experienced 5 severe floods over 5 years, destroying the wood that women had collected and preserved.[22] Often, households move to

shelters during disasters, where it is challenging to arrange fuel.

Eighty percent of all wood consumed in the country is used for cooking.[23] Fuelwood consumption in rural areas is among the principal reasons for forest degradation.[24] In 2022, Bangladesh lost 13,800 hectares of tree cover, equivalent to 8.07 metric tons of CO2 emissions.[25] Bangladesh is also dependent on fossil fuels to produce electricity. Ninety percent of Bangladesh's energy is produced from natural gas, oil, diesel, and coal.[26] This has increased carbon emissions from 23.51 metric tons in 2000 to 78 metric tons in 2015.[27]

The high usage of biomass fuel in the country, especially at the household level, results in indoor air pollution, a cause of 49,000 premature deaths annually.[28] Biomass-based cooking methods, such as the 3-stones cookstove and the charcoal cookstove result in incomplete combustion of fuel, producing poisonous carbon monoxide. Low-income households are more likely to use solid fuels and have limited space to accommodate a kitchen with proper ventilation for cooking. As a result, living conditions inside homes are precarious, especially in urban informal settlements with a high population density. Women and children who stay near the cooking area are exposed to significant health risks from inhaling the pollutants.[29] According to the World Health Organization, household air pollution causes non-communicable diseases such as stroke, ischemic heart disease, chronic obstructive pulmonary disease, and lung cancer.[30] Studies in Bangladesh show 4 times higher mortality among neonates born to mothers who use solid fuel such as peat, wood, and charcoal than those who use clean fuel.[31]

Market opportunity

Modern energy solutions and technologies have tremendous scope to improve gender equality and drive economic growth. A household is considered to have gained access to modern energy cooking services if it uses efficient fuel, has lower exposure to pollutants, finds it convenient to collect fuel and prepare a stove, has readily available and affordable fuel, and uses safe stoves.[32]

In Bangladesh, the majority of households (57.6%) use traditional stoves, followed by clean cookstoves that operate on liquified petroleum gas (LPG), piped natural gas, electricity, and biogas (34.6%). Improved cookstoves that utilize pellets, briquette, ethanol, or solar power are used by a much smaller percentage of the population (6.3%).[33] Clean cookstoves are common in urban areas, while traditional and improved cookstoves (ICS) are more common in rural regions. Stove and fuel stacking (use of multiple stoves and fuel) is also common in rural areas. ICS is considered a good measure to support the transition from traditional cookstoves due to the fuel-saving potential and low cost.

To drive the adoption of clean cooking, the Bangladesh government developed a National Action Plan for Clean Cooking (2020–2030), which targets 100% clean cooking access by 2030 and proposes an

investment budget of US$2.9 billion over 10 years. This intervention builds on a previous action plan of 2013 that focused on facilitating financial solutions for clean cooking businesses through promoting access to capital for small and medium enterprises, access to climate funds, and additional financing options from international donors at lower rates.[34] The clean cooking programs benefited the ICS sector, resulting in the adoption of 7.7 million cookstoves and 102,000 biogas digesters. However, the growth of ICS has stagnated, with just 6.3% of the population using the cookstove for cooking.[35]

Studies indicate that grid connection increases the adoption of LPG/natural gas/electricity-based cookstoves. Usage is highest among those with a grid connection as the primary source of electricity and lowest among those without access to electricity.[36] As 99% of the population has access to electricity in Bangladesh, the electric stoves sector is a big potential market. The National Action Plan estimates that 7.5% of households will use electric stoves by 2030.[37]

Electromagnetic induction stoves are easy to use and are cost and time-efficient. These stoves achieve over 90% efficiency, more than LPG and ethanol stoves that operate at around 55% efficiency.[38] This difference is especially relevant for cost-conscious low-income households, as higher efficiency minimizes waste of energy, leading to lower energy costs and reduced emissions. Research by Modern Energy Cooking Services (MECS) found that the price of electric cooking for a family of 6 in Bangladesh is around BDT600 (US$5.5) per month, which is lower than that of LPG and firewood-based cooking (BDT800 or US$7.3 per month).[39]

Biogas also serves as a source of clean cooking fuel. Bangladesh has an expansive agricultural sector, and a substantial amount of agricultural and livestock waste is generated yearly (biogas potential from livestock waste was 25,520 million cubic meters in 2021).[40] This waste, combined with the decentralized nature of biogas production, represents a significant opportunity for biodigester expansion.

> *Half the global population lacks access to clean, modern cooking solutions. Women and girls lose around 13 hours per week cooking with biomass and then breathe in the harmful smoke it generates, leading to almost 4 million deaths annually — almost three times more than global deaths from traffic accidents. With that kind of impact potential, scaling clean cooking solutions provides the biggest triple-bottom-line opportunity of this decade.*
>
> **Ben Jeffreys, CEO and Co-founder of ATEC**

3 - BUSINESS DEEP DIVE

3.1 Business headline

ATEC is a for-profit enterprise that provides modern energy cooking solutions to low-income households in Bangladesh and Cambodia. ATEC recently expanded in India, Kenya, Rwanda, Zambia, Nepal, and Bhutan through partnerships with last-mile distributors. ATEC assembles and distributes products to both urban and rural households. The products include Tier 5 electromagnetic induction stoves (eCooks) that operate on electricity and comprise of single and double stoves. ATEC provides prefabricated biodigesters that convert animal, kitchen, and green waste into biogas used for cooking. The biodigesters also generate slurry that can be used as organic fertilizer. The biodigesters can be installed in or above the ground, making them usable during flooding.

The induction stoves and the biodigester are PAYGO enabled, allowing customers to pay in installments. ATEC markets products through its online channel; 80% of product sales are online. ATEC offers value-added services such as a 3-year warranty, installation support, and after-sales logistical and technical assistance. All induction stoves have pre-installed Global System SIM (GSM), through which ATEC captures live data on the user's cooking habits, fuel consumption, and location. This data is used to generate digitally verified carbon credits at the Gold Standard. The carbon credits are then sold to the buyers in the voluntary carbon market.[41]

ATEC's value proposition is that it distributes and finances Tier 5 modern energy cooking products (eCooks and biodigesters) to urban and rural, low-income households, resulting in reduction in time and expenditure on cooking. ATEC's internal studies show that induction stoves are 50% cheaper than stoves that use LPG or charcoal. According to an external evaluation in Cambodia,[42] a biodigester user can save cooking time by 3 hours per day and increase income by US$521 annually through additional time for income-generation activities, increased crop yield due to the use of organic fertilizers, and reduced expenditure on fertilizers and fuel. The eCooks and biodigesters have fast adoption, as many households already have access to the inputs/fuel (electricity and biowaste) required to operate them. The induction stoves can be plugged into an electric socket, while biodigester installation takes less than 3 hours. Low-income households that cannot afford the upfront cost can opt to repay the product cost, up to US$5 per month, through the PAYGO method. ATEC's customers also get other benefits while using the products. Rural households can utilize household waste as cooking fuel. Customers can reduce 80% of cooking time by using induction stoves and biodigesters.

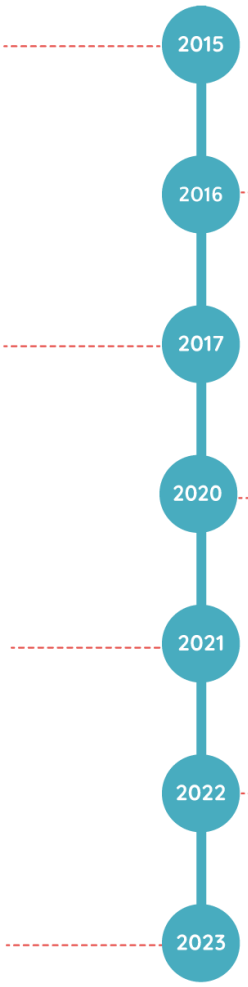
ATEC sells carbon credits verified and authenticated under the Gold Standard standards. ATEC ensures the integrity of its carbon accounting system by using a New Metered

Methodology (NMM), which digitally verifies carbon credits. There is a lack of trust in voluntary carbon markets due to pervasive over-crediting from cookstove offset methods to calculate the carbon offset. It is estimated that cookstove projects over-credit carbon offset by 6.3 times due to flawed methodologies. ATEC uses the NMM, rated as the most accurate cookstove methodology by the University of Berkeley.

ATEC's competitive advantage is that its cooking products generate income from 2 sources: sales of cooking products and carbon credits. Each eCook generates revenue of up to US$10 per month from PAYGO model for 2 years and US$20 per year from the sale of carbon credits for 7 years. Thus, each eCook generates up to US$380, resulting in a product margin of up to 48%. This is unlike revenue-generating models of competitors, which make profits only from a conservative markup. This puts ATEC over other competitors due to the carbon credit authenticity established through the methodology and systems that the carbon buyers prefer. The eCook has hardware such as IoT and GSM sim to track usage. ATEC has adopted data solutions such as NMM and dMRV (digital Measurement, Reporting, Verification). This puts ATEC at an advantage in the voluntary carbon market compared to other cookstove carbon competitors.[43] In 2023, ATEC and Global Energy Management and Sales, the business entity of multinational utility company ENGIE signed a long-term agreement to purchase 11.5 million tons of carbon credits generated from eCooks in Bangladesh and Cambodia. This is the first significant deal signed under the Gold Standard's NMM in the voluntary carbon market sector. ATEC is further taking steps to accelerate sales and incentivize users through payments from carbon credits. ATEC has piloted an incentive payment linked to the use of the stove, called 'Cook-to-Earn', to make the eCooks more affordable. Under this program, some carbon credit revenue is passed on to customers through mobile money as per usage (US$5 to US$10 per month).

> *I am impatient about this problem. I want it to be solved immediately. The solutions exist; we don't have to create a new technology to solve the cooking problem. It is now about scaling the solution.*
>
> **Ben Jeffreys, CEO and Cofounder ATEC**

ATEC's journey[44]



2015

A joint venture seeded by Engineers Without Borders and Live and Learn to test biodigesters. The venture won the Google Grand ImpactChallenge.

2016

ATEC Biodigester International established in Cambodia with 1 product (biodigesters).

2017

Secured a seed round of US$700,000.

2020

ATEC expanded to Bangladesh. Raised US$1.6 million equity from Engie, Phitrust, Small Giants and Foundation Ensemble.

2021

Introduced eCook in Bangladesh and Cambodia, Integrated an application to eCook stoves to capture real-time data on carbon offsetting and monitor households' cooking fuel usage.

2022

Rolled out the use of the eCook integrated App for mobile money installment payments. Acquired a Gold Standard Registration verification. Surpassed 10,000 active units, driven by eCook. Raised US$2.6million in bridge financing.

2023

Partnered with ENGIE Global Energy to sell 10.5 million tons of carbon offset through the eCook stoves in the next 10 years. Partnered with Solektra Rwanda Ltd to expand to Rwanda; Commenced shipping of eCook stoves to Rwanda. Secured funds to start operations in Zambia; partnered with Vital Light in Zambia as an implementing entity.

