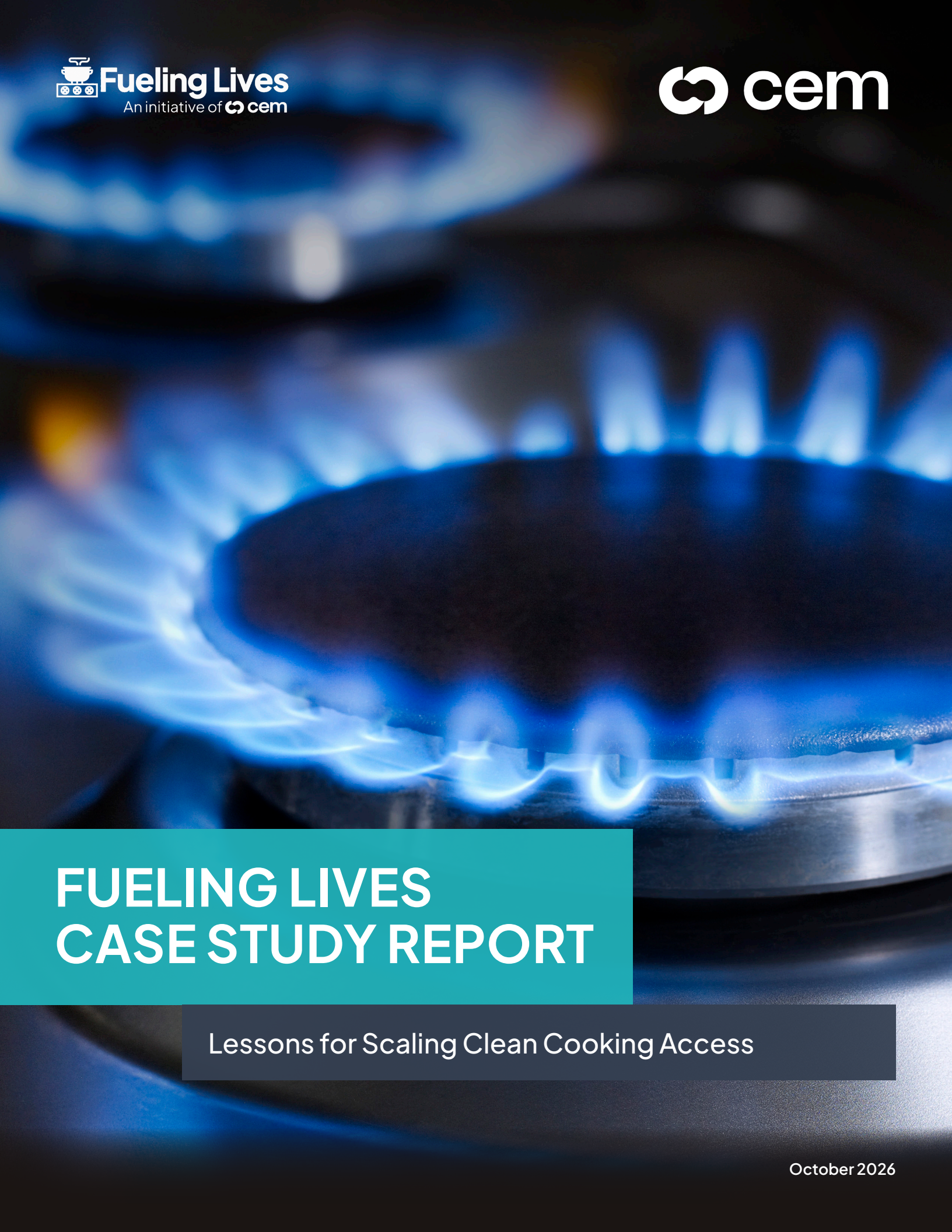


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FUELING LIVES CASE STUDY REPORT

Lessons for Scaling Clean Cooking Access

October 2026

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Acknowledgments

The authors are deeply grateful to the exemplary clean cooking programs we had the pleasure to engage and collaborate with: ASCENT, Forward7, Clean Cooking Alliance, Modern Cooking Facility for Africa, and Modern Energy Cooking Services. The programs provided content and resources compiled by the National Laboratory of the Rockies. We would also like to thank our internal review team for their feedback, editing, and overall efforts toward finalizing the report: Holly Darrow, Sophie Schrader, Sheri Anstedt, and Jennifer Korte. The authors acknowledge that Claude was used for initial desk research and in cross case study pattern analysis in this report.

This report is available at no cost from the National Laboratory of the Rockies (NLR) at www.nlr.gov/publications.

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List of Acronyms

AfDB	African Development Bank
ASCENT	Accelerating Sustainable and Clean Energy Access Transformation
CCA	Clean Cooking Alliance
CCAC	Climate and Clean Air Coalition
CCF	Clean Cooking Fund
CFLA	Cooking For Life Africa
CLEAR	Comprehensive Lowered Emission Assessment and Reporting (CLEAR) Methodology for Cooking Energy Transitions
COMESA	Common Market for Eastern and Southern Africa
COP	Council of Parties
CSP	cooking service provider
DER	distributed energy resource
eCooking	electric cooking
EPC	electric pressure cooker
ESMAP	Energy Sector Management Assistance Program
FCDO	Foreign, Commonwealth & Development Office
Forward7	Clean Fuel Solutions for Cooking Initiative
IDA	World Bank International Development Association
IEA	International Energy Agency
IFC	International Finance Corporation
LPG	liquefied petroleum gas
MCFA	Modern Cooking Facility for Africa
MECS	Modern Energy Cooking Services
MRV	monitoring, reporting, and verification
NDC	Nationally Determined Contribution
NLR	National Laboratory of the Rockies
PAYGo	pay as you go
PMUY	Pradhan Mantri Ujjwala Yojana
RBF	results-based financing
REAF	Regional Energy Access Financing Platform
SEforALL	Sustainable Energy for All
TDB	Trade and Development Bank
UN	United Nations
UNFCCC	United Nations Framework Convention on Climate Change
WB	World Bank
WBG	World Bank Group
WFP	World Food Program
WICC	Women in Clean Cooking
WLGA	World Liquid Gas Association

Executive Summary

Nearly 2 billion people worldwide still rely on wood, charcoal, agricultural waste and other traditional fuels that produce harmful particulate emissions for cooking, contributing to an estimated 2.5 million premature deaths each year due to household indoor air pollution and having far-reaching impacts on productivity, development and education. (International Energy Agency [IEA] 2026). Adoption of clean cooking technologies can mitigate these challenges and provide sizeable economic and health benefits. Efforts in Indonesia, India, and other Asian countries have nearly doubled domestic access to clean cooking, whereas in sub-Saharan Africa the number of people without access continues to rise (IEA 2026; S&P Global 2024).

Clean cooking technology is typically defined by particulate emissions at the point of use, or in this case in the consumer's kitchen. Such clean cook stove solutions include LPG, biogas, biofuels, pellets and advanced biomass, and electric cooking solutions. Much of the recent progress in clean cooking access has been driven by LPG, with roughly 70% of new clean cooking access since 2010 being driven through LPG adoption (LPG Roadmap for Africa), including approximately 75% of clean cooking access gains in sub-Saharan Africa since 2018 (IEA 2025). Other solutions are expected to continue to play an important role as well: the IEA's Accelerating Clean Cooking and Electricity Services Scenario for universal African access calls for 60% LPG, 17% electric, 11% bioethanol and biogas, and 10% advanced biomass to achieve universal access goals (IEA 2025).

This report compiles case studies across varying types of organizations that provide lessons for increasing affordable, reliable, and secure access to clean cooking technologies and fuels. The highlighted programs include the World Liquid Gas Association, Saudi Arabia's Forward7, the Clean Cooking Fund's Accelerating Sustainable and Clean Energy Access Transformation, Modern Cooking Facility for Africa, Modern Energy Cooking Services, and the Clean Cooking Alliance. These case studies demonstrate that regional, institutional, and household contexts remain a key driver for technology selection. Several case studies point to LPG as a continued driver of new clean cooking access, highlighting its high portability and energy density, and lack of grid dependency contributing to reliability even in the face of grid disruptions.

These case studies provide insight into barriers to clean cooking uptake, and on the essential role of locally tailored policies, technology adoption programs, and financing initiatives. They also highlight a critical implementation gap driven largely by lagging financing, market infrastructure, and government coordination (across programs, agencies, or integration into national plans). Notably, a lack of market-ready operators and bankable projects, coupled with insufficient market infrastructure, creates a bottleneck that limits ability of capital at scale to reach communities and end-users. The case studies identify essential policy and regulation, supply chain and delivery, and financing actions that can help address technical and market gaps and accelerate the flow of finance and ultimate uptake of clean cooking solutions. Actions that will help close this implementation gap are presented in Table ES-1.

Continuation and expansion of existing local, national, and international programs to adopt these policies and measures is essential to enabling 2 billion people around the world to access modern cooking solutions and achieve healthy, thriving lives.

POLICY AND REGULATION	SUPPLY CHAIN AND DELIVERY	FINANCING
• Embed dedicated government capacity (e.g., delivery units) to coordinate clean cooking across ministries • Integrate cooking demand into national energy access and air quality planning • Adopt or adapt ISO clean cooking standards and set and enforce national cooking appliance and fuel standards • Regulate and enforce LPG cylinder recirculation model and safety standards • Use outcome-tied disbursement instruments (e.g., Program-for-Results, results-based financing)	• Match technologies to local context rather than a single prescribed pathway • Invest in after-sales service, repair, and technician networks from the outset • Build underlying fuel and distribution infrastructure, not just appliance distribution • Prioritize institutional users (schools, hospitals) as a route to scale • Build local research, workforce, and supply chain capacity	• Sequence concessional, results-based, and commercial capital deliberately • Close the consumer financing gap through on-bill financing, pay as you go, and similar mechanisms • Mobilize and track private sector co-financing • Invest in verified usage measurement as a financing prerequisite • Where these markets operate, crediting should be technology-neutral, crediting verified emissions outcomes regardless of fuel. Revenue from carbon credits should be considered an accelerant to a commercial business model.