3.2 Founder story

Founder of ATEC

Ben Jeffreys

Ben Jeffreys is the Co-Founder and Chief Executive Officer of ATEC. He holds a bachelor's degree in business (International Commerce & Marketing) from Queensland University of Technology, Australia. Ben has over 15 years of experience in social enterprise and international development. Ben started his career in the corporate sector and transitioned to the social impact sector to work for purpose-driven initiatives. He credits his experience in the corporate sector for building his skills that are helpful in leading ATEC. Before founding ATEC, Ben worked with the School of Social Entrepreneurs and Oxfam. In 2015, Ben was approached to co-found and lead ATEC in Cambodia. ATEC Biodigesters International was seeded as a joint venture by Engineers without Borders[45] and Live and Learn Environmental Education.[46] While working in rural Cambodia, these entities observed that 80% of waste generated by farmers was organic waste and saw an opportunity to develop a biodigester that could turn waste into energy. Engineers without Borders took the lead in creating a prototype of the biodigesters and won a prize fund from the Google Impact Challenge 2015 to test it.

From the onset, Ben observed cultural differences in Cambodia, a region emerging from the Khmer Rouge regime.[47] Ben observed that it took a significant amount of time to build trust with local people and local communities. This phenomenon primarily shaped ATEC's initial years in Cambodia, where Ben channeled his experience in social entrepreneurship to understand community needs and devise solutions accordingly. Ben observed that while biodigesters were technically sound, they could not be used by rural communities because they were complex to operate and manage. Ben and his team spent the initial years retrofitting and refining the biodigesters. ATEC deployed interns and built a few prototypes. However, the rural households were not keen to take monetary risks to adopt a cooking product they had not used before. In response, the ATEC team introduced the monthly repayment system.

In Cambodia, ATEC learned that the rural families mostly engaged in livestock trading and would only have access to organic waste for a limited timeframe. This hindered the market growth of biodigesters. The biodigesters serve the needs of only households with access to organic waste from livestock. After 4 years in Cambodia, Ben led market expansion in Bangladesh, where the market for biodigesters was significantly bigger due to the dominance of the agricultural sector.

The ATEC team began to explore other products that could solve the clean cooking problem for a larger population. The team explored various products, such as LPG and ethanol stoves, and decided to scale induction stoves due to high electricity access rates in Cambodia and Bangladesh. By this time, ATEC had established a distribution model, PAYGO financing, and had significant capabilities in managing product sourcing. Induction stoves were introduced in Bangladesh and Cambodia and are now ATEC's most-selling products. While ATEC has expanded to new regions, it has retained its original 2 cooking products, biodigesters and induction stoves. Ben believes in concentrating on a few product lines. His mantra on social entrepreneurship is influenced by the Hedgehog concept, developed by Jim Collin, which suggests that organizations should focus on something they are good at, passionate about, and which is profitable. Ben was passionate about solving the clean cooking problem. He believes the clean cooking problem can be solved through technological innovation, and must be addressed.

Ben's vision for ATEC is not limited only to increased cooking product sales in unserved markets. According to Ben, ATEC intends to bring sectoral changes through high-quality, low-priced products and scalable distribution. In 2021, Ben wrote an article, 'How to solve clean cooking for 4 billion people: the disruptive potential of the impact flywheel'. The Impact Flywheel results from years of ATEC's experience solving the clean cooking problem. Ben views that there will be turning points in ATEC's growth aligned to turns in a flywheel. The first turn is when the organization has the necessary funds to invest in a team and supply chain of high-quality, low-cost products. ATEC, according to Ben, has already cleared this turn with an established last-mile distribution model. The second turn involves identifying a customer group that can generate carbon credits. The carbon credit sale to capital providers will finance additional research and development (R and D) that will drive down costs and increase product quality. Ultimately, the organization creates a more significant impact with debt securitization, resulting in greater profitability and more R and D investment.

> *To be disruptive in solving problems for over 1 billion people, one must combine systems thinking with macro trends and apply this to a flywheel model that strategically compounds over time. This isn't easy, but it is achievable — and we think ATEC and others can do it to solve clean cooking.*
>
> **Ben Jeffreys, CEO and Cofounder ATEC**

3.3 Business model

Customer segment	**Low- and middle-income households in rural and urban areas:** ATEC's customers are low- and middle-income households with limited access to clean cooking solutions. eCook customers use biomass, charcoal, and LPG fuel for cooking and are connected to grid electricity. The customers of biodigesters are rural households involved in farming and those with access to 25–55 kilograms of manure generated daily from livestock. These are generally farmers with domesticated animals, such as cows and pigs. Most of ATEC's customers cannot make upfront payments to buy the products. **Distributors:** Since 2020, ATEC has partnered with more than 50 micro-entrepreneurs who work as ATEC's agents. The agents buy ATEC's products in bulk and sell them to customers. ATEC has also partnered with distribution companies in Rwanda and Zambia to sell eCooks. **Carbon credit buyers:** ATEC targets international buyers of Gold Standard carbon credits. ATEC registers a project in the Gold Standard registry. The buyers sign long-term agreements after the verification mechanism. Current buyers include Engie, Shell, Fair Climate Fund, BRD/World Bank, TEM and MyClimate.
Value proposition	ATEC's value proposition is that it provides affordable and modern energy through Tier 5 cooking products: biodigesters and electric stoves that reduce household energy expenditure and time spent on cooking. This is made accessible through PAYGO, a consumer financing instrument, and through reliable installation and maintenance support. ATEC provides Gold Standard carbon credits for carbon-credit buyers based on verified real-time usage measured through a new metered methodology.

 Competitive advantage	ATEC has developed and patented pay-as-you-go (PAYGO)enabled electromagnetic induction cookstoves and biogas, making it one of the few modern energy Tier 5 cooking products available to low-income households in Bangladesh and Cambodia. Since its inception, ATEC has increased its unit sales 5x by focusing on a small product line, which allows it to deepen its presence, provide targeted marketing and build internal capacity. ATEC's patented IoT solution is the only registered dMRV solution commercially scaling within the clean cooking sector. This gives the enterprise an advantage in the sale of carbon credits due to carbon credit integrity, and the additional revenue earned from these sales allows it to outprice the traditional cost and margin manufacturers.
 Channels & key partnerships	The eCook stove is entirely manufactured in a factory in China and then imported to Bangladesh and Cambodia. ATEC imports molds and Gazi tanks to create biodigesters. ATEC sells its products through online platforms: eCookstove.com and atecbio.com. Eighty percent of ATEC's marketing is through digital platforms such as WhatsApp and Facebook. ATEC has incorporated an agent system into its marketing strategy in Bangladesh. The agents resell ATEC's products and educate the locals about clean cooking solutions. The local agents receive training from ATEC. ATEC uses a B2B distribution model to expand its markets internationally. In Rwanda, it has partnered with Solektra, a leading provider of clean renewable energy solutions. In Zambia, it has partnered with Vitalite, a community distribution and service company.
 Customer relationship	**Physical:** ATEC has a dedicated tele-service and customer care department to help with installation, maintenance and after-sales support. ATEC conducts customer surveys to enquire about client satisfaction. **Digital:** Customers use the ATEC application to make monthly PAYGO payments and receive payments through the Cook-to-Earn program. Customers can raise tickets on the application to register complaints about the product.
 Pricing and payment methods	**Pricing** **eCook:** The cook stove costs US$270 (single stove) or US$350 (double stoves). Customers repay in 24 months under the PAYGO model. The product has an electric stovetop and is accompanied by induction utensils. The product has a 3-year warranty. **ATEC Bio:** The price of a biodigester is US$800, or US$700 if the total cost is paid upfront. Customers can repay in 27 months under PAYGO. The unit has a twin gas stove, biodigester tank, rice cooker, hose and PAYGO box. The product has a 3-year warranty. **Payment methods:** Customers can pay the total cost upfront or via PAYGO. Payments are made via a mobile application or at nearby kiosks. For carbon credits, international buyers can procure carbon credits through the Gold Standard mechanism. The agreement details the price set for carbon credit sold

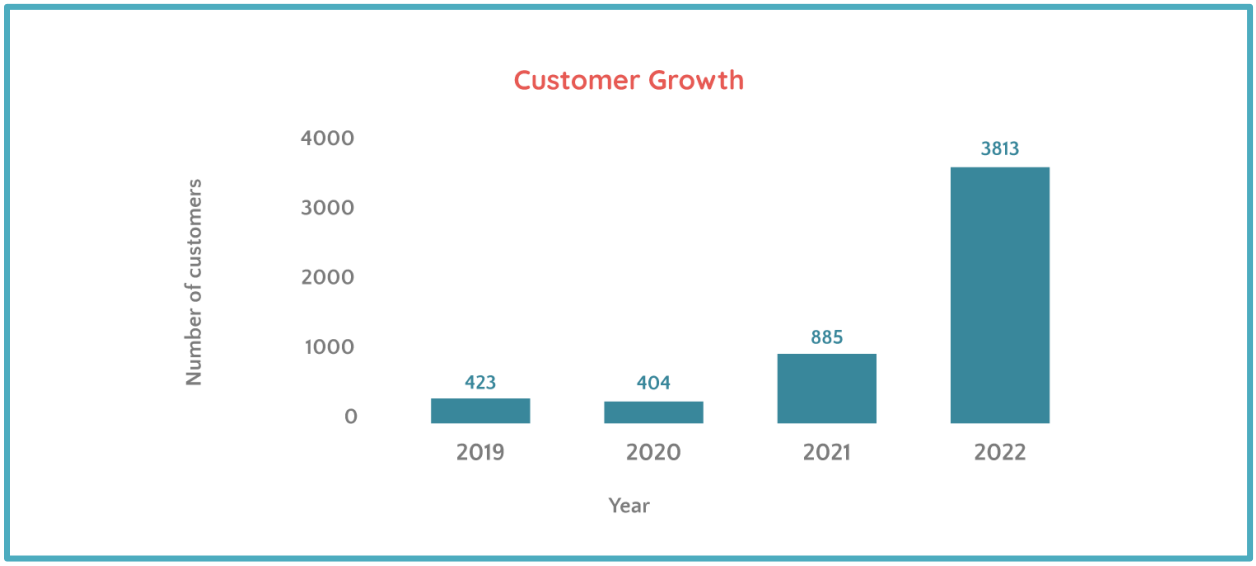
	at US$10/ ton and is expected to rise to about US$24 to US$30. This is an accrued revenue realized over 10 years. The carbon credit partnership also has an upfront payment component.
Revenue streams	ATEC's revenue is from sales of biodigester systems and eCook units. ATEC receives some grant support, which is less than 20% of the total revenue.
Cost structure	ATEC spends 21% on personnel and 37.74% on legal, consulting, finance and accounting, and travelling operations. Technology expenditure accounts for 12%, and Cost of Goods Sold (COGS) is 25.26%, including Opex and 4% on marketing.