Table ES1. Clean cooking technology actions to close the implementation gap

Section 1: Introduction

The United States, India, Saudi Arabia, Japan, and the Netherlands launched the Fueling Lives Initiative in 2025 to catalyze global investment that opens access to clean cooking fuels and infrastructure and empowers local communities with modern energy solutions. This report highlights member and partner experiences in designing and implementing clean cooking initiatives. It describes varied approaches and interventions as well as key drivers advancing clean cooking access and uptake around the world. The six case studies present member experiences that show that sustained use of clean stoves and fuels comes from market development, including regulatory frameworks, distribution infrastructure, and commercial financing, rather than long-term aid and subsidies alone.

1.1 Background and Overview of Clean Cooking Technologies

A lack of clean cooking is a worldwide, but solvable, problem. Around 2 billion people do not have access to clean cooking solutions. They cook on rudimentary stoves or three-stone fires fueled by sources that are harmful to human health, such as charcoal, firewood, coal, agricultural waste, or animal dung.

Numerous studies have extensively documented the negative economic and health impacts of these traditional cookstoves, such as those conducted by the Climate and Clean Air Coalition (CCAC), the World Economic Forum, the World Health Organization, the National Institutes for Health and the United Nations Environment Program. Cooking over traditional cookstoves exposes people to harmful smoke that leads to respiratory complications and cardiovascular disease. These health effects contribute to 3.7 million premature deaths annually, particularly among women and children (International Energy Agency [IEA] 2023).

Further, collecting fuel sources for rudimentary cookstoves has many impacts, such as reduced economic activity, increased risk for fuel collectors, and deforestation. Fuel collection, which can require an average of 5 hours per day (IEA 2023), is often the responsibility of women and girls, resulting in less time for educational opportunities. Many women have noted their daily trips to gather fuel expose them to greater risk of violence and assault (IEA 2023). Additionally, estimates suggest fuel gathering annually contributes to deforestation on a scale roughly the size of Ireland (IEA 2023). Collection is heavily concentrated in Eastern and Southern Africa, resulting in further food stress influenced by environmental stress and soil degradation . Without accelerated action against these challenges, the resultant annual cost of inaction—considering negative impacts to health, gender, and the environment—is estimated at $2.4 trillion (World Bank Group 2023; IEA 2025). (In this report, currency is provided in U.S. dollars, unless otherwise noted.)

CLEAN COOKING TECHNOLOGY	DESCRIPTION
Liquefied petroleum gas (LPG)	LPG stoves burn a stable mixture of propane and butane.
Biogas	In a large vessel, biodigesters decompose organic matter into biogas, which is then used in a burner and also produces a slurry that is used as fertilizer.
Natural gas	Natural gas, typically methane, is delivered to households via distribution pipelines to power burners.
Alcohol fuels	Ethanol is often distilled from crops after fermentation and is then used in a burner.
Pellet and Other Improved Biomass	Pellets processed from biomass for use in pellet stoves and other advanced biomass stoves with improved efficiency and reduced indoor emissions
Electric	Electric cooking typically includes hot plates, induction stovetops, rice cookers, or electric pressure cookers.

Table 1. Overview of Clean Cooking Technologies

Transitioning to clean cooking technologies reduces these impacts and provides sizeable economic and health benefits. Clean cooking technology is typically defined by ISO standards for indoor air quality and meet the highest-level tiers for emissions. Technology tiers are scored typically using the World Bank's Multi-Tier Framework (0–5) across the following categories: efficiency, exposure, convenience, availability, safety,

and affordability. Table 1 provides an overview of the most common clean cooking technologies.

The attributes of each technology vary, and often a single technology does not provide a complete solution. Clean cooking technologies may be selected based on household or regional considerations such as income, fuel and electricity access, and uses including cuisine type. The use of multiple sources of stove and fuel (i.e., fuel stacking) can be tailored to support case-by-case considerations. Figure 1 provides a scale of performance of each technology in several categories, highlighting characteristics that may influence households and other stakeholders to design fuel stacks that meet their needs in several areas. Additionally, World Bank's Multi-Tier Framework on cooking provides a comprehensive tool to capture information on access to cooking energy, including six attributes: two technical attributes that have long shaped the definition of clean cooking (exposure and efficiency) and four contextual attributes that capture the user's cooking experience (convenience, fuel availability, safety, and affordability).



Figure 1. International Energy Agency (IEA) clean technology comparison. Source: IEA (2023)

1.2 Clean Cooking Technology Deployments Globally

Globally, countries have deployed programs to increase access to clean cooking fuels and technologies. Efforts in Indonesia, India, and China have almost doubled access to clean cooking in these countries by providing free stoves and subsidized canisters of liquefied petroleum gas (LPG) (IEA 2023). However, the number of people without access or not utilizing clean cooking options in sub-Saharan Africa continues to grow, as population growth outpaces clean cooking access. Globally, the number of people without access or not utilizing clean cooking is declining, but in sub-Saharan Africa, the number is rising. Figure 2 depicts the stark contrast in projected use across continents.

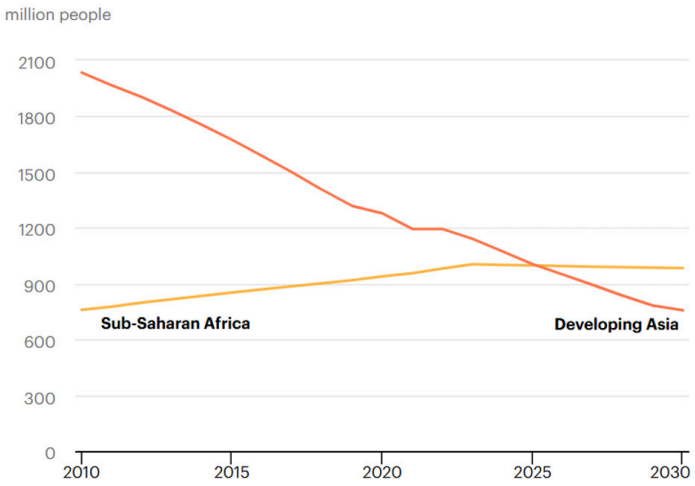


Figure 2. Population without access to or not using clean cooking in sub-Saharan Africa and developing Asia. Source: IEA (2023)

The outlook of sub-Saharan Africa's clean cooking sector has since improved as a result of private sector investment and new policies and infrastructure. In 2024, investment in the sector reached $770 million to support end-use equipment (e.g., stoves, cylinders) and expanded infrastructure (IEA 2026). Since 2024, more than 120 new policies and programs were introduced to support clean cooking deployment (IEA 2026). However, further policy action, sustained international partnerships, and continued public and private investment will be needed for Africa to match the rapid gains achieved across Asia.

IEA conducted analysis on realistic scenarios to reach universal clean cooking, emphasizing solutions that are already commercially available—primarily through LPG. Their Accelerating Clean Cooking and Electricity Services Scenario assessment mapped the spread of clean cooking technology needed to reach universal clean cooking in Africa based on regional cost and affordability. The study concluded a feasible fuel mix to support widespread access would comprise 60% LPG, 17% electric, 11% bioethanol and biogas, and 10% advanced biomass cookstoves—emphasizing LPG as a key near term solution for rapidly expanding clean cooking access, particularly in contexts where reliable electricity remains limited (IEA 2025). IEA estimates investment in clean cooking stoves, equipment, and infrastructure necessary to enable widespread clean cooking access would need to reach approximately $8 billion annually (IEA 2023). Widespread clean cooking access would result in 2.5 million fewer premature deaths from harmful household air pollution, save roughly 550 hours annually from reduced fuel gathering, and minimize deforestation (IEA 2023).

In line with these findings, real-world deployments of clean cooking technologies from 2019 to 2023 were supported by more than 70% LPG adoption in sub-Saharan Africa (Figure 3; IEA 2025). LPG is a particularly robust solution for rapid clean cooking deployment in rural communities where electric cooking (eCooking) may not be readily accessible or reliable because of a lack of access to reliable electricity. In these cases, use of LPG stoves (LPG canisters and compatible cookstoves) can reduce the effects associated with traditional cookstoves; the LPG stoves do not rely on established infrastructure for deployment.

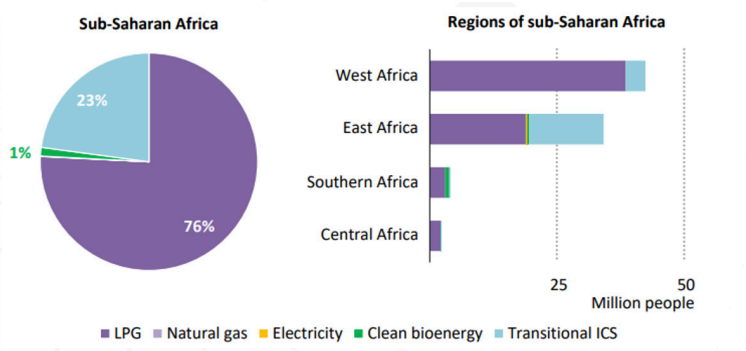


Figure 3. Clean cooking solution adoption. Source: IEA (2025)

Although the technologies that enable clean cooking are well understood, there are still questions as to the best policies and business models to enable their deployment. Driving clean cooking deployment requires action to make projects financially feasible and monetizing the system-level benefits that it delivers. Real-world examples can provide insights on how to deliver a range of technologies and business models at scale, sustain their use over time, and finance their growth in regional contexts. Case studies provide practical knowledge demonstrating what works on the ground.

The following section highlights initiatives to advance clean cooking in Africa and Asia to demonstrate various strategies, interventions, and key drivers that have proven successful. The case studies document transferable lessons in technology, finance, policy, and community engagement that can be translated into action and scaled to meet the need for clean cooking technologies globally.

Section 2: Case Study Review

This section presents six case studies of programs working to expand access to clean cooking solutions. To prepare these case studies, the Fueling Lives Secretariat provided a series of questions and a standardized template to case study contributors, who provided their own case study content. The case studies that follow are thus presented without additional influence from the authors of this report or other Fueling Lives members and as such reflect the experiences and views of each contributing organization. The programs reviewed present a diverse representation of the sector, including bilateral research and innovation programs, multilateral sovereign lending platforms, government-backed delivery initiatives, a finance facility, and a global convening body. The programs showcased in this report include:

- **Forward7 Initiative.** A Saudi-Arabia-led bilateral program providing partnerships, infrastructure, awareness, and market-enabling activities for clean cooking technology deployment across Africa and Asia.
- **World Liquid Gas Association (WLGA).** A global industry association for the liquid gas value chain, representing more than 300 companies in more than 125 countries, whose Cooking For Life campaign, Cooking For Life Africa Task Force, and LPG Roadmap for Africa drive advocacy, safety standards, and market-development conditions for LPG-based clean cooking.
- **Accelerating Sustainable and Clean Energy Access Transformation (ASCENT).** A World Bank multiphase lending program integrating electricity access and clean cooking across more than 20 countries in Eastern and Southern Africa.
- **Modern Cooking Facility for Africa (MCFA).** A results-based financing facility funded by the European Union, Sweden, and Norway that supports private clean cooking companies across seven sub-Saharan African countries.
- **Clean Cooking Alliance (CCA).** Funded by numerous country governments, businesses, and organizations, the Clean Cooking Alliance (CCA) mobilizes investment, innovation, and political will to accelerate access to and adoption of clean cooking.
- **Modern Energy Cooking Services (MECS).** A United-Kingdom-funded research, policy, and market-development program led by Loughborough University, the World Bank's Energy Sector Management Assistance Program (ESMAP), and CLASP: Appliances for People and the Planet.

These case studies (see the overview in Table 2) are presented to contextualize different policies, programs, and other drivers that have proved successful in enabling clean cooking technology adoption around the world. A synthesis and discussion of key case study lessons and findings is presented in Section 3.

PROGRAM	PRIMARY ROLE	FINANCING MODEL	TECHNOLOGY STANCE	GEOGRAPHIC SCALE	DISTINCT CONTRIBUTION
Forward7	Bilateral technology deployment	Government grants + subsidy	LPG-led; biogas; electric	Africa, South Asia, Southeast Asia	Ecosystem-building philosophy; pay as you go (PAYGo) LPG; institutional schools platform
WLGA	Industry association: global advocacy, standards, and market development	Convenes industry commitments and co-financing pledges	LPG-focused	Global	LPG Roadmap for Africa; cylinder safety and cylinder recirculation model standards; humanitarian LPG evidence base
MECS	Research and policy influence	Grant-funded research and pilots	Electric-first, all-fuels evidence base	Tanzania flagship; 16+ country portfolio	Evidence that de-risks electric cooking (eCooking) and utility partnership models
ASCENT	Sovereign + private finance at scale	World Bank International Development Association (IDA) loans/grants + results-based financing (RBF) + blended finance	Technology-neutral	20+ countries, Eastern and Southern Africa	Integrated cooking into electricity access finance at an unprecedented scale
MCFA	Market-building RBF facility	Catalytic grants + RBF + TA	Technology-neutral, performance-based	7 sub-Saharan African countries	Hybrid finance bridge from grant to commercial/ carbon finance
CCA	Global convenor and standard-setter	Donor-funded; non-implementing	All fuels, technology-neutral	Global	Builds shared infrastructure: carbon integrity, data, standards, government capacity

Table 2. Program Comparison at a Glance

In the following sections, each case study includes a program overview, approach, target markets and technologies, and lessons learned to compare across cases. A synthesis of cross-cutting themes follows the case studies to highlight lessons learned, best practices, and other considerations for transferring and scaling these approaches to clean cooking technology deployment in other contexts.

Case Study 1:

Clean Fuel Solutions for Cooking (Forward7)

KEY CHARACTERISTICS

FUNDER:
Kingdom of Saudi Arabia's Oil Sustainability Program

TIMELINE:
Launched 2021
Active delivery 2024 (ongoing)

LOCATION:
Sub-Saharan Africa (Rwanda, Tanzania, Madagascar, Zambia, Ghana, Nigeria, Kenya); South and Southeast Asia (Bangladesh, India, Indonesia, Nepal)

TECHNOLOGY SCOPE:
LPG cooking systems; biogas biodigesters; electric/solar-enabled cookstoves; selection is context-specific, based on local infrastructure, affordability, and needs

MODEL TYPE:
Government bilateral aid: subsidized kit distribution; grant-based funding; strategic private sector and multilateral partnerships; awareness and policy programs; institutional expansion

Program Overview and Goals

The Clean Fuel Solutions for Cooking Initiative (Forward7) is the Kingdom of Saudi Arabia's flagship bilateral clean cooking program, established in 2021 under the Middle East Green Initiative.

The initiative was developed in response to the continued reliance of billions of households worldwide on rudimentary and hazardous cooking fuels that have disproportionate consequences for public health, the health and socioeconomic well-being of women and children, environmental sustainability, and economic development. Forward7's mission is to achieve Sustainable Development Goal 7 (SDG7: Affordable and Clean Energy—universal access to clean cooking) by enhancing global collaboration to provide clean cooking solutions to millions of people worldwide.

Forward7 is implemented and managed by the Kingdom of Saudi Arabia's Oil Sustainability Program in coordination with the Ministry of Energy and operates through strategic partnerships with governments, local institutions, development organizations, and the private sector. Projects are tailored to local needs, infrastructure conditions, and affordability constraints—reflecting a technology-inclusive philosophy that selects solutions based on context rather than prescribing a single fuel pathway.

Barriers To Address

Forward7 is designed to address several key barriers to clean cooking technology deployment, including:

- **Affordability.** Both up-front equipment cost and ongoing fuel access place clean cooking solutions beyond reach for most low-income households. Forward7's primary financial mechanism is subsidizing this up-front cost, removing the single largest barrier to adoption.
- **Last-mile distribution.** Supply chains for LPG cylinders, electric appliances, and biodigester components are underdeveloped or absent in rural and peri-urban areas. Forward7 supports distribution infrastructure and partnerships to bridge this gap.

- **Awareness and behavior change.** Low public awareness of clean cooking benefits, safety standards, and available technologies constrains adoption even where access exists. Awareness programs are a core program component, reaching more than 5.5 million people across Ghana and Nigeria to date.
- **Gendered burden.** Women and children bear the greatest burden of biomass cooking through health exposure, fuel collection time, and safety risks. Addressing these gender-specific factors is a core motivation of the initiative, not an add-on.
- **Standards and policy gaps.** Inconsistent standards across markets and insufficient policy frameworks slow market development. Forward7 works with the African Organization for Standardization and national governments to harmonize standards and build enabling regulatory environments.

Target Markets and Technologies

Target Markets

Forward7's primary objective is to reach underserved households, particularly low-income, rural, and peri-urban families in sub-Saharan Africa, South Asia, and Southeast Asia who currently rely on traditional solid fuels. Beyond households, Forward7 has expanded its reach across four additional target segments:

- **Schools.** Ensuring clean cooking transitions in schools deliver better health, nutritional, and educational outcomes for children while reducing fuel costs and time burdens for institutions is another critical market area for Forward7's programs.
- **Broad populations.** Awareness programs in Ghana and Nigeria have reached more than 5.5 million people—a scale of behavior change engagement that far exceeds the number of households receiving direct technology access. This reflects Forward7's recognition that knowledge and social norms are as important as hardware for sustained adoption.
- **Youth and research communities.** In Kenya and Tanzania, university students have been engaged in field data collection for Forward7 projects. By engaging these groups, Forward7 builds local research capacity and embeds clean cooking knowledge in the next generation of policymakers and practitioners.
- **Small farm owners.** The biodigester programs specifically target smallholder dairy farmers in Asia for whom the biodigester provides both a clean cooking solution and an agricultural productivity tool through biofertilizer production.

Technology Portfolio: Context-Driven Selection

Forward7 uses a technology-inclusive approach to choose the most appropriate clean cooking solution for each deployment context based on local infrastructure availability, affordability, and end-user needs. The three core technologies and their primary deployment regions are detailed in Table 3.

COOKING TECHNOLOGY	DESCRIPTION AND DEPLOYMENT CONTEXT
LPG cooking systems	LPG is prioritized for its efficiency, significant emissions reductions compared to biomass, and practical deployment in markets with existing or developing LPG distribution infrastructure. For these reasons, it is the primary technology deployed in urban and peri-urban Africa (Rwanda, Tanzania, Zambia). In Rwanda and Tanzania, Forward7, along with partnership investments, supports LPG filling station infrastructure. Similar is true for Zambia, where 10 filling stations are planned to provide the backbone of distribution needed for market-level access and scale.
Biogas biodigesters	This is the primary technology for rural farming communities in South and Southeast Asia (Bangladesh, Indonesia, India, Nepal). Biodigesters convert animal manure and organic agricultural waste into renewable biogas for cooking and biofertilizer for crops. Units range from small household systems to larger agricultural installations. This technology addresses cooking access, waste management, agricultural productivity, and carbon emissions, simultaneously making it the highest multibenefit solution in Forward7's portfolio, especially for smallholder dairy farmers.
Electric/ solar smart cookstoves	Deployed in Madagascar (electric cooking program) and in Forward7's school transitions in Tanzania (electric pressurized stoves for institutional kitchens), electric stoves are prioritized where grid connectivity or solar integration is available and where their operational simplicity (i.e., no fuel supply chain required beyond electricity) makes them cost-effective at scale. In schools, electric pressurized stoves are particularly suited to higher-volume institutional cooking demands.