3.4 ATEC's growth story

ATEC has steadily increased its customer reach and sales over the years. ATEC is currently not profitable but plans to become profitable within the next 2 years. ATEC's revenue comes from sales of biodigester systems and eCook units.

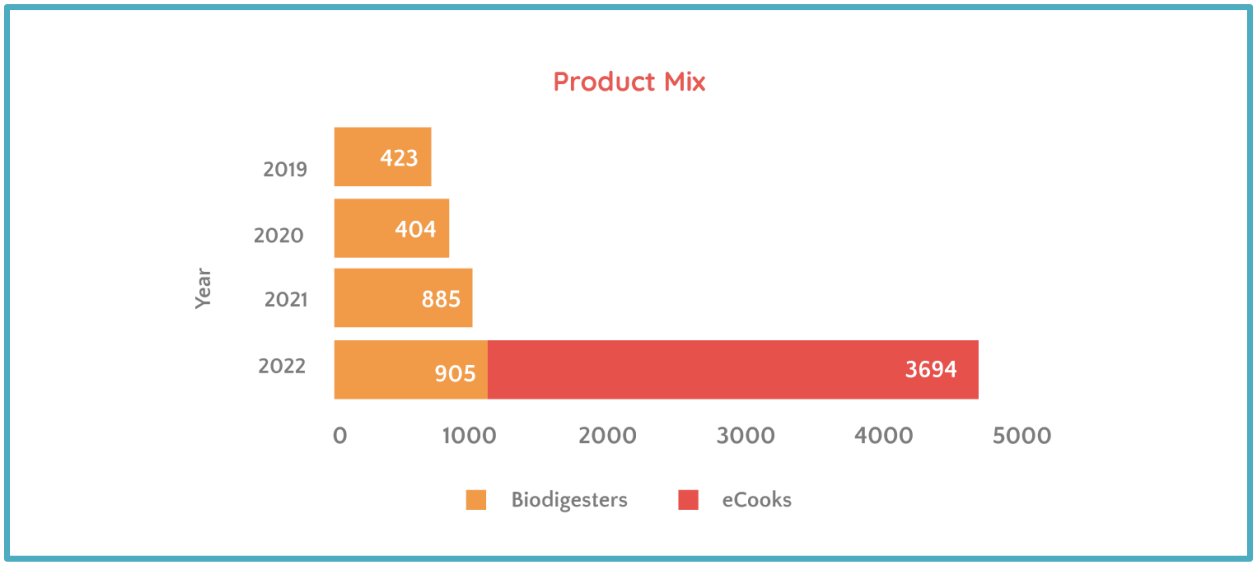
3.4.1 Customer growth:

ATEC's customer base has increased in both Cambodia and Bangladesh. Fifty-five percent of ATEC's customers are in Cambodia, while 45% are in Bangladesh. ATEC had a significant increase in customer numbers in 2022 following the introduction of eCooks.



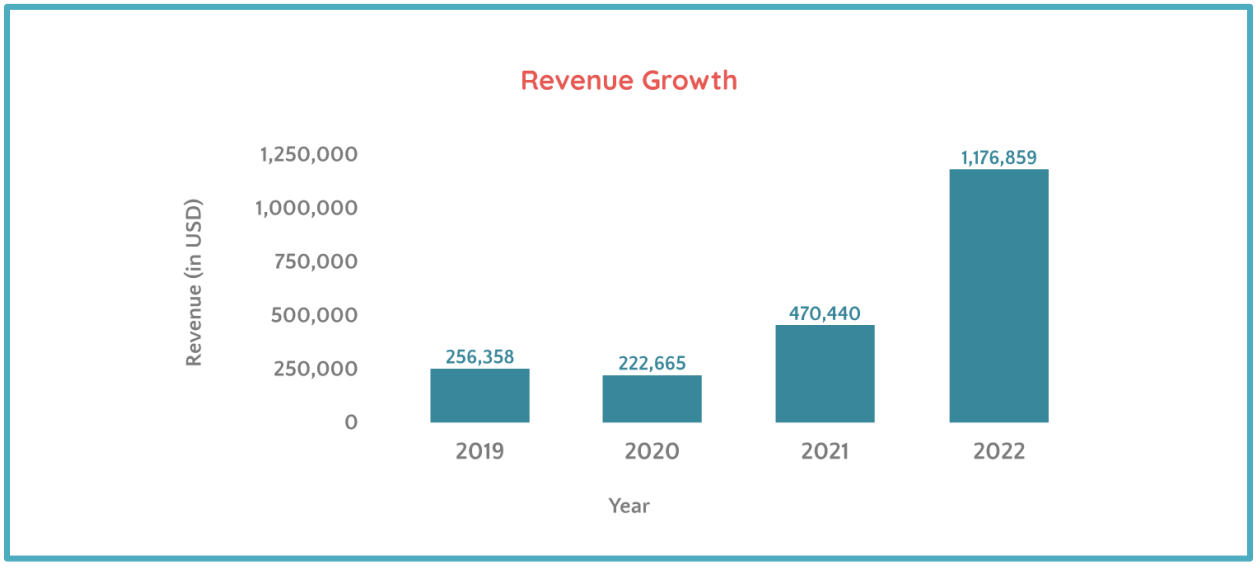
3.4.2 Product sales and mix:

Since 2019, ATEC has sold 2,627 biodigesters and 3,694 clean eCooks in Cambodia and Bangladesh. As of June 2023, ATEC has sold 935 biodigesters and 4,582 eCooks. At ATEC, the eCooks are the fastest-growing product line. eCooks constitute 70% of the total product sales. This is a result of a successful market penetration, especially in Bangladesh. ATEC has introduced carbon credit projects that will generate revenue from the year 2024 onwards.



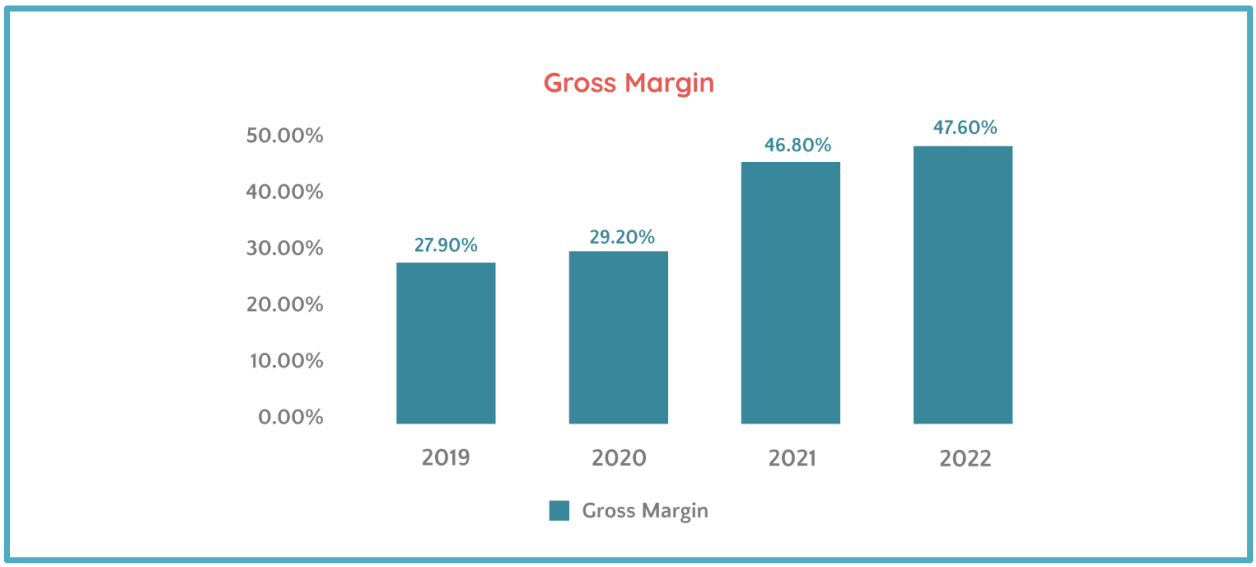
3.4.3 Revenue growth:

ATEC's revenue from the sales of its products has increased steadily. Between 2021 and 2022, the revenue doubled due to the introduction and sales of eCooks. ATEC is projecting a revenue of US$1.2 million in the next 2 years from the sales of carbon credits.



3.4.4 Gross margin:

ATEC has steadily increased its gross margin due to the reduced Cost of Goods Sold (COGS) in the last year and the increased price of biodigesters after the pandemic.



3.5 People and governance

ATEC is committed to gender and climate justice and strives to achieve this not only through its product and service offerings, but also through its people and governance structures, practices, and policies.

2X Criteria[48]	Climate and Gender Justice[49]
• Founder is a man. • 17% of senior management are women. • 25% of the board members are women. • 30% of full-time employees are women. • 80% of customers are women. • Products and services specifically or disproportionately benefit women.	• To a large extent, the company provides affordable clean energy and fuel solutions to energy-poor households in urban and semi-urban areas, which improves women's health outcomes and economic participation. • To a large extent, the company supports local economic regeneration and just transition, reducing the health impacts from environmental pollution and the care workload on women in vulnerable communities. • To a large extent, the company has improved access to affordable and reliable clean energy, which has reduced women's care responsibilities and freed up time for leisure, education and economic activities.

ATEC is a **gender-intentional** business.[50]	ATEC is a **gender-transformative** business.[51]

ATEC has 70 full-time employees, 7 of whom are based at the Australian headquarters. The Bangladesh and Cambodia teams have 14 Managers and 28 Assistant Managers (14 in customer service, 7 in sales, and 7 in technical assistance). The remaining 21 employees work with the Assistant Managers. ATEC's governance team consists of 8 members, 2 of which are women. It also has an advisory board of 7 members, including 2 women.

ATEC has various policies to support employees, including equal pay for equivalent work, employee grievance mechanisms, protection against violence at work, fully paid maternity and paternity leave, and protection against discrimination.

ATEC has in-house mentorship programs for employees to improve their knowledge and skills. ATEC organizes mandatory weekly and monthly events known as coffee buddies programs, in which employees interact with colleagues to learn about others' work. ATEC reviews employee performance based on quarterly job scorecards of each employee.

3.6 Support received to date

ATEC has received financial and non-financial support through grants, equity, debt, technical assistance, and capacity building. The key items of support received are as follows:

Financial	
Equity funding	In 2022, ATEC raised US$1.3 million in the form of a *bridge convertible note* to support its carbon credit market capability. The investment was led by Elea, a Swiss-based impact investor, and joined by other investors such as Schneider Electric Energy Access Asia Fund, Sypkes Group, Phittrust Asia, and Small Giants. ATEC used the investment to initiate dMRV cookstove carbon credits under Gold Standard's new metered methodology and prepare the expansion of eCook across Asia and Africa.
Debt funding	ATEC raised US$650,000 debt from the Energy Access Relief Fund (EARF) led by Social Investment Managers and Advisors (SIMA). The fund supported enterprises grappling during COVID-19 with liquidity issues. ATEC used the low-cost and unsecured debt for working capital and prevented job losses.
Grant funding	The Danish International Development Agency provided a US$2 million grant to ATEC to sell eCook to 51,000 households in Bangladesh by July 2026. ATEC also received US$300,000 from Modern Energy Cooking Services (MECS) to scale up its operations in Rwanda. ATEC has received a grant from the GSMA Innovation Fund for Digital Urban Services. With the GSMA fund, ATEC created an embedded app

	with eCook through which customers can pay and check their electricity consumption. ATEC used part of the grant fund to pay accreditation fees to the Gold Standard, enabling ATEC to initiate carbon credit projects.
Non-financial	
Technical assistance	ATEC received technical assistance from Water and Energy for Food Grand Challenge (WE4F), funded by USAID, for market assessment, public relations and communication, gender-based knowledge support, and business development. ATEC won the WE4F Asia EDGE (Enhancing Development and Growth through Energy) Ag-Energy Prize, receiving US$100,000 and an invitation to the Asia Clean Energy Forum. Roots of Impact, an impact-linked fund manager and advisor, assisted ATEC in outlining effective impact management systems.
Capacity building	ATEC received catalytic funding and support from Biniyog Briddhi, a multi-year program supported by the Embassy of Switzerland in Bangladesh aimed at scaling impact enterprises in Bangladesh. Through the Impact Ready Matching Fund (IRMF) structure, ATEC received financial incentives to deepen its impact measurement practices and improve customer segmentation across rural and semi-urban populations.
Product development	ATEC has also partnered with Schneider Electric, a multinational company specializing in digital automation and energy management, to develop a solar-based induction stove. This product will primarily be deployed as an off-grid clean cooking solution in Sub-Saharan Africa.

**Full summary of the support received is here*

3.7 Key business drivers and challenges to growth

Key business drivers	
Electricity penetration in Bangladesh	ATEC has seen significant growth in the sale of eCook stoves (70% of products sold by ATEC are eCooks). Each eCook generates up to 48% product margins and is a lucrative product line. The market size for induction stoves is high due to high electricity penetration in Bangladesh. Ninety-six percent of the population in Bangladesh has access to electricity. Most households have electricity 8 hours during the day and 3 hours at night and use medium-to-high load appliances. The availability of electricity enabled ATEC to market eCooks as a conducive alternative to ICS and gas-based stoves.

Extensive digital and smartphone adoption	Eighty percent of ATEC's product sales are through online channels, as Bangladesh has a high number of smartphone users who are adept at online shopping. The mobile industry in Bangladesh has scaled rapidly over the last decade to become the fifth-largest mobile market in the Asia Pacific, with over 85 million unique subscribers to mobile internet services.[52] ATEC uses internet and mobile services infrastructure to market and distribute its products. Thus, ATEC does not have to spend on door-to-door marketing (a standard marketing method for distributing consumer products in rural areas).
Growth of e-commerce platforms	ATEC saves costs on last-mile distribution due to the well-established infrastructure of e-commerce platforms. A market study conducted by ATEC showed that more than 300 delivery companies in Dhaka and 50,000 Facebook-based outlets deliver almost 30,000 products daily. ATEC sells its products through an in-house online platform delivered through logistics/transport partners. ATEC can deliver products within 48 hours of order placement.
Increased demand for carbon credits	The voluntary carbon credit market was valued at US$2 billion in 2021 and is expected to grow 15 times by 2030 and 100 times by 2050.[53] This will help channel private investment towards climate-action initiatives and attract capital to the Global South. Clean cooking companies globally have observed an increase in carbon credit sales in both size and frequency, growing from just 1% of total revenue in 2017 to 29% in 2020.[54] Carbon credits such as those generated from cookstove projects are currently priced at about US$10 per ton and are predicted to increase to US$30 in the carbon credit market. These carbon credit sales will allow companies to subsidize end users' costs further.
Ability to attract investors	ATEC has successfully highlighted the impact of its work through robust data. It has also adopted technical and methodological measures that attract investors and create opportunities to collaborate with global capital providers. The enterprise has a proven investor track record with US$4.4 million equity and US$2 million debt funding raised from investors including Engie, Schneider Electric and Elea. ATEC's eCook was the first cookstove product internationally registered under the Gold Standard's new metered methodology, and it is still the only commercially scaling enterprise in the market that provides dMRV credits.

Challenges to growth	
Ecosystem	**Market competition from cheaper cooking products:** The Bangladesh market has several players selling low-quality cooking products and offering no repair or maintenance services. The frequent malfunctioning of such products without sufficient support services creates customer mistrust. ATEC has to ensure effective marketing to convince the clients about its product and service quality. ATEC educates customers about product benefits, highlighting its safety and cost-effective features.
Operational	**Fuel stacking and user education:** Rural households are initially reluctant to shift from conventional methods to new products, fearing that the food would taste different and the quality would also differ.[55] 'Dirty stacking' is a challenge when despite having clean cookstoves, households use traditional stoves (charcoal stoves, open-fire stoves) with high frequency. ATEC has initiated the Cook-to-Earn Program to incentivize end-users to move towards 'clean stacking' when modern energy cooking solution, induction and biodigesters, become the primary cooking methods. Product tampering is also common when users try to resolve a technical issue themselves instead of highlighting it to the after-sales team. ATEC is undertaking an initiative to encourage users to register their complaints directly with ATEC. All required information about the product, PAYGO, and contact information for customer care is provided in the mobile application. ATEC is currently training local agents in Bangladesh to market and sell its products, which should lower the time spent on customer acquisition. **Default payments:** ATEC encounters challenges in receiving timely PAYGO repayments and occasionally struggles to keep the default rates under 10%. ATEC's customers have varied incomes and cash flows. In rural areas, the income depends on the agricultural season, and households have competing priorities such as education, health and nutrition, which can result in defaulting in payments. If there is a payment delay, ATEC offers a 7-day grace period, after which the eCook is blocked until the payments are made. ATEC is further piloting and testing different PAYGO payment schemes to customize its approach for customers and their revenue cycles. ATEC intends to reduce the dependence on PAYGO and increase upfront revenue by building partnerships with wholesale partners who will buy in bulk and pay full product cost.
Financial	**Climate finance availability**: Climate finance from institutions such as the Green Climate Fund and the United Nations Environment Program is channelled mainly through government institutions. These funds are provided directly to governments, which then award funding to local institutions. While ATEC focuses on providing clean cooking solutions with a climate impact, it cannot directly apply for climate finance and must therefore apply for climate finance from member governments, which is competitive. Thus, it is difficult to access financing solutions and obtain support from the Bangladesh government. **Currency exchange rate fluctuations:** In the past year, Bangladesh has encountered unprecedented volatility due to the rise in dollar valuation. This has increased import costs and caused a surge in taxes. ATEC imports the finished eCook stove product from a factory in China for sale in Bangladesh. As there has been an increase in the cost of production, the predicted unit economics have not

met expectations. ATEC has recently identified a domestic manufacturing company in Bangladesh to produce 25,000 units a month to mitigate this problem. ATEC is also prototyping local assemblies in India, Rwanda and Zambia.

4 - IMPACT DEEP DIVE

4.1 The impact theory of change of the enterprise

Mission statement

ATEC's mission is to solve challenges presented by a lack of access to clean cooking (and the resulting climate change implications) by offering modern, technology-enabled cooking solutions. ATEC aims to be the global leader in clean cooking by 2030.

Theory of change

ATEC has developed the following theory of change to reduce the time women and girls spend on fuel collection and cooking in Bangladesh.

ATEC's pathway to reduce care workload on women and girls

Activities

Activity 1
Sourcing and assembling of biodigesters and eCooks in Dhaka (Bangladesh) and Phnom Phen (Cambodia).

Activity 2
Product marketing (online and offline channels).

Activity 3
Financing systems (PAYGO) and onboarding users on the PAYGO application.

Activity 4
User education of PAYGO, product usage and maintenance through embedded app and training.

Activity 5
After-sales (installation, warranty).

Activity 6
Tracking of product usage and carbon credits with IoT-equipped products.

Activity 7
Partnership brokering with buyers of carbon credit.

Outputs

Output 1
Increased product affordability through PAYGO:

Increased product affordability through PAYGO: ATEC offers a PAYGO mechanism through which customers can repay the product's cost in instalments. This financial contract requires no collateral or additional interest, increasing the product's affordability (resulting in STO1).

Output 2
Enhanced information about product usage and PAYGO:

Customers are onboarded to the PAYGO application through which they make monthly payments. The application also contains all information about the product, repayment, and customer care contact details (resulting in STO2).

Output 3
Regular after-sales services to the end-users:

ATEC's products come with a 3-year warranty. Customers receive installation and after-sales support. The customer service department handles all the product and service complaints. ATEC calls all customers quarterly to inquire about client satisfaction and product impact (resulting in STO3).

Output 4
Increased use of modern, clean cooking products:

ATEC offers Tier 5 cooking products that are more efficient and reduce time spent on cooking by 80%. Studies show that biodigesters have reduced cooking time by 3 hours daily (resulting in STO4).

Output 5
Increased provision of clean cooking products that reduce indoor pollution and household carbon emissions:

The shift to biodigesters and eCook over other traditional biomass cooking fuel have reduced indoor air pollution (resulting in STO4).

Output 6
Provision of clean cooking products that reduce household fuel consumption:

ATEC's products use electricity or animal waste to generate fuel for cooking. Customers no longer need to spend time or money collecting biomass fuel for cooking, such as wood or charcoal. Studies indicate that induction stoves are 50% cheaper than other LPG or charcoal stoves (resulting in STO5).

Output 7
Provision of biodigester that generate organic fertilizer:

ATEC Bio uses organic waste to generate biogas and result in optimal utilization of waste materials to generate slurry used as fertilizers (resulting in STO5).

Output 8
Enhanced reputation of ATEC's carbon credit offering in the voluntary carbon market:

ATEC has adopted new methodologies and technological products to demonstrate the authenticity of carbon emission data tracking. ATEC also uses networking to highlight the impact and forge new partnerships. This enhances trust and increases reputation among carbon credit buyers (resulting in STO6).

Short term outcomes

STO 1
Increased number of users who buy modern, clean cooking products:

Increased product affordability through PAYGO: ATEC offers a PAYGO mechanism through which customers can repay the product's cost in instalments. This financial contract requires no collateral or additional interest, increasing the product's affordability (resulting in STO1).

STO 2
Increased knowledge among users to manage products and installments through embedded app:

ATEC aims to increase the usability of the products through user education. Customers receive support to manage and plan their PAYGO repayments through the digital application that showcases the entire payment history and upcoming payments. Customers also receive training on correctly using and maintaining the products for long-term durability (resulting in MTO1).

STO 3
Increased product durability:

ATEC's recurring revenue from carbon credit is tied to cooking product longevity. ATEC aims to increase product durability through quality design, assembling, and after-sales service support. ATEC also educates end-users on product usage to avoid any tampering (resulting in MTO1).

STO 4
Increased use of modern, clean cooking products:

The usage of time-efficient cooking products that generates no smoke has increased the usage of products distributed by ATEC (resulting in MTO1).