Table 3. Core Technologies and Their Primary Deployment Regions

Primary Approach and Interventions

Forward7 operates through an intervention model that combines direct technology deployment (see Table 5 and 6) with market-enabling activities, institutional partnerships (see Table 4), and policy engagement. Forward7 has designed its program to deliver long-term impact by supporting subsidized equipment with infrastructure investment, public awareness, and policy frameworks.

Direct Technology Deployment—Subsidized Kits

The foundation of Forward7's approach is subsidizing the up-front cost of clean cooking kits to remove the largest barrier to household adoption. Through Forward7, the Kingdom of Saudi Arabia provides grant-based funding and develops strategic partnerships to absorb the capital costs of clean cooking technologies that low-income households cannot bear. This subsidy model is applied across all three technology pathways:

- **LPG cylinder kits in Africa.** Stoves, cylinders, and smart pay-as-you-go (PAYGo) valve technology enables flexible micro-payments tied to consumption and increase affordability for households. In Rwanda, the PAYGo model (via a Bboxx partnership) has demonstrably increased sustained LPG use by allowing households to pay in small amounts rather than absorbing the full cylinder refill cost at once.
- **Biodigester systems in Asia.** Units of 2 to 40+ cubic meters are installed in farms by trained local technicians and, with ongoing support from implementing partners (Sistema.bio and Air Products), establish local fuel sources for biogas.
- **Electric cookstove kits in Africa.** In Madagascar and Tanzania, appliances are provided at subsidized cost to households and schools, respectively; users access electricity through existing or developing grid infrastructure.

Awareness and Behavior Changes at Scale

Forward7 has invested in end-user awareness not only to supplement clean cooking kit distribution, but also as a stand-alone program component. In Ghana, awareness programs have reached nearly 4 million people and in Nigeria, over 1.6 million. This scale of engagement far exceeds the direct deployment numbers and reflects Forward7's understanding that technology adoption at the household level requires both access and knowledge.

Awareness programs cover the health benefits of clean cooking, safety standards for both LPG cylinder utilization and electric appliances, available technologies and pricing, and the environmental benefits of switching to clean fuel sources. In Nigeria, awareness campaigns are complemented by capacity building programs such as the National Human Capacity Training Program for LPG adoption, which trains local community mobilizers and establishes micro-distribution retail points, creating a community-level infrastructure for sustained LPG access.

Institutional Expansion—Clean Cooking in Schools

Forward7 is a co-founder of the Platform for Clean Cooking in Schools, launched in partnership with Sustainable Energy for All (SEforALL) and the World Food Program (WFP) as part of the broader School Meals Coalition. Schools present a compelling case for clean cooking transition because they have predictable, high-volume cooking loads; measurable health impacts on students, teachers, and cooks; and the potential to serve as demonstration sites that build community confidence in new technologies. This platform is critical to grow clean cooking progress from the household-level kit level to systemic change. In Tanzania, Forward7 has transitioned two schools to electric pressurized stoves, with a third in progress. The institutional model delivers compounding benefits: improved health, better nutrition from school feeding programs, reduced fuel costs for educational institutions, and broader community exposure to clean cooking technologies.

Infrastructure Development

Technology deployment is supported through the development of the underlying infrastructure needed to sustain ongoing fuel access. In Zambia, Forward7 has launched the first of 10 planned LPG filling stations, a foundational infrastructure investment that will make sustained LPG use possible in markets where distribution bottlenecks prevented adoption despite community demand. Forward7 puts infrastructure development first, a critical step to supporting equipment distribution and reliable fuel supply.

Policy, Standards, and Market Enablement

To support technology deployments and ensure clean cooking markets function reliably, Forward7 actively supports standards alignment and enabling market conditions through relevant partnerships. Forward7 has developed a key partnership with the African Organization for Standardization to harmonize standards for clean fuel solutions, cooking products, and delivery processes across sub-Saharan Africa. By engaging in standard harmonization, the initiative facilitates cross-border trade of clean cooking equipment, ensures quality control in distribution, and builds the regulatory foundation for private sector investment in African clean cooking markets. Research and data collection are conducted in coordination with university students in Kenya and Tanzania, building national research capacity and creating the evidence base for program adaptation and policy advocacy. Forward7 also launched the Clean Cooking Award—a $45,000 prize competition at LPG Expo 2026 in Johannesburg targeting innovations in urban LPG scale-up, frontier and rural deployment contexts, and customer continuity and loyalty programs. This innovation incentive mechanism is designed to identify and scale solutions to meet the most persistent last-mile and retention challenges.

Key Implementing Partners & Stakeholders

PARTNER TYPE	DESCRIPTION
Program owner	Kingdom of Saudi Arabia: Oil Sustainability Program—(overall management and strategic direction)
Policy framework	Middle East Green Initiative: parent initiative providing Forward7's diplomatic, environmental, and institutional mandate
LPG partner (Rwanda)	Bboxx: data-driven energy platform headquartered in Rwanda; implements PAYGo LPG kit distribution across five districts; provides smart cylinder locking valve infrastructure
Biogas technology	Sistema.bio: global social enterprise; biodigester design, installation, training, Internet of Things monitoring, and monitoring, reporting, and verification (MRV) across Bangladesh, Indonesia, India, Nepal; 14 years global experience
Nepal partner	Sistema.bio
Indonesia partner	Sistema.bio
India partner	Air Products (industrial gases) and Sistema.bio: biodigester systems in Begusarai and Lakhisarai districts, Bihar
Schools/ institutional	SEforALL and the WFP: co-founders of the Platform for Clean Cooking in Schools; School Meals Coalition integration
Standards body	African Organization for Standardization: standards alignment for clean cooking products and processes across sub-Saharan Africa
Innovation platform	WLGA: host of LPG Expo 2026, Johannesburg; platform for Forward7 Clean Cooking Award
Nigeria program	Nigeria Ministry of Petroleum Resources: National Human Capacity Training Program for LPG adoption
Research partners	King Abdullah Petroleum Studies and Research Center (KAPSARC) and MECS
Community level	Local mobilizers, brand ambassadors, technicians, and distribution agents trained and deployed across all country programs

Table 4. Key Implementing Partners and Stakeholders

Progress and Impacts To Date

25,205+	10,013	5.5M+
Total kits in delivery (Africa and Asia)	People impacted (Asia completed)	Awareness program reach (Ghana and Nigeria)

COUNTRY/ REGION	KITS DEPLOYED	TARGET	PEOPLE IMPACTED
Bangladesh	600	600	3,180
Indonesia	400	400	1,950
India (Bihar)	413	413	2,466
Nepal	400	400	2,417
Asia TOTAL	1,813	1,813	10,013

Table 5. Deployment Results: Completed Projects (Asia Biodigesters)

Economic and Time-Savings Impacts

Deployment of clean cooking technology across Africa and Asia has resulted in significant economic impacts. Bangladesh biodigester households save an estimated $210 per household per year in energy costs—totaling $126,000 annually across the 600-household project. For low-income farming households, this represents a meaningful reduction in household expenditure on biomass fuel. Time savings in Bangladesh alone amount to an estimated 657,000 hours per year—an average of 3 hours per household per day, or 11 to 15 hours per week, predominantly for women who would otherwise spend this time collecting firewood.

These time savings translate directly into economic opportunity: hours previously lost to biomass collection can be redirected to productive agricultural work, small business activities, education, or childcare compounding the economic co-benefits of the clean cooking transition.

Rwanda environmental impact: the Rwanda LPG program is projected to save approximately 35,000 mature trees per year as households switch away from firewood and charcoal—a tangible contribution to forest conservation and carbon sequestration.

COUNTRY/REGION	KITS DEPLOYED	TARGET	PEOPLE IMPACTED	OTHER IMPACT
Tanzania (LPG)	13,752	25,000	125,000 projected	LPG smart meter + cylinder kits; urban and peri-urban households
Rwanda (LPG)	10,000	50,000	250,000 projected	PAYGo smart valve kits via Bboxx; 5 districts; 35,000 trees/year (yr) saved
Madagascar (eCook)	1,040	4,000	20,000 projected	Electric smart cookstoves; first eCooking deployment in Madagascar
Tanzania (Schools)	2 schools	3 schools	1,600 students	Electric pressurized stoves; school feeding program integration
Zambia (Infra)	1 station	10 stations	10,000 projected	LPG filling stations; foundational distribution infrastructure
Africa TOTAL	~25,000 kits+	~82,000 target	395,000+ projected	Combined LPG, eCooking, and infrastructure across 4 countries

Table 6. Deployment Results: Under Execution (Africa 2025/2026)

Key Success Stories and Lessons Learned

Success

A technology-inclusive, context-driven approach allowed for the best match by context. Forward7's technology-inclusive approach is one of its most important design choices. LPG offers a solution to urban and peri-urban Africa, where distribution infrastructure exists or can be built. Electric stoves offer a solution for grid-connected markets and institutional settings. Biodigesters offer a solution to rural smallholder farming communities, where organic feedstock is available. Matching technology to the context rather than deploying one technology universally produces higher adoption rates, more sustainable use, and better returns on subsidy investment.

The platform for Clean Cooking in Schools targets institutions. Forward7's co-founding of the Platform for Clean Cooking in Schools with SEforALL and WFP targets institutional markets (schools, health clinics, community kitchens), which offer several advantages over household markets. Institutions create predictable, high-volume demand that justifies infrastructure investment, provide measurable health outcomes that create strong political and donor support, and uphold public visibility that builds community trust in new technologies. By integrating clean cooking into the School Meals Coalition framework, Forward7 has connected its energy access agenda with food security, nutrition, health, and education outcomes, creating a multisector value proposition that is far more compelling to governments and funders than a stand-alone program.