STO 5
Increased household savings on fuel and fertilizers:

ATEC aims to increase household savings through usage of cost-effective modern energy products and reuse of organic waste in rural areas. Past studies indicate that ATEC's offerings have reduced fuel and fertilizer expenditures. Biodigester users also see an increase in income by US$521 due to productivity increases and savings on fertilizers and fuel (resulting in MTO2).

STO 6
Increased revenue and disbursement from carbon credit to end-users:

ATEC has piloted a program to remit part of carbon credit revenue back to end-users. ATEC aims to scale this model so that end-users receive incentives to adopt clean cooking. This ATEC is adopting measures to attract carbon finance players and buyers who intend to purchase carbon credit from ATEC (resulting in MTO2).

Medium term outcomes

MTO 1
Regular usage of modern, clean products in daily cooking and heating:

ATEC aims for Tier 5 cooking products to become the primary and only product that households use to meet their cooking and heating needs. Regular product usage will result in a shift from conventional energy sources and drastically reduce greenhouse gas emissions. ATEC aims that the product's durability, knowledge to manage the payment and product, and positive impact on health and income will encourage users to use the product regularly and avoid dirty stacking altogether (resulting in LTO1).

MTO 2
Increased monetary benefits for users from the use of modern, clean cooking products through carbon credits and savings:

ATEC aims to increase end-users' benefits of using clean cooking products through carbon credit remittance and increase household income. The remitted amount and income will increase the cash among the end users and make the Tier 5 cooking products more affordable (resulting in LTO1).

Long term outcomes

LTO 1
Reduced time and income poverty among women and girls in low-income communities:

ATEC envisions that women and girls from low-income communities regularly use modern, clean energy products. Regular usage will reduce the time spent on cooking and generate other benefits, such as improved living conditions. Women and girls will also receive monetary benefits through carbon credits and income opportunities to address income poverty.

4.2 Current impact and measurement practices

ATEC measures the benefits and impact of its products through information collected from sales, after-sales calls, and the eCook application. All the primary and secondary data is stored and analyzed using 3 platforms - HubSpot, Angaza, and Amazon QuickSight. ATEC displays some of this data in the central impact dashboard on its website.

- **Customer information and commercial data:** The commercial data on sales, customer profile and address, date of order, family income, and household size is stored in HubSpot. ATEC uses Angaza, a sales and customer management software widely used in distribution, to monitor and manage the PAYGO system.
- **Real-time usage data:** ATEC uses Amazon QuickSight to track product real-time usage. The built-in GSM SIM in the stove collects real-time data related to the frequency of usage, cooking time, product health, tampering, and address. Users can see daily and monthly use and track their payments through the application.
- **Client Satisfaction Surveys:** ATEC has set an average usage threshold for the eCook stoves. If the real-time usage of a household drops below this baseline on QuickSight, ATEC's Customer Care Department makes follow-up calls to enquire if the product malfunctioned. ATEC collects product impact data over phone calls. Biodigester users do not have a dedicated app and rely on staff interaction to communicate with ATEC. HubSpot is used to track customer complaints.
- **Secondary indicators to estimate product impact:** ATEC also uses secondary indicators to measure outputs, such as reduction in fuel expenditure, indoor air pollution, and time spent by women collecting fuel/cooking. For instance, ATEC uses WHO's Clean Household Energy Solutions Toolkit (CHEST) and Disability Adjusted Life Years (DALY) to estimate indoor air pollution reduction.
- **Primary data to assess product impact:** Impact Investment Exchange (IIX) evaluates ATEC's impact through the IIX Sustainability Pyramid that considers the organization's mission, financial viability, and positive social and environmental effects to assess its contribution toward the Sustainable Development Goals. The Pyramid is built on the information reported by the organization. ATEC published its impact report in March 2023.

ATEC is looking to develop its impact measurement framework. In future, ATEC plans to better understand, evaluate, and measure the long-term impact of reducing and rewarding unpaid care work through monetary incentives and compensation. Through this, ATEC aims to understand the total earnings made by a household through payment from carbon credit revenue, the usage of earnings, and changes in household dynamics due to eCook and the biodigesters.

Challenges

- Disaggregation of customer information based on geography: ATEC receives online orders from different parts of the country. Although ATEC knows the exact location of the household, it cannot identify whether the household is rural or urban, as this is not mentioned in the order details. Sometimes, customers living in semi-urban areas do not know if they are part of urban or rural administration.
- Evidence on care workload: ATEC conducts client surveys to capture the impact data but faces challenges getting specific and informative answers. These surveys inquire about the time saved, the previous cooking method, whether eCook is now their primary method, and whether there has been any change in income or consumption of wood fuel or LPG. However, relying on primary data sources to monitor these impacts is difficult as the households do not keep records.

ATEC's business impacts (*as per internal measurement system*)

- Number of biodigesters and eCook units sold: 11,838
- Number of household beneficiaries: 48,605
- Tons of forest wood conserved: 1,955,186
- Tons of greenhouse gas reduced: 48,122
- Quantity of organic fertilizers generated (Kg): 148,704,336
- Number of hours saved: 14,896,560

4.3 Customer's own experiences of the solution

Understanding the social context, emotional needs, preferences, and barriers faced by ATEC's customers is key for potential investors to understand where ATEC excels and has room to grow. The following sections provide insights into the foundation of the business' market success and its impact on the lives of ATEC's customers, with the aim of helping investors make informed investment decisions.

To inform this analysis, the research team conducted 13 in-depth interviews with ATEC's customers to gather insights on their lived experiences and realities.[56] [57] This section presents the results of the qualitative impact deep dive, starting with a snapshot of the customers, followed by an examination of different customer personas, and their journey of using ATEC's eCook. This section concludes with a qualitative overview of ATEC's impact, as experienced by customers in their daily lives.

4.3.1 Customer snapshot

ATEC's customers are champions of the technological solutions provided by the business, and they serve as testimonies to the physical, mental, and social benefits of improved access to their products.

Customers of ATEC share a relatively common profile in terms of basic demographics. They are predominantly women aged between 21 and 39 years, with the average age being 35.[58] The majority are married, while a few are widowed. The typical household size varied, with some comprising 3-4 members and others as many as 5-7, often with several family members living together.

ATEC customers exhibited a diverse range of education levels. Some hold college and master's degrees, and a small minority have only completed intermediate exams. The rest identified themselves as literate but did not specify their education level.[59]

Average household income among ATEC customers was BDT35,000 (US$320).[60] A majority reported their household income between BDT12,000 and BDT30,000 (US$110-US$274), placing them below both the national average household income in Bangladesh (US$296) and the international poverty line. On the other hand, a few reported a higher average income ranging from BDT50,000-BDT70,000 (US$457-US$639).[61]

The majority of the women interviewed were not engaged in paid employment, focusing instead on household responsibilities. Some had their own micro businesses, such as selling savory foods. A small minority worked as healthcare professionals (Senior Staff Nurse), or as educators (Assistant Headmistress).

Women were primarily drawn to the ATEC eCook stove due to its perceived advantages: faster cooking times, cost-effectiveness, and reduced risks compared to gas stoves. Many expressed positive satisfaction and considered it affordable, safe, and financially sound. Most discovered the stove through social media platforms like Facebook, online advertisements, intentional online research, or word-of-mouth from family members.

While women were the driving force behind the decision to invest in the eCook, emphasizing their preference for modern, eco-friendly cooking solutions, most relied on financial support from their husbands to make the purchase. The upfront deposit and installments for these stoves varied from BDT500-BDT2,500 (US$5-US$23), with subsequent monthly payments ranging from BDT500 and BDT850 (US$5-US$8) spread over 24 months. These variations in cost were due to the type and size of the chosen stove.

4.3.2 Customer personas

The qualitative research revealed 4 distinct customer personas that use the eCook.

- **The Advertisement-Influenced Shopper:** This persona first learned of the eCook through a Facebook advertisement. While she relies on government-provided gas, she often faces shortages. After having watched the eCook stove advertisement, she decided to purchase it. What drew her most to this stove were its aesthetics and efficiency.
- **Online-Research Shopper:** This persona uses gas cylinders, but with recent price hikes, she recognizes the need for a cost-effective alternative. In her quest for an electric stove, she conducted online research, comparing various options. Ultimately, she determined the eCook to be superior. She highly values quality products, excellent customer service, and positive online reviews, all of which ATEC offers.
- **Peer-Influenced Shopper:** Influenced by a neighbor or relative, this persona decided to invest in the eCook. After witnessing its performance firsthand in a neighbor's kitchen, she was sold on the idea. Her primary considerations include cooking comfort, safety, and the compact design of ATEC's stove.

These distinct personas have been created through a qualitative analysis of customer characteristics, beliefs, attitudes, and behaviors. Each persona is descriptive, actionable, and unique, reflecting the customer's primary motivations, challenges, and awareness levels concerning the benefits they receive from the eCook. This understanding enables the ATEC team to empathize with the customers, thereby fine tuning their offerings to increase their reach and more effectively address customer demands. Below is an in-depth examination of these 3 distinct personas.

Below is an in-depth examination of these 3 distinct personas.

Sadia's Bio

Sadia, a 33 year old woman, manages a small business alongside her household responsibilities. Married with 3 children, her monthly household income is BDT56,400 (US$515), primarily sourced from her husband's earnings.

Sadia's home is equipped with a government-supplied gas line. However, its unreliability, characterized by frequent outages and low pressure, has prompted Sadia to consider alternative cooking solutions. Her interest was piqued when she came across an eCook advertisement on Facebook, which highlighted the stove's attractive design and its ability to cook twice as quickly as traditional gas stoves.

Sadia Mohammad

Advertisement-Influenced Shopper

Demographic information *(of the persona she represents)*
Age: 21-42 years
Marital status: Married
Children: 3 children
Education: Completed college
Monthly Income: BDT56,400 (US$515)
Occupation: Likely to be a housewife and also running a small business
Occupation: Likely to be engaged in some form of paid work (business, driver)
Average hours spent on care and domestic work: 5.5 hours

Motivation

Upon seeing an advertisement for the stove on Facebook, Sadia felt compelled to make a purchase. The ad promoted the stove's ability to cook at double the speed of conventional gas stoves and showcased its sleek design. These factors, combined with the issues with the gas line, convinced her to purchase the eCook.

As Sadia already spends a substantial amount of time on care and domestic work, a time-saving stove was highly appealing. It serves as a reliable alternative during gas outages or low-pressure periods. Currently, she uses the eCook twice daily, appreciating its regulated heat that minimizes the chance of food getting burnt.

Sadia's purchasing behavior reflects an 'advertisement-influenced shopper', given her heavy reliance on the Facebook advertisement for her decision.

Times have changed. Cooking on gas takes a lot of time. This stove takes much less time. Gas can burn babies, but not your stove. Time is always saved here.

The Advertisement-Influenced Shopper, 21 years old

Some behavioral traits

- Sadia's decision to purchase the stove was significantly influenced by the compelling visuals and persuasive messaging of a Facebook advertisement. She appears particularly receptive to ads, especially those that align with her individual needs.
- Her pride in the stove is evident. Compliments from guests on its stylish design and affirmations of her taste elevate her sense of ownership.
- Financially, her husband oversees the payments for the stove, both initial and subsequent monthly installments. As a result, Sadia is not aware of the exact cost or their outstanding payments for the stove. This suggests that there might be domains of decision-making in their household where she is not the primary decision-maker.
- Time-efficiency is of utmost importance to Sadia. She appreciates that the stove can prepare meals in half the time of her gas stove, and she values not wasting time during gas outages or low pressure.
- She values efficient multitasking in the kitchen. The electric stove grants her the freedom to set her meal to cook, tend to other tasks, and return to a ready dish. This advantage is absent with her gas stove, which poses a risk of burning food due to its lack of heat regulation.
- Her profile as an advertisement influenced persona suggests frequent engagement with online platforms, primarily Facebook. She is likely to actively engage in these ads through clicks, shares, or comments.
- Sadia's purchasing decisions can occasionally be impulsive. While she may be convinced by the advertisement, she might not always be making a long-term investment. Specifically, offers with a sense of urgency, like limited-time promotions or discounts, might drive her to make immediate purchases.

Nasrin's Bio

Nasrin, a married woman, lives with her husband, mother-in-law, and a child who is under 18 years. Employed in an office, Nasrin and her husband collectively earn approximately BDT28,500 (US$260) per month.

For her cooking, Nasrin purchases 2 gas cylinders each month. Given their cost, she has been searching for a supplementary, cost-effective solution. Her online research introduced her to various alternatives, and ATEC's eCook stove emerged as the top choice based on favorable customer reviews.

Nasrin Abdul

Online Research Shopper

Demographic information *(of the persona she represents)*

Age: 24-30 years
Marital status: Married
Children: 1 child, lives with her husband and mother-in-law
Education: Likely to have completed year 12 of high school
Income: BDT28,500 (US$260)
Occupation: Likely to be a junior employee at an office
Average hours spent on care and domestic work: 4.5 hours

Motivation

Facing rising costs with her gas usage, Nasrin's sought an additional stove to complement her gas cylinders. After comparing ATEC's eCook with other market offerings online, she was convinced it was the optimal choice.

While several companies offered similar solutions as ATEC, online reviews were pivotal in her decision-making process. Durability and commendable customer service were important for her. Upon contacting ATEC's customer service, she received reassurances about the product's durability and its capacity to cook at twice the speed of her gas stove. Convinced, Nasrin promptly made her purchase the next day and arranged for home delivery.

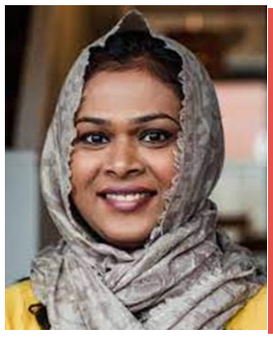
Her methodical online research and informed purchasing decision align with the traits of an 'online research shopper'.

I actually see different brands of electric cooking stoves that are on the market, so, one day, I was searching about it on the internet. I wanted to buy a stove of this type which would give long time durability and good service.

Online Research Shopper, 21 years old

Some behavioral traits

- Nasrin is consistently looking for ways to reduce expenses, as evidenced by her search for a more economical alternative to gas cylinders.
- Before making a purchase, Nasrin conducts thorough research. She does not settle quickly but compares various products to find the best fit.
- Even though she lives in a joint family setup, she seems to have autonomy in decision-making, especially concerning household appliances.
- Nasrin appreciates the cost-effectiveness of the eCook stove. Previously, a gas cylinder would last around 3 months; now, with the eCook stove, one cylinder can last 6 months or longer.
- She recognizes the risks of storing gas cylinders at home, especially considering potential gas leaks that could harm her baby or lead to fires. Prioritizing her family's safety, she also finds the electric stove convenient, given the challenges in transporting gas cylinders.
- Both Nasrin and her husband have a preference for foreign-made products, which influenced their decision to choose the ATEC stove, given it was not locally manufactured.
- While some people comment on the stove's cost, Nasrin recognizes its long-term value and consistently recommends it to her friends and family.
- Nasrin's willingness to recommend the stove to friends and family indicates she believes in its value and benefits. It also shows that she relies on social validation, considering the opinions of her close circle, which in turn can influence her behavior and decisions.



Taslima's Bio

Taslima, a 37 year old woman, lives with her husband, two daughters, and her eldest son along with his wife. While Taslima primarily manages the household, the family's financial responsibilities rest on her husband and eldest son. Their combined monthly income is approximately BDT22,500 (US$205).

Informed largely by the opinions of her immediate circle, friends, and family, Taslima decided to purchase the ATEC eCook stove after seeing its benefits firsthand at a neighbor's home. The neighbor highlighted several advantages of the stove, particularly its efficiency and comfort over traditional gas stoves.

Taslima Ahmed

Peer Influenced Purchaser

Demographic information *(of the persona she represents)*
Age: 35-40 years old
Marital status: Married
Children: Likely to have 2-3 children and a daughter-in-law
Education: Likely to have completed year 10 of secondary education
Income: BDT22,500 (US$205) per month
Occupation: Housewife
Average hours spent on care and domestic work: 5.5 hours

Motivation

After witnessing the eCook's benefits at her neighbor's residence, Taslima felt compelled to introduce it to her own home. Her neighbor's account of a more comfortable kitchen environment, especially with the reduced heat and the ability to use a fan simultaneously, appealed to Taslima. Further, she was drawn to the stove's aesthetic appeal and its time-saving capability.

Despite its relatively higher price, Taslima actively recommends the eCook to her acquaintances. She emphasizes its cost-effectiveness concerning electricity bills and the convenience of installment payments.

Through her purchase decision, Taslima displays the traits of a 'peer-influenced purchaser', given the significant impact her neighbor's recommendation had on her choice.

When a person cooks in the wood oven or gas stove, they have to stand by that place so, normally they feel sick day by day but now, with the electric oven, it is no pain to cook.

Peer-Influenced Purchaser, 35 years old

Some behavioral traits

- Taslima is heavily influenced by the experiences and recommendations of her immediate social circle. Witnessing a product's benefits firsthand or hearing about them from trusted acquaintances greatly impacts her purchasing decisions.
- Despite acknowledging the high initial price of the stove, she recognizes and values its long-term cost-effectiveness. Additionally, she appreciates flexible financial options offered by ATEC in terms of installment payments.
- Once satisfied with a product, Taslima becomes an advocate for it. She actively recommends the eCook to her peers, emphasizing its benefits.
- Coming from a low-income household, she was in search of efficient solutions. Taslima values direct experiences and real-life testimonies over advertisements or promotions. Her neighbor's firsthand account was a significant factor in her decision to purchase the eCook.
- She prioritizes the safety and well-being of her children while always looking for opportunities to engage them in kitchen activities. While the gas stove generated excessive heat and posed burn risks, hindering her children's involvement, the eCook fosters a comfortable environment, enhancing bonding time with her daughters in the kitchen.
- Although she acknowledges that food cooked on a wood stove has a superior taste, she values the convenience of the electric stove and has acclimated to its taste.
- Eager to streamline her kitchen tasks, she already possesses a rice cooker and gas stove. She embraces a proactive approach to modernizing her kitchen, consistently seeking out efficient appliances that enhance her overall cooking experience.

4.3.3 Journey maps

These personas are illustrative of how different customer groups discover and decide to use the ATEC eCook. In this section, we use journey maps to provide additional detail on the emotional experience of customers from awareness to purchase.

Journey maps are a visual representation of the highs and lows experienced by customers as they access and use the eCook. In this way, customer journey maps can help ATEC to identify opportunities for improvement and ensure that the needs, wants and constraints of various customer segments are considered in the expansion and refinement of their products, services, or reach.

The journey to using the eCook starts with awareness, in which potential customers discover the product. Consideration follows as they weigh their options and gather more information. Decisions are made in the third stage, where customers discuss with their family and decide to purchase the product. This is followed by purchase and payment. The next stage, Product Usage, marks their first experience using the product and experiencing its impact in their day-to-day life. This is followed by the customer maintaining the product for continued use. The journey ends with Loyalty and Advocacy, where the customer remains an active user of the cooking stove and recommends it to others.

Table 1: The process a customer goes through while purchasing the eCook from ATEC

	Pre-product purchase		Product purchase		Post-product purchase		
Stage	Awareness	Consideration	Decision	Payment and purchase	Product usage	Product maintenance	Loyalty and advocacy
Activities	Customer seeks information or is made aware of the product	Customer evaluates the need for the product and discusses its purchase	Customer approaches the source to make the purchase	Customer makes the first payment, registers their details, and brings the product home.	Customer begins using the product and experiences its benefits.	Customer makes any recurring purchases required to continue using the product	Customer reviews the product after its sustained use and promotes it
Customer goals	An average customer first learns about the eCook through various sources like Facebook advertisements, word-or-mouth from a neighbor, or by seeing it at a family member's house. Perception about the price seems to be a bit high among some customers, as other similar products are widely available for much	Customers may engage in research, including searching for the company name online, visiting their Facebook page, or inquiring through the helpline or call center. They compare features, price, and payment options with other available stoves in the market. If women come across the product first, there is usually a discussion with their husbands	The customer responds to the ad or sends a message on eCook's Facebook page, or calls the number provided to place an order. None reported visiting a physical store for a purchase.	Online order seems to be done mostly by husbands. Potential customers fill out an online form and submit their National Identity Card (NID) card for complete registration. Most reported making online payments through Bkash, while a few paid in cash. Customers can choose to opt for a one time or a	The customer receives the product within 7-15 days of ordering. Most customers start using it right away and use it to cook at least 2 meals a day.	Customers continue to pay a monthly installment for 24 months. Those with a single burner pay BDT500 (US$5) and those with a double burner pay BDT850 (US$8). Customers start experiencing the benefits such as lower electricity bills and faster cooking time. They appreciate that the stove is easy to clean compared to other stoves they	Some customers faced problems with the eCook but reported receiving prompt support from the ATEC team, aiding their confidence and trust in the business. Customers evaluate their satisfaction with the product and their willingness to continue using it. Customers with a single burner think about upgrading to 2 burners or consider

	cheaper. However, the stylish look of the stove still intrigues most.	before making the purchase. But when husbands discover the products, they tend to buy the product without consulting their wives.		monthly installment payment. Almost all opted and appreciated the installment payment options. The installment and downpayment are dependent on whether the customer purchased a stove with a single or a double burner.		used in the past.	purchasing the product for family members such as their mother or mother-in-law. They refer the product to friends, family, and community members who might benefit from switching to the eCook.
Emotions	 Curious	 A mix of excitement and caution, requires effort	 Eager and anxious	 Anticipating in excitement	 Overjoyed	 Content but slightly stressed about recurring installments	 Relaxed and satisfied
Levers	*Social network* The product benefits from high trust by existing customers who introduce and recommend the product to potential customers, enabling the brand to gain better reach. *Availability of information*	*Initial perception* The product comes across as attractive and beneficial. Hence, initial interest in the product is high. The general perception after seeing the eCook is extremely positive. *Safety concerns*		*Flexible payment* The brand has multiple payment options which allows a customer to obtain the product and pay later.	*Ease of use* Customers find it easy to learn how to use the new cookstove and incorporate the stove into their existing cooking routine. The customers found the stove easy to maintain, as	*Friendly reminders* Customers appreciated the ATEC team calling them to remind them about their upcoming monthly installment. *Reduction in electricity costs* Customers note a reduction in their	*High satisfaction* Most women are satisfied after using the eCook and recommend it to other groups who would benefit in particular, such as other women. Several reported buying it for other family members such as their mother