PAYGo integration in Rwanda helped increase sustained use. The integration of Bboxx's smart valve technology into the Rwanda LPG program is producing early evidence of a key sector problem being solved: sustained use after initial distribution. Bboxx's PAYGo model has already helped its existing LPG customers more than double their average monthly consumption compared to conventional cylinder purchasing models. This indicates a genuine trend of fuel switching, not a one-time adoption. By removing the large-payment barrier that causes households to ration LPG or revert to biomass, PAYGo transforms LPG from a one-off kit distribution into an ongoing clean cooking service.

Lessons

Building ecosystems drives demand and enables supply of clean cooking. Forward7 demonstrates that moving beyond subsidizing hardware to build a lasting ecosystem is essential to the uptake of clean cooking technologies. The combination of technology deployment with robust end-user awareness (5.5 million people reached in Ghana and Nigeria alone), policy alignment (African Organization for Standardization partnership), infrastructure development (10 LPG stations planned in Zambia), and institutional market development (Platform for Clean Cooking in Schools) creates a self-reinforcing system. Awareness creates demand, infrastructure enables supply, policy enables market entry, and institutions demonstrate viability at scale. No single element works without the others, and Forward7's multilayer model addresses all simultaneously.

Case Study 2:

The World Liquid Gas Association (WLGA)

KEY CHARACTERISTICS

FUNDER:
Membership-funded association. The Cooking For Life Africa Task Force (CFLA) commissioned the LPG Roadmap for Africa; the IEA Summit on Clean Cooking in Africa generated US$2.2 billion in public and private pledges, against an assessed need of $4 billion a year to 2030 in sub-Saharan Africa (S&P Global 2024).

TIMELINE:
Launched 2012

LOCATION:
Global; country transition research spans Brazil, Ecuador, Ghana, India, Indonesia, Kenya, Peru, Senegal, Sri Lanka, and Turkey; current market-development focus is sub-Saharan Africa; humanitarian programming in Bangladesh and Poland.

TECHNOLOGY SCOPE:
LPG cooking systems

MODEL TYPE:
More than 300 private and public companies in more than 125 countries, involved in one, several, or all activities of the industry (S&P Global 2024).

Role in sector:
Advocacy, standard-setting, market development, and convening.

Cooking For Life: facilitating the transition of 1 billion people from traditional, dirty, and dangerous fuels to cleaner-burning LPG by 2030. Launched 2012; nearly 400 million conversions to date, active in 11 countries (UNHCR 2021).

Program Overview and Goals

The WLGA promotes the use of liquid gas to foster a safer, cleaner, healthier, and more prosperous world and acts as the authoritative voice of the global liquid gas industry across the full value chain. Its key focus areas include emissions reduction, improving energy access, and enhancing energy efficiency, all of which contribute to SDG 7 (S&P Global 2024). WLGA brings together more than 300 private and public companies operating in more than 125 countries in support of this mission. The Association was established in 1987 and granted Special Consultative Status with the United Nations Economic and Social Council in 1989. It develops long-term partnerships with international organizations (see Table 8) and implements projects on local and global scales (S&P Global 2024).

WLGA's primary clean cooking vehicle is Cooking For Life. Cooking for Life launched in 2012 with the goal of transitioning 1 billion people from cooking with traditional fuels—as well as other dirty fuels—to cleaner-burning LPG by 2030. Since the launch there have been nearly 400 million conversions to LPG, mostly through national conversion programs in India and Indonesia and campaign activities in 11 countries (UNHCR 2021).

The campaign's foundational document, Cooking for Life Roadmap to a Billion (2013), set out three tactical steps for WLGA: intervening in country markets as part of regulatory and educational processes; identifying and filling information gaps through partnered research; and capturing success stories and lessons learned from conversions worldwide, with an emphasis on scalability and sustainability. WLGA's country-transition research

program was commissioned specifically to address the third of these (Tyler 2018).

The following case study reviews WLGA's Cooking For Life campaign, the Cooking For Life Africa Task Force (CFLA), and its LPG Roadmap for Africa, WLGA's country-level transition research, and its humanitarian LPG programming.

Cooking For Life: Objectives and Evidence Base

As WLGA's primary clean cooking vehicle, Cooking For Life has four objectives:

- Transition 1 billion people from traditional fuels and other dirty and dangerous fuels to cleaner-burning LPG by 2030 (UNHCR 2021).
- Capture and disseminate scalable, reliable conversion models—documented across 10 national transition programs representing 2 billion people, or almost 30% of the world's population (Tyler 2018).
- Demonstrate LPG's contribution across health, gender equality, economic development, and environmental sustainability to position the technology as a central contribution to SDG7 and highlight direct contributions to SDGs 3, 5, 8, 9, 11, and 13 (S&P Global 2024).
- Build regulatory, financing, and infrastructure conditions that allow governments and the private sector to scale LPG adoption (S&P Global 2024).

Target Markets and Technologies

Nearly one-third of the global population relies on traditional fuels (e.g., firewood, charcoal, animal dung, and crop residues) for cooking. Approximately 40% of the population without clean cooking access is in sub-Saharan Africa, with the remainder in developing Asia. Sub-Saharan Africa is the only region where the number of people without access continues to climb; some 900 million Africans lack access to clean cooking fuels (S&P Global 2024).

The health burden of using these fuels is severe and unevenly distributed. In 2020, the World Health Organization estimated household air pollution was responsible for approximately 3.2 million deaths per year, including more than 237,000 deaths of children under 5 years of age. Household air pollution from firewood is responsible for one-quarter of global deaths from stroke and other chronic diseases. In Africa, women and children account for 60% of premature deaths associated with inhaling household air pollution (S&P Global 2024).

The Case for LPG

To address these risks and provide healthier solutions, WLGA is focused on the distribution of LPG. LPG presents some primary benefits for rapid clean cooking transitions:

- **Available now, at scale.** Approximately 70% of the countries that increased access to clean cooking technologies since 2010 did so through LPG. Global LPG supply has grown rapidly over the last decade and production is expected to continue growing into the mid-2030s. LPG is expected to remain abundant through 2050, meaning there is ample supply to meet aggressive clean cooking targets (S&P Global 2024).
- **Portable and distributable.** One unit of liquid LPG produces around 250 units of vapor, making it an energy-dense fuel. Energy-dense fuel allows for large amounts of energy to be stored in small fuel cylinders and ensures that it can be transported efficiently by ship, rail, and road. In remote and rural regions, small canisters can be transported to consumers by bicycle, tricycle, boat, and canoe—even in rucksacks (Tyler 2018).
- **No grid dependency.** LPG's ease of transport and storage makes it practical where infrastructure for electricity is still underdeveloped. It is not intended to replace solar or electric energy, but to serve as an immediate replacement for harmful traditional fuels while electrification proceeds (S&P Global 2024).
- **Controllable heat and efficiency.** An LPG flame exceeds 1,800°C and can switch from full flame to simmering in under a second. Traditional fuels cannot be rapidly changed, leading to energy loss and waste. A wood fire lit at midday may have to be sustained all day to cook the evening meal; an LPG stove is switched on and off as needed (Tyler 2018).
- **Immediate health impact.** Rural households can reduce indoor air pollution from particulate matter by 98% by switching from woodburning to LPG-burning stoves. LPG emits no black carbon upon combustion, averting essentially all black carbon emissions and nearly all indoor air pollution (S&P Global 2024).
- **Environmental gain.** If more than a billion people switch to LPG by 2030, 1.2 million hectares per year of forest would be saved, eliminating nearly one-quarter of current global deforestation. Estimates suggest 1.2 billion people switching from wood to LPG would create a net annual atmospheric reduction of 279 million tons of carbon (S&P Global 2024).

Priority Market Contexts

Cooking for Life targets several markets ranging in size:

- **Developing-country household markets.** Programs range from national-scale government schemes (India's PMUY, Indonesia's kerosene conversion, Peru's Cocina Perú, Senegal's butanisation) to private-sector initiatives in specific communities (e.g., Sri Lanka's tea plantations, Kenya's PAYGo trials) (Tyler 2018).
- **Institutional markets.** Turkey's program converts rural school heating from wood and charcoal stoves to LPG, targeting up to 8,000 schools; with an average family size of 4.2, the potential reach is more than 3 million people, at an estimated $30,000 per school (Tyler 2018).
- **Humanitarian settings.** Refugee camps and conflict-affected populations, where firewood collection exposes women and children to protection risks and camp fuel demand creates deforestation pressure and tension with host communities (UNHCR 2021; WLGA 2022).

Primary Approach and Interventions

WLGA's approach is to build a foundation that allows national governments and private companies to drive large-scale LPG adoption. This foundation includes regulatory frameworks, consumer financing, infrastructure investment, safety standards, and a documented evidence base of what has and has not worked (see Table 7).

Advocacy and Policy Engagement

The IEA held its inaugural Summit on Clean Cooking in Africa on May 14, 2024, bringing together high-level African government officials, European government representatives, and stakeholders of international oil companies and clean fuel businesses. WLGA signed the Clean Cooking Declaration along with hundreds of stakeholders, pledging to prioritize clean cooking in achieving SDG7. The declaration brought together the governments of Tanzania and Norway, the African Development Bank, and the IEA, with $2.2 billion committed across public and private sectors (S&P Global 2024).

At the summit, WLGA announced the establishment of the CFLA Task Force, uniting industry partners including S&P Global, Equinor, Petredec, Oryx Energies, and TotalEnergies, to develop an LPG Roadmap for Africa. The CFLA commissioned S&P Global Commodity Insights to review the clean cooking crisis in Africa, analyze LPG's role, and identify the countries with the highest potential for expanding LPG consumption by 2030 (S&P Global 2024).