	Customers can easily find more information about the product through specific contact numbers or Facebook pages. *Design of the eCook* Most customers prefer the design of eCook over other available options.	Customers have expressed concerns over the use of gas cylinders and are appreciative of a safer option.			it could quickly be cleaned or wiped after use. *Complimentary gifts* Customers value the inclusion of additional pans as a complimentary gift with their purchase of the stove.	electricity bills after using the eCook stoves. *After-sales services* Customers appreciate ATEC's provision of sales service for 2 years following the purchase.	or mother-in-law.
Barriers	*High perceived product cost* Customers mentioned that eCook stoves are much more expensive than other brands of electric stoves available in the market. *Advertising channels* As a significant number of people in Bangladesh do not have access to Facebook, ATEC should consider utilizing traditional advertising methods		*High perceived product cost* Customers are often initially unaware of the product's cost and the available installment payment options.		*Learning curve* Some customers initially fear they might not be able to use the stove, but this concern is quickly alleviated once they start using it. *Product quality of complimentary gifts* Customers were disappointed that the complimentary pans were of poor quality, becoming unusable after a few uses. This raised concerns for some about the overall quality of the stove.	*Recurring costs* Some customers reported that they would switch back to gas cook stoves if the prices in the market are not too high.	

	to enhance product awareness.				Some customers also had to invest in additional utensils compatible with the stove, as their existing ones were not usable with the eCook. *Language barrier* Some customers received the product manual only in English and expressed a preference for it to be in the local language, Bangla. This concern highlights a potential barrier, as many women who could benefit from the product may not have English proficiency.		

4.3.4 ATEC's impact

This section presents the impact of the eCook on customers' daily lives, based on qualitative data. The quotes below are the customer's own words.

Across the board, customers reported marked improvements in their daily routines after adopting the ATEC eCook. Key benefits highlighted include a comfortable cooking environment, significant monetary savings, and reduced cooking time. The impact has been consistent across all customer personas.

Qualitative evidence of theory of change	
Long-term outcomes	**LTO1**: Reduced time and income poverty among women and girls in low-income communities.

- **Reduced time:** The ATEC stove is notably more time-efficient than traditional alternatives such as gas stoves, cooking food at a faster pace. Women, on average, reported a time-saving of at least 30 minutes daily, amounting to 3.5 hours each week. Additionally, given the stove's temperature is simple to control, women do not need to continuously oversee their cooking, granting them freedom to manage other tasks simultaneously, thereby further reducing their daily workload.

"It used to take 2 hours or more to cook on a gas stove. Now it takes no more than 1.5 hours to cook, saving me 30 minutes which I can use for cleaning. Can complete the right work at the right time. I can give time to the child. I would not have got this remaining time if I cooked on gas."
Advertisement-Influenced shopper, 21 years old

"I know it takes 20-25 minutes to cook on the stove. At that time, I am relaxed. In these 20 minutes, I finish many other household chores. It saves me a lot of time."
Online-Research shopper, 31 years old

- **Reduced expenditures:** The stove also provides considerable financial relief. Previously, women would typically spend an average of BDT1,800 (US$16) monthly on gas cylinders, with expenses ranging from BDT1,200 to BDT2,400 (US$11-US$22). However, when using the ATEC stove, their monthly electricity costs average at BDT667 (US$6), spanning between BDT500 and BDT700. (US$5-US$6). This change equates to a monthly saving of approximately BDT1,133 (US$10) or almost 2.7 times less than their original expenditure.

"Using a gas stove costs me 1,200 taka per month, but with an eCook, I only spend 700 taka on electricity. It's both economical and faster. Unlike [another brand] which costs 900 taka monthly on electricity, I prefer this brand as it is more cost-effective."
Advertisement-Influenced shopper, 21 years old

Medium-term outcomes	**MTO1:** Regular usage of modern, clean products in daily cooking and heating. **MTO2:** Increased monetary benefits for users from the use of modern, clean cooking products through carbon credits and savings.

- **Regular usage:** Women reported that they use the ATEC cookstove for all their cooking tasks, using it twice daily to prepare meals. Most appreciated the stove's minimal heat emission, which enhances kitchen safety and created a more comfortable cooking atmosphere.

"I cook in it (ATEC cookstove) 2 times morning and evening. In the morning, I boil potatoes and rice. It takes less than 30 minutes to cook rice."
Peer-Influenced Purchaser, 35 years old

- **Product endorsement and recommendation:** ATEC's customers demonstrate their confidence in the product by recommending it to their neighbors, family, and friends. The stove's user-friendly design allows individuals to master its usage within a day, and ATEC offers efficient, cost-free troubleshooting when required.

- **Trust and customer satisfaction**: Majority of the women expressed high satisfaction with ATEC's eCook.
  - **Product satisfaction:** ATEC's eCook received a satisfaction score of 2.69 out of 3 from the respondents. This suggests that the stove clearly resonates positively among its users. A majority have expressed positive satisfaction, with none feeling dissatisfied and a few remained neutral.
  - **Overall satisfaction:** For those satisfied, the quick cooking time stood out, while others valued its reliability over gas stoves. While women reported its higher price, they acknowledged that the installment option makes it affordable, making it a worthy investment. One critique was the stove's small size, making it difficult to prepare larger meals. However, their willingness to share this feedback underscores trust in ATEC and an eagerness for continued engagement. In general, the eCook has earned positive approval, with a few minor complaints.

"I'm satisfied. I am very satisfied with using this stove."
The Upgrader, 55 years old

"I used to cook on a gas stove before, the gas would run out, that time I have a routine you understand? Like that routine, I used to cook in the afternoon, do housework, eat and drink, then take a little rest and go out for a walk in the evening, for the gas stove these things were not done properly. Now cooking on this stove allows me to do everything on a routine basis."
Peer-Influenced Purchaser, 39 years old

"There are many benefits like I can finish cooking early and spend time with my baby. All my work has become much easier after the arrival of eCook."
Peer-Influenced Purchaser, 40 years old

Short-term outcomes	**STO1:** Increased number of users who buy modern, clean cooking products. **STO2:** Increased knowledge among users to manage product and installment through embedded app. **STO3:** Increased product durability. **STO4:** Increased use of modern, clean cooking products. **STO5:** Increased household savings on fuel and fertilizers. **STO6:** Increased revenue and disbursement from carbon credit to end-users.

- **Reduced pressure of housework:** Most women highlighted the safety features of the cookstove, like reduced heat emission and burn prevention, which enables family members to assist in cooking minor meals rather than waiting for her.

"Earlier, my son and daughter would say too much heat comes from the gas stove when they went to fry an egg. They did not feel comfortable cooking. After eCook arrived, they are not getting that heat anymore. They enjoy cooking. Earlier I had to be involved, and now I don't have to be as involved. They are helping me more."
Advertisement-Influenced Shopper, 39 years old

- **Self-maintenance:** While customers anticipated maintenance costs, none reported any expenditures. All handle the cleaning and upkeep themselves. Support services, accessible via a simple call, coupled with an informative guidebook, were appreciated.

"When I complained to them, they took my complaint nicely and after taking it they returned my stove as new without any payment for it."
Online-Researcher, 21 years old

"Cleanup is not a big deal, just take a towel or kitchen tissue and wipe it off easily, it's so easy."
Advertisement-Influenced shopper, 42 years old

Outputs	**O1:** Increased product affordability through PAYGO. **O2:** Enhanced information about product usage and PAYGO. **O3:** Regular after sales services to the end-users. **O4:** Increased provision of more time efficient cooking products. **O5:** Increased provision of clean cooking products that reduce indoor pollution and household carbon emissions. **O6:** Provision of clean cooking products that reduce household fuel consumption. **O7:** Provision of biodigester that generates organic fertilizer. **O8:** Enhanced reputation of ATEC's carbon credit offering in the voluntary carbon market.

- **Overall value addition:** Women highlighted several transformative benefits of using the ATEC's eCook, which have substantially improved their lives. Primarily, the reduced heat creates a more pleasant cooking experience without excessively warming the kitchen. Additionally, some noted the positive effects on their skin, which remains unaffected due to lower heat exposure. This safer cooking environment also encourages them to involve younger family members, particularly their daughters, fostering quality bonding time. Those transitioning from traditional fire stoves appreciate the absence of smoke and the hassle-free cooking experience. Furthermore, the convenience of the stove allows them the freedom to multitask and complete other tasks.

"This electric cooker does not cause skin problems. It doesn't emit the damaging heat that gas ovens do. I'm no scientist, but I believe this stove is gentler on the skin."
Online Researcher, 29 years old

- **Affordability:** The installment payment system counters the stove's high price point, contributing to its popularity. User experiences reflect the stove's utility, cost-effectiveness, and time-saving advantages.

"The main reason behind buying eCook was that it didn't cost me 1,800 taka per month. It was only 500 taka. Isn't it reasonable? I could do my complete cooking, and it was very economical and finished cooking very quickly and saved me a lot of time."
Advertisement-Influenced Shopper, 22 years old

- **Product efficiency:** Most women acknowledged the time and economic benefits of the eCook. On average, they reported a daily time saving of 30 minutes while cooking. The reduced need to buy gas cylinders or use the government's gas supply translates into savings. Furthermore, it only adds BDT500-700 (US$5-US$6) to the monthly electricity bill, underscoring its efficiency.

"You think you have to buy gas for 1,200 taka per month. If you cook with eCook, the electricity bill comes to 700 taka, so it is better to cook with eCook. It is economical, and you can cook quickly. However, like [another electric stove brand], the electricity bill comes to 900 taka per month, so I like the induction stove of this brand more, and the electricity bill will be less."
Advertisement-Influenced shopper, 21 years old

5 - LOOK FORWARD AND LESSONS LEARNED

5.1 Growth and sustainability plans

ATEC intends to generate US$7.9 million in revenue by 2025, with over 40,000 active units (from Series A funding) through market penetration and geographical expansion. ATEC's plans include the following:

Geographic expansion	ATEC plans to expand operations from 2 to 8 countries in Asia and Africa through partnerships with domestic distributors. ATEC is in talks with Frontier Market for India, Solketra in Rwanda, and Vitalite in Zambia. ATEC will also scale up existing operations in Bangladesh and Cambodia.
Product development	ATEC is working with Schneider Electric to develop a solar-based induction stove that will be an off-grid solution for households, such as those in Sub-Saharan Africa that do not have access to electricity.
Execute carbon contracts	ATEC will execute the projects with Engie, Shell, FairClimateFund, BRD/World Bank, TEM, and MyClimate. Each project has earmarked targets for scaling the eCooks and biodigesters in Cambodia and Bangladesh.