The LPG Roadmap for Africa: Three Calls to Action

The roadmap identifies 11 high-opportunity sub-Saharan markets that have experienced LPG demand growth and/or made considerable progress in creating the regulatory and investment environment to support substantial growth: Angola, Burkina Faso, Cameroon, Ghana, Kenya, Mozambique, Nigeria, Rwanda, South Africa, Tanzania, and Togo. Sub-Saharan Africa currently consumes roughly 4 kilograms (kg) per capita of LPG; the target for these markets is 25 kg per capita by 2030 (S&P Global 2024).

CALL TO ACTION	DESCRIPTION
Prioritize regulatory foundations	Establish clear, enforceable regulations: partnerships between governments and industry, promotion of the cylinder recirculation model, and comprehensive cylinder safety regulation. Effective frameworks build consumer confidence and encourage investment.
Implement consumer financing and payment strategy	Microfinancing, PAYGo systems, and partnerships between financial institutions and energy companies. Pilot projects in Cameroon and Kenya demonstrate the potential of these strategies to increase LPG usage and achieve high repayment rates.
Invest in infrastructure and roads	Develop urban storage and distribution networks, enhance rural road connectivity, and attract foreign investment. Prioritizing urban infrastructure creates economies of scale; improved rural transport networks enable delivery to remote areas.

Table 7. Three Calls To Action Under the LPG Roadmap for Africa (S&P Global, 2024).

Industry Standards and Safety

WLGA published extensive guidelines for and analysis of the cylinder recirculation model in its Guidelines for the Development of Sustainable LPG Markets – Early Stage (2014). Its Guide to Good Industry Practices for LPG Cylinder Management (2013) is an international standard covering cylinder material, design, manufacture, maintenance, repair, requalification, and scrapping, as well as refilling procedures at the filling plant. A key requirement of WLGA's country research is to assess initiatives to ensure conformity with WLGA's good industry practices.

CFLA MEMBERS	S&P GLOBAL, EQUINOR, PETREDEC, ORYX ENERGIES, TOTALENERGIES
Multilateral partners	IEA; Clean Cooking Alliance; African Development Bank (AfDB); UNHCR (observer member since July 2018, under a memorandum of understanding); UNDP (joint Rural Energy Challenge project); UN Office for Project Services (field audits of the Cocina Perú program).
Regional partners	African Refiners and Distributors Association; Global LPG Partnership; Polish Liquid Gas Association.
Research and review	S&P Global Commodity Insights (author, LPG Roadmap for Africa); University of California Berkeley, the Global Alliance for Clean Cookstoves and the Global LPG Partnership (reviewers, Accelerating the LPG Transition); International Union for Conservation of Nature and Natural Resources (evaluation of the Cox's Bazar program).
Operating companies cited	Total and Omera (Cox's Bazar supply); Pertamina (Indonesia); Laugfs Gas PLC (Sri Lanka); Repsol (Peru); AmeriGas Polska, Bałtykgaz, Chemet SA, DragonGaz, Gaspol SA and GOK Regler und Armaturen Polska (Poland); World Central Kitchen (WLPGA observer member).

Table 8. Key Implementing Partners and Stakeholders

Progress and Impacts To Date

Headline Results

~400M	~70%	92%	11
conversions to LPG since Cooking For Life launched in 2012 (UNHCR, 2021)	of countries gaining clean cooking access since 2010 did so through LPG (S&P Global, 2024)	fall in annual firewood demand at Cox's Bazar after LPG introduction (UNHCR, 2021)	high-opportunity African markets identified in the LPG Roadmap (S&P Global, 2024)

India

India is an example of a country that has successfully increased use of clean cooking methods, nearly tripling access to LPG over the past 20 years. This access rose from just 22% of the population in 2000 to 64% by 2019—an increase achieved despite a 30% rise in India's population over the same 19-year period. In 2012, two-thirds of rural households were still relying on harmful cooking methods (WLGA 2023).

Under the PMUY, $1 billion of funding helped cover the up-front cost of LPG cookstoves, resulting in 80 million new households switching to LPG, supported by 10,000 new LPG distributors and PAYGo technology using text messaging in rural areas. LPG consumption rose 40% between 2014 and 2019. A "smokeless village" initiative aimed at the most remote communities has created over 3,800 smokeless villages (WLGA 2023).

The measured impact is substantial: the death rate from household air pollution decreased by 64% between 1990 and 2019, with an estimated $8 billion in annual cost savings through improved health outcomes, productivity, and well-being gains. Emissions savings total 296 megatons of equivalent CO_2 per year, and the switch has cut particulate matter emissions by 2,190 kilotons per year. For a typical household, annual emissions fall from 2.58 to 0.23 tons of equivalent CO_2 (WLGA 2023).

Separately, the government had distributed 80 million LPG connections by 2019, increasing penetration from 62% to 99.8% by April 2021. PMUY 2.0 was announced in August 2021, targeting a further 10 million connections, and completed in January 2022; total connections under PMUY stood at 90.4 million as of September 2022 (S&P Global 2024).

Bangladesh—Cox's Bazar

Within weeks of the humanitarian camps being established, more than 730 megatons per day of forest firewood was required to meet cooking fuel demand, in an area of high forest concentration; Ukhiya and Teknaf have 60% and 40% forest lands, respectively. LPG is now available to the entire refugee population, supplied by WLGA members Total and Omera (UNHCR 2021).

An International Union for Conservation of Nature evaluation collecting household-level data from 1,399 Rohingya and host-community households, plus 10 surrounding markets, found an almost four-fold increase in firewood demand after the camps were established. After LPG was introduced, annual firewood demand fell from 462,000 MT/year (yr) to 37,000 MT/yr—below the sustainable collection limit from the forests (UNHCR 2021).

Co-benefits went beyond fuel. Use of LPG spread to neighboring restaurants, food shops, and local bazaars. Nutritional diversity improved: the Food Diversity Index rose from 0.24 to 0.34 for Rohingya households and from 0.34 to 0.48 among host community households, with LPG users consuming more vegetables and vitamins (UNHCR 2021). By removing the need to walk outside the camps for firewood, human-animal conflicts—typically encounters with snakes or wild elephants—dropped.

Poland—Ukrainian Refugee Response

The conflict that began on February 24, 2022, caused Europe's largest refugee crisis since the Second World War, with an estimated 8 million people displaced. In the first 8 months, Border Guard officers cleared over 7 million people at crossings from Ukraine into Poland. Some 93% of the refugees were women, many elderly, and 63% arrived with children often carrying nothing but hand luggage (WLGA 2022).

LPG companies including AmeriGas, Bałtykgaz, Chemet, DragonGaz, Gaspol, and GOK organized front-line assistance: transport, LPG for gas heaters, and fuel for catering outlets serving hot meals. AmeriGas Polska supported the UGI Feeding and Fueling initiative with World Central Kitchen, working toward a goal of serving 100,000 hot meals a day, and became the gas distributor of choice at the Przemyśl mobile kitchen near the Medyka crossing. This was the first safe haven where refugees could get warm and eat. Polish Liquified Gas Association became the coordinator for member companies and advised on Polish standards and safety regulations. With refugees sometimes waiting 48–72 hours for border clearance, Gaspol provided fuel free of charge for LPG heaters at a time when soaring domestic demand had made cylinders difficult to procure. UGI International created a $35,000 grant and donated the same amount again in LPG supplies to World Central Kitchen (WLGA 2022).

WLGA's conclusion from the response is that LPG proved its value as an energy carrier that quickly and effectively helped displaced people survive, with the key advantage that it enables fast deployment of relief facilities wherever they are needed, even without any preexisting energy infrastructure (WLGA 2022).

Key Success Stories and Lessons Learned

Successes

- **LPG is a proven, scalable clean cooking transition fuel.** Roughly 70% of the countries that gained clean cooking access since 2010 did so through LPG. Its success stems from accessibility, affordability, scalability, and, most importantly, availability for deployment right now, given the right regulations, enforcement, and investment (S&P Global 2024).
- **The CFLA converted an industry pledge into a concrete market development tool**. Established at the May 2024 IEA Summit, the task force commissioned and delivered the LPG Roadmap for Africa by December 2024, identifying 11 high-opportunity markets, assessing each one's supply, infrastructure, economic growth, existing market, policy, investment climate, and affordability, and setting out three specific calls to action (S&P Global 2024).
- **Humanitarian LPG has a measurable evidence base.** The Cox's Bazar program moved from preliminary discussions in early 2017 to full refugee-population coverage, with independent IUCN evaluation quantifying the result: firewood demand cut from 462,000 to 37,000 MT/yr, below the forests' sustainable collection limit, along with documented nutritional, safety, and carbon benefits (UNHCR 2021).
- **Consumer financing works when it is locally mediated.** Microfinance pilots in Cameroon reported repayment rates of 94% rising to 98%, and in Kenya 90% of borrowers repaid all loans. In Sri Lanka, a private company reached 50,000 families in 18 months by routing the offer through estate cooperative societies that the community already trusted (Tyler 2018; S&P Global 2024).

Lessons

- **Distribution success does not equal sustained use.** Ghana distributed 5 kg and 14 kg cylinders free to households and institutions from 1992, yet only around 10% of the population uses LPG for cooking and more than 85% still rely on solid fuels. Fuel stacking persists even after successful introduction, meaning households keep the old stove alongside the new one, using whichever suits the task. Full confidence in the LPG package must still be earned (Tyler 2018).
- **Subsidies are easy to introduce and hard to remove.** Ecuador fixed a 15–kg cylinder at $1.60 and has been unable to remove it, at a cost of roughly $700 million a year, while up to 25% of the product is smuggled across borders. Senegal's subsidies were withdrawn in 1985 under IMF loan conditions and hastily reintroduced 2 years later after the 'gas riots'. Brazil's last subsidy removal in 2001 doubled prices and shifted households back to alternative fuels. The recurring finding is that broad, untargeted subsidies strain national budgets while disproportionately benefiting wealthier households (Tyler 2018; S&P Global 2024).
- **A transition needs a champion, a compelling proposition, and enforced safety practices.** Across all 10 country reviews, three conditions had to be in place: there has to be motivation for change; the value proposition to the consumer must be compelling, simple, easy to understand, convincing, and affordable; and the application of safety and standard industry practices is vital to enabling the industry to grow safely and sustainably. The champion can be government (Indonesia, Peru), the private sector (Sri Lanka, Kenya), or a combination (Brazil, India, Turkey) (S&P Global 2024).
- **The eight barriers identified two decades ago from the WLPGA/UNDP Rural Energy Challenge still apply:** low density of the target population; low purchasing power; need for local credit; inadequate cylinder size; weak safety culture and poor enforcement; competition from cheaper subsidized alternatives; inadequate state policy; and weak distribution networks in remote rural areas. Cylinder sizing cuts both ways—too large and the entry cost and weight are prohibitive; too small and consumers lose confidence as it empties frequently (S&P Global 2024).
- **Regulatory fragmentation and weak enforcement deter the investment the sector needs.** Ghana's customer-owned cylinder model led to improper filling, accidents, and a 20% decline in consumption from its 2011 peak before the country committed fully to the cylinder recirculation model in September 2023. In Kenya, illegal cross-filling means companies will not invest in assets others will use. Supportive regulations are only helpful if there is proper compliance and enforcement (S&P Global 2024; Tyler 2018).

Case Study 3:

Accelerating Sustainable and Clean Energy Access Transformation (ASCENT)

KEY CHARACTERISTICS

FUNDER:
World Bank International Development Association (IDA)

Lead Implementer:
World Bank Group (IDA, International Finance Corporation [IFC]); Common Market for Eastern and Southern Africa (COMESA, regional platform); Trade and Development Bank (TDB) Group/Trade and Development Fund (Regional Energy Access Financing Platform [REAF]).

BUDGET:
$5 billion IDA base + $10 billion additional mobilization from development partners, private sector, carbon markets, and climate finance.

TIMELINE:
Approved: November 2023
Launched: June 2024
Program close: 2030

LOCATION:
Eastern and Southern Africa — Began in Rwanda, São Tomé and Príncipe, Somalia, and Tanzania then expanding up to 20 countries over the next 20 years.

TECHNOLOGY SCOPE:
Clean Cooking (Tier 3–5 appliances and fuels, technology-neutral); distributed energy (minigrids, solar home systems); on-grid electrification.

MODEL TYPE:
Multiphase programmatic approach—combined sovereign lending, private sector financing, RBF grants, technical assistance, and digital monitoring, reporting, and verification (MRV).

The ESMAP Clean Cooking Fund: World Bank's Launchpad for Scaling Clean Cooking, With ASCENT as a Flagship Implementation Example.

Program Overview and Goals

The World Bank has been at the forefront of advancing clean cooking globally, with ESMAP playing a central role in translating this commitment into scalable investments and measurable results. Since the establishment of the ESMAP Clean Cooking Fund (CCF) in 2019, World Bank financing for clean cooking has expanded steadily. The CCF mobilizes public and private investment by co-financing development operations, catalyzing technological and business-model innovation, and linking financial incentives to independently verified results. Building on this experience, ESMAP launched CCF 2.0 in 2024 to deepen technical and operational support for the timely preparation and implementation of clean cooking projects; develop replicable financing instruments for low-income and hard-to-reach populations; and better connect global knowledge, innovation, and financing with country-level demand. The CCF provides support across the full project cycle: (1) upstream, by integrating clean cooking into World Bank country and sector strategies; (2) midstream, by providing data, analytical tools, technical advice, capacity building, and operational design support; and (3) downstream, by co-financing World Bank lending operations.

CCF's support spans multiple regions and is increasingly embedded in major regional and sectoral initiatives, including Mission 300 in sub-Saharan Africa, air-quality programs in South Asia, the commitment to achieve 95% clean cooking access in Latin America and the Caribbean, the integration of clean cooking into agricultural value chains through AgriConnect, efforts to strengthen LPG value chains through LPG4Africa, and renewed investment in midstream gas infrastructure. These efforts demonstrate that the World Bank now has the instruments, operational pipeline, knowledge base, and partnerships needed to move beyond isolated pilots and establish clean cooking as a systematic, scalable, and results-oriented area of engagement across regions and sectors.

The Accelerating Sustainable and Clean Energy Access Transformation Program

The ASCENT program is the World Bank's flagship energy access initiative for Eastern and Southern Africa formally launched in 2024. ASCENT is structured as a multiphase programmatic approach through a coordinated rolling series of country-level investments and regional platforms that together comprise one of the largest integrated energy access programs in the world. ASCENT's three regional platforms—the REAF facilities (REAF 1 and 2) and the Regional Energy Access Acceleration Program—provide critical financing support, technical expertise, and knowledge exchange to the growing list of ASCENT national projects (14 projects have been approved as of August 2026).

ASCENT responds directly to the scale and urgency of the energy access deficit in the region. Its primary objective is to connect 100 million people with reliable and affordable electricity within 7 years through both on-grid and distributed energy resources. Clean cooking is embedded in its agenda with a target of providing 20 million people with clean cooking solutions. This stems from the theory that clean cooking is required to achieve access to affordable, reliable, and modern energy for all. ASCENT is also the leading vehicle for Mission 300, a joint initiative of the World Bank Group and the African Development Bank that targets 300 million new electricity connections across sub-Saharan Africa by 2030.

ASCENT also illustrates how ESMAP brings together upstream knowledge, technical assistance, catalytic grant financing, and partnership-building to shape and support a large-scale regional investment platform. The program is expected to leverage $5 billion in IDA financing and an additional $10 billion from public and private partners, making it one of the World Bank's largest energy access initiatives to date. ESMAP helped lay the foundation for this first-of-its-kind $15 billion regional program by providing $19 million in co-financing through CCF and the Electricity Access Fund, followed by an additional $5 million to support subsequent additional financing. This support has accelerated country-level project preparation and early implementation, strengthened regional program coordination, and, critically, helped embed clean cooking as an integral part of the regional energy-access agenda rather than as a stand-alone or secondary intervention.

ASCENT demonstrates that ESMAP's contribution extends well beyond grant financing. By combining upstream analytics and knowledge, operational design support, co-financing, regional coordination, and climate-finance mobilization, ESMAP has helped translate ASCENT's ambition into an operational regional platform. Its engagement has strengthened the institutional, financial, digital, and governance systems required to deliver early results, mobilize investment, and sustain the expansion of electricity and clean cooking access across Eastern and Southern Africa.

100M	20+	$15B	20M+
People targeted for electricity access	Countries in Eastern and Southern Africa	Total program mobilization target	ASCENT: overall people targeted for clean cooking

The Three-Pillar Structure

ASCENT is organized around three mutually reinforcing pillars (Table 9), each addressing a distinct but connected dimension of the energy access challenge. The first pillar focuses on developing regional and national platforms to enable economies of scale and cost reduction strategies. The second pillar contributes to expanding grid electrification and strengthening utilities. The third pillar will finance distributed energy to support widespread access to clean cooking technologies.

1 REGIONAL AND NATIONAL PLATFORMS	2 GRID ELECTRIFICATION	3 DISTRIBUTED ENERGY AND CLEAN COOKING
COMESA Regional Acceleration Platform provides technical assistance, policy harmonization, digital tools, and capacity building for governments. It also supports digitization and digital MRV across the program.	Investment and technical assistance for grid densification, last-mile connectivity, medium-voltage extension, utility strengthening, variable renewable energy integration, and digitization of utilities.	Financing for distributed energy (e.g., minigrids, solar home systems) and clean cooking. Delivered primarily via ASCENT-REAF through TDB, combining debt, RBF grants, and technical assistance.

Table 9. ASCENT Regional Pillars

Additionally, community and gender engagement is embedded in country-level ASCENT projects through ESMAP's gender framework, which is directly incorporated into projects such as ASCENT Zambia. COMESA's regional platform provides technical assistance to governments to ensure that national energy access plans, including clean cooking components, reflect the needs of communities. IFC's engagement with private sector companies includes gender-lens investment criteria, recognizing women as both primary clean cooking beneficiaries and key market participants.

Technology Portfolio

ASCENT is explicitly technology-neutral on clean cooking, consistent with the World Bank Group's approach across its clean cooking portfolio. The ASCENT REAF program supports the full spectrum of viable solutions, with selection driven by local market context, infrastructure availability, and affordability:

- Improved biomass cookstoves. Where electricity access is not yet viable, Tier 3+ improved biomass stoves remain within scope as a transition technology, consistent with ESMAP's multi-tier framework.
- LPG and clean fuel alternatives. Country-specific solutions including LPG, biogas, and ethanol are supported where they represent the most cost-effective pathway to Tier 4 or 5 cooking access.
- eCooking. Supported where grid reliability and household income allow. ESMAP's ASCENT-REAF brief identifies a $2 million equity need for clean cooking companies in the distributed energy resources (DER) sector, reflecting the emerging market for off- and on-grid eCooking.
- Solar home system-integrated electric cooking. REAF finances companies delivering solar home systems that can power basic cooking appliances and other hybrid solutions.
- Minigrid electric cooking. REAF directly finances minigrid developers whose systems can support cooking loads—building on MECS and ESMAP research demonstrating that cooking demand actually improves minigrid financial sustainability.

Primary Approach and Interventions

ASCENT operates simultaneously as a sovereign lending vehicle (IDA loans and grants to national governments), a private sector financing platform (via REAF and IFC), a regional coordination mechanism (via COMESA), and a market-building instrument (via results-based financing [RBF] grants). Clean cooking is addressed across all four dimensions, emphasizing that unlocking electricity access and clean cooking together is essential to program success.

Sovereign Lending and National Program Support

At the country level, ASCENT provides IDA financing to national governments to implement comprehensive energy access programs that include clean cooking components in addition to grid and off-grid electrification (see Table 10).