5.2 Ask of investors and stakeholders

Financial needs:

ATEC requires US$3m in Series A funding to expand its market reach. This funding will be for the following initiatives:

- 40% of the capital will be used for geographic expansion across Asia and Africa, establishing distribution networks in Bangladesh, Cambodia, Rwanda, India, Nepal, Kenya, Zambia and Bhutan.
- 40% will be used to scale up eCook model 3.0, develop a solar-based induction stove, and continue research and development on hardware, software and data.
- 20% will be to drive scale through digital carbon credit and PAYGO partnership development, executing carbon contracts with organizations such as Engie, Shell, and the Fair Climate Fund.

Series A funding will further set up ATEC to mobilize US$15m in Series B funding in 2024. ATEC is also searching for grants and debt financing to fund its growth plans. As such, the enterprise seeks support from investors, donors, and carbon credit buyers within the voluntary carbon market.

Non-financial needs:

ATEC requires advisors and technical assistance to understand the carbon credit taxation policies and systems in different Asian and African countries.

5.3 Lessons learned

ATEC addresses inadequate adoption of clean cooking solutions through modern energy systems in rural, semi-rural and urban households. ATEC demonstrates pathways to reduce care workload on cooking by distributing modern energy cooking solutions that are not readily available to low-income families who use affordable fuel, such as charcoal and wood. The ATEC model demonstrates the impact of technology, electricity and mobile penetration to make modern cooking products affordable and accessible.

In rural areas, many households use biomass-based cookstoves, and uptake of Tier 4 or beyond cooking solutions will require models that take into account customers' paying capacity, need, and fuel availability. ATEC's model shows the need for customized scaling pathways to support the transition to cleaner cooking products in urban and rural areas. ATEC designed and built biodigesters for rural customers that use raw materials readily available in households with livestock and agriculture waste. In urban areas, with extensive grid electricity and continuous power supply, ATEC offers induction stoves. A customer-centric approach has enabled ATEC greater access to consumer markets than businesses selling LPG and ethanol cookstoves, which require dedicated fuel supply chains challenging to arrange in rural areas. Further, the PAYGO model for financing end-customers made it affordable for customers and minimized the risk associated with a new technology.

ATEC's growth highlights the merits of focusing on fewer product lines as a scaling strategy. Unlike competitors who introduce a range of cooking products and stoves, ATEC has concentrated on just 2 product types: biodigesters and induction stoves. This has helped ATEC to utilize resources effectively and prevent product cannibalization. ATEC has better operational efficiencies, as it needs to manage fewer manufacturing and assembling processes. By limiting the product line, ATEC has also been able to identify, test, and adopt appropriate carbon credit calculation methodologies, which could have been complex with more products.

ATEC demonstrates the importance of measuring impact through digital technology and using the data to generate revenue. ATEC has adopted technologies to capture real-time data on

product usage and use that data to ascertain the carbon offset, number of hours saved on care work, and number of trees saved. The data is updated, displayed through the dashboard, and integrated into ATEC's impact story. It is one of the ways through which ATEC has succeeded in raising varied investments from multiple partners.

ATEC's model explores whether and how carbon finance can compensate for unpaid care work. ATEC has piloted the Cook-to-Earn Program to incentivize users to use induction stoves and biodigesters frequently. ATEC has partnered with FairClimateFund, which purchases carbon credits from ATEC, with the agreement that 70% of the funds will go to local households. ATEC views remittance from carbon credits as an innovative mechanism to compensate women and girls for time spent on cooking and that this measure will result in women's economic empowerment. The potential of this model as a measure to reduce care workload will depend on the amount of carbon credit revenue provided to the end user, whether women and girls get the amount in their bank account, and whether they have the agency to utilize that money.

5.4 Recommendations for policymakers, investors, and enterprises

Labor-saving technologies such as biodigesters and induction stoves significantly reduce the care workload of women and girls. ATEC aims to reduce the time spent by women on care work and provide them an additional income through increased usage of clean cooking products and monetary incentives. Action from policymakers, investors and entrepreneurs will further boost ATEC's initiatives.

Policymakers

Streamline the methodology to calculate carbon credits: Policymakers should promote NMM, an advanced methodology to calculate greenhouse gas emissions, in all metered cooking devices to ensure transparency in the calculation of carbon credits. The methodology quantifies emission reductions by directly measuring energy or fuel consumed through digital technologies. As a result, it is more accurate compared to conventional methods, such as surveys. The methodology will increase data transparency and encourage carbon offset buyers to invest in the cooking sector through carbon finance.

Public infrastructure in rural regions: The care workload of women and girls is higher in rural areas due to lack of electricity, piped water connections, and access to clean cooking fuel. Investing in rural infrastructure is critical to reducing care workload. ATEC's model shows that higher electricity access increases the adoption of clean cooking solutions. Thus, by strengthening public infrastructure in electricity and water, policymakers can create a conducive environment for private-sector participation to develop a market-oriented solution.

Investors

Diversify sectoral priorities: Investors should provide capital to support businesses in upcoming and underfunded sectors such as the care economy, which offer multiple intersectional opportunities for impact creation. The GIIN 2023 report shows that the energy sector attracts the most significant proportion of assets under management by impact investors, followed by financial services and healthcare. Sectors such as water, sanitation and hygiene, receive very low investment. Enterprises in the care economy sector are likely to receive even less funding. Given that care economy businesses overlap with many other sectors, there are opportunities for investors to deliver multiple development outcomes with one investment. ATEC's model shows that investment in clean energy has a ripple effect on other development issues, such as environment, health, education and unpaid care work. Investors who focus on climate or health should incorporate a gender lens within their investments, as both of these issues are gendered. In incorporating a gender lens, benefits related to women's unpaid care should be a primary consideration.

Build the technical capacity of enterprises: Investors should provide advisory and technical support to enable investee enterprises to achieve the desired financial and impact goals. Investors often require enterprises to act on aspects such as a decent work agenda, inclusive product offerings, diversity and equity, and environmental sustainability. However, enterprises might not have the resources, tools, and knowledge to attain those goals adequately. Investors can build enterprise capacity to achieve priorities through training, resources and mentorship support. These collaborative engagements can ensure that enterprises meet investors' priorities, resulting in a lasting relationship. For example, Schneider Electric has invested in ATEC and offered expertise in developing a solar-based induction stove for off-grid households.

Enterprises

Ensure balance between profitability and impact: Social entrepreneurs should attain both profit and impact to ensure that enterprises are financially sustainable and attract capital to grow businesses and change people's lives. Enterprises should have systems and structures to balance profitability and impact. For example, ATEC drafted and adopted 'Impact Flywheel' to articulate its impact and growth pathway. Enterprises should consolidate their learning and vision into a document to ensure all employees and partners understand the commitment and roadmap to attain impact and business goals.

Adopt technology to measure and demonstrate impact: Social enterprises should consider technology to capture data and show impact. ATEC's model indicates that technology integration enables enterprises to communicate their impact credibility and attract investments. Enterprises can identify outcomes that are difficult to measure due to constraints, such as tools and resources. Enterprises can adopt various technological tools, including software, mobile-based devices or IoT-enabled technology to ease data collection and communicate impact.

ENDNOTES

[1] The Tier is assigned as per the Multi-Tier Framework, which measures cookstoves on 6 attributes: (i) exposure, (ii) efficiency, (iii) convenience, (iv) safety, (v) affordability, and (vi) fuel availability. "Modern energy cooking services" refers to a household meeting the Tier 4 or higher standard across all six measurement attributes. The Tiers range from 0 to 5. https://www.worldbank.org/en/topic/energy/brief/fact-sheet-multi-tier-framework-for-cooking

[2] Gold Standard was founded by the Worldwide Fund for Nature (WWF) and other NGOs to serve as the benchmark in carbon markets, ensuring that projects adhere to the highest levels of environmental integrity. The organization has developed the standard Gold Standard for the Global Goals and certifies projects against the standard. https://www.goldstandard.org/impact-quantification/carbon-markets

[3] Carbon markets are categorized under (i) Compliance market, driven by binding targets on carbon emissions in which entities buy carbon allowances to manage their carbon budget, and ii) Voluntary carbon market, for individuals and companies that voluntarily wish to offset carbon by purchasing carbon credits.

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[44] ATEC's expansion to Rwanda, funded by MESC and a partnership with Solekra Rwanda Ltd.

[45] A non-profit entity that partners with businesses to harness the potential of engineering to develop products and solutions to social problems.

[46] Live and Learn works to create climate resilient communities across Asia and the Pacific.

[47] From 1975-1979, Cambodia was under the regime of the Khymer Rouge, led by the dictator- Pol Pot, resulting in the death of 2 million people.

[48] 2X criteria can be found here.

[49] We assessed businesses that worked in the sectors of energy and emissions or water and sanitation against 4 climate and gender justice criteria related to: environment and land use; health, safety and security; education and training; and time use.

[50] Businesses were assessed on a 21 point scale, with scores of 0-7 being gender unintentional, scores of 8-14 being gender intentional and 15-21 being gender transformative.

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[56] The research team conducted 13 in-depth interviews with customers of ATEC'S eCook. ATEC shared a list of customers who fulfilled the following criteria: female customers, have been a customer of the eCook for a minimum of 3 months and a maximum of 6 months. The customers for interview were selected through purposive sampling to ensure diversity in age, occupation, socio-economic status. An interview guide was used to ensure consistency in the questions asked, although some follow-up questions were added as necessary to explore topics in more detail. The interviews were conducted in Bangla (Bengali), audio-recorded, and transcribed verbatim for analysis. The data collected from these interviews was analyzed thematically in NVivo to identify key themes and patterns in participants' responses. Given the small sample size and purposive sampling, one of the limitations of our analysis is that it might not be representative of the different socio-demographics of all ATEC customers.

[57] From the list of initial 50 customers provided by ATEC, equally split between eCook and biodigester users, eCook users were notably more available and willing to participate in the interview. Out of 13 respondents, 12 were eCook users. This significant imbalance can be traced back to distinct characteristics of the 2 groups. For instance, eCook users, often having access to grid electricity, are more likely to have consistent access to mobile phones, which is essential for remote research. In contrast, biodigester users, typically in rural settings with farming and livestock responsibilities, might have less availability for interviews. Thus, our findings predominantly reflect the perspectives and experience of eCook users. We urge readers to approach Section 3.3 of the case study with this context in mind and exercise caution before generalising these insights to ATEC's broader customer base.

[58] Of the 13 women interviewed, 6 preferred not to reveal their age.

[59] Of the 13 women interviewed, 5 did not specify their education qualification.

[60] US$1 = BDT109 Retrieved from: https://currency.world/convert/USD/BDT

[61] Of the 13 women interviewed, 2 preferred not to disclose their household monthly income.

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