COUNTRY	INTERVENTION
Mozambique	$477 million total. Targets nearly 5.1 million people for electricity access and 360,000 for improved clean cooking solutions. Components include on-grid connections, off-grid solar, utility performance improvement, and clean cooking. Funded by IDA, Sweden, and Norway.
Ethiopia	$424 million total. Targets nearly 6 million people for electricity access using a program-for-results approach tying disbursements directly to verified outcomes. Implemented by the Ministry of Water and Energy and the Ethiopian Electric Utility.
Zambia	$200 million IDA grant. Targets 1.6 million beneficiaries by 2030 across remote and underserved communities. ESMAP is supporting gender activities within the project.
Rwanda	Part of the first wave of ASCENT approvals, Rwanda has committed to achieving universal electricity access and clean cooking in its national energy compact. $300 million IDA and $100 million co-financing from Asian Infrastructure Investment Bank, targets 1.8 million beneficiaries for electricity access and clean cooking for 80,000 households.
Tanzania	First-wave country that is aligned with Tanzania's National Clean Cooking Strategy 2024–2034 and the Mission 300 electricity compact. $300 million IDA; targets 4 million beneficiaries for electricity access.
Malawi	$250.8 million ($245.8 million IDA grant, $5 million ESMAP grant). Target: 4.4 million people received direct access to electricity through new connections; 645,000 people granted access to clean cooking solutions.

Table 10. Overview of ASCENT Sovereign Lending Programs

ASCENT-REAF: The Regional Private Sector Financing Mechanism

REAF (implemented by TDB Group with World Bank financing) is ASCENT's primary instrument for mobilizing private capital for DERs and clean cooking. REAF offers three instruments to private companies:

- **Debt financing.** Direct loans to DER and clean cooking companies, co-financing, or on-lending via financial intermediaries. Smaller loans to small and medium enterprises provided through TDB's trade and development fund.
- **RBF grants.** Performance-based grants to companies entering new markets or piloting innovations. The RBF window currently has a total envelope of $12 million. The first five grants totaling $10.8 million were allocated in November to BioLite, BURN, Ignite Energy Access, RDG, and Yellow. Supported uses included solar home systems, minigrids, productive uses of energy, and clean cooking solutions.
- **Equity financing to Zafiri.** Additional financing to ASCENT REAF was approved in June 2025, including a $25 million IDA credit, $25 million Clean Technology Fund (CTF) loan, and $5 million ESMAP grant. This additional financing supports TDB's equity financing to Zafiri, the WBG-led Mission 300 DER Permanent Capital Vehicle. This initiative is anchored by investments from IFC, the African Development Bank, Nordic Development Fund, the Rockefeller Foundation, and the IDA Private Sector Window. The additional financing will enable TDB to serve as a strategic investor and shareholder of Zafiri.

Financial and Digital Strategy

ASCENT combines activities through its regional platforms with financial and digital programs that support clean cooking outcomes:

- **Blended finance architecture.** ASCENT is designed explicitly as a catalytic platform, using $5 billion in IDA financing to signal commitment and mobilize an additional $10 billion from development partners, national utilities, the private sector, carbon markets, climate finance, and philanthropy.
- **Program-for-Results instrument.** Used in ASCENT Ethiopia, Madagascar, and others, this instrument ties IDA disbursements to verified outcomes rather than inputs—creating strong country incentives for measurable energy access delivery and reducing fiduciary risk.
- **Carbon finance integration.** ASCENT COMESA supports countries in accessing carbon financing through participation in carbon markets. The CCAC's dedicated eCooking project for ASCENT-REAF includes advice on carbon and other impact financing mechanisms—creating a pathway for clean cooking carbon credits to supplement RBF grants.
- **Digital MRV at scale.** Prospect's digital MRV platform and Odyssey's financial technology platform supports REAF's portfolio management, enabling real-time tracking of energy access outcomes across a multicountry, multicompany portfolio. ASCENT COMESA is simultaneously supporting national digital MRV capacity in participating countries.

- **Project preparation facility.** A critical component supporting governments and the private sector to develop bankable, investment-ready projects, addressing the pipeline gap that has historically limited the deployment of large energy access finance pools.

Climate and Clean Air Coalition Partnership: Bridging Air Quality and Energy Access

In November 2024, the CCAC approved funding for a dedicated project to connect the knowledge developed by the MECS framework to ASCENT on eCooking. This project will provide advisory support on digitizing clean cooking devices and on carbon and other impact financing mechanisms—directly connecting ASCENT's energy access goals with the CCAC's mandate to reduce black carbon and other short-lived climate pollutants.

Program owner	World Bank Group—Energy and Extractives Global Practice, Eastern and Southern Africa
Financing arm	IDA —grants and concessional loans to governments
Private sector finance	IFC —equity and debt to private companies; Multilateral Investment Guarantee Agency (MIGA)—political risk guarantees
Regional coordination and technical assistance platform	COMESA —technical assistance, digitization, policy harmonization, and project preparation facility
Private finance vehicle	TDB Group/Trade and Development Fund—REAF implementation, debt, RBF grants, small and medium enterprise lending
Digital infrastructure	**Odyssey Energy Solutions**—REAF's platform for blended finance management, MRV, and results verification **Prospect—ASCENT**-supported digital MRV platform for ASCENT countries and developing an ASCENT regional digital MRV platform and carbon engine
Clean cooking advisory	MECS and Climate and Clean Air Coalition—eCooking digitization support and carbon finance advisory for ASCENT-REAF
Catalytic/seed funding and technical assistance	ESMAP: $24 million seed funding that unlocked ASCENT; technical support for gender, standards, and geospatial planning
Mission 300 partner	African Development Bank Group: co-leads Mission 300; committed $2 billion over 10 years to clean cooking in Africa
Grantee companies	As of August 2026, BioLite, BURN Manufacturing, Ignite Energy Access, RDG, and Yellow became the first REAF RBF grant recipients
Debt facility recipient	BURN Manufacturing signs the first REAF debt facility agreement
Permanent capital vehicle	Zafiri (Mission 300 DRE Permanent Capital Vehicle): IFC, AfDB, Nordic Development Fund, Rockefeller Foundation, International Development Association Private Sector Window
Nationally determined contribution (NDC)/policy framework	UN Framework Convention on Climate Change: national energy compacts under Mission 300 aligned to NDCs
Country governments	17+ governments with active ASCENT phases and 35 national energy compacts launched under Mission 300 as of August 2026

Table 11. Key Implementing Partners and Stakeholders

Progress and Impacts To Date

14+	59M	$10.8M	1.8M
Country phases approved by mid-2026	People connected via the Mission 300 portfolio to date (as of June 2026)	First REAF RBF grants signed (November 2025)	People targeted by first five REAF grantees

Program Rollout

ASCENT's deployment has created significant impact across stakeholder engagement, health improvement, and conservation including:

- The ASCENT multiphase approach reached 14+ approved country phases by mid-2026, including Rwanda, Tanzania, Somalia, São Tomé and Príncipe, Burundi, Mozambique, Malawi, Ethiopia, Zambia, Eswatini, Comoros, Lesotho, and Madagascar, with additional countries in pipeline. The program's first wave exceeded expectations for pace of country uptake.
- The June 2024 ASCENT Launch Event in Lusaka, Zambia, successfully engaged all 16 IDA-eligible countries and private sector partners, signaling broad regional ownership.
- ASCENT Week in Lusaka (September 2025) convened more than 400 public and private sector energy leaders, establishing ASCENT as the primary regional platform for energy access coordination in Eastern and Southern Africa.
- ESMAP estimates the health, gender, and climate cost of lack of clean cooking in the Eastern and Southern Africa region at $169 billion annually—the counterfactual impact that ASCENT's clean cooking component is designed to reduce.
- The CCAC-ASCENT partnership directly targets reducing black carbon—a short-lived climate pollutant from biomass cooking that contributes disproportionately to higher temperatures in the near-term and respiratory disease. Black carbon reductions of up to 70% by 2030 relative to 2010 are achievable through clean cooking transitions at scale.
- Within Mission 300 more broadly, 59 million people have been connected to electricity through the portfolio across Tanzania, Madagascar, Ethiopia, DRC, and Zambia—demonstrating that the program is generating momentum ahead of its 2030 deadline.
- Gender integration is a program-wide commitment: ESMAP is providing dedicated gender support to ASCENT country projects (including Zambia), and IFC's gender-lens investment criteria apply across the REAF private sector portfolio.

Key Success Stories and Lessons Learned

Successes

- **Regional programming at sovereign scale creates systemic change.** ASCENT's multiphase programmatic architecture creates economies of scale in program design, knowledge transfer, and private sector engagement, allowing for quick program replication across countries (Rwanda, Tanzania, and Somalia in the first wave; Burundi, Mozambique, Ethiopia, and Zambia following rapidly) and reducing preparation times and transaction costs.
- **Program-for-Results financing aligns incentives with verified outcomes.** ASCENT's use of the Program-for-Results instrument (notably in Ethiopia and Madagascar) ties IDA disbursements directly to measurable, verified outcomes such as electricity connections, clean cooking access, and utility performance metrics. This outcome-based approach reduces the risk of funding infrastructure that does not translate into real energy access. It also generates the verified impact data that carbon finance and impact investors increasingly require.
- **Integrating clean cooking into electricity access programming creates mutual reinforcement.** ASCENT's Pillar 3, which combines distributed energy resources and clean cooking in a single financing window, operationalizes what researchers have termed "mutual support" between electricity access and clean cooking. By financing clean cooking companies through the same platform as solar home system and minigrid companies, ASCENT creates natural alignment: solar home system companies can offer eCooking appliances to existing customers and minigrid developers can plan for cooking loads. This integrated approach is more likely to achieve seamless cooking transitions than stand-alone clean cooking programs that ignore electricity access dynamics.

Lessons

- **Private sector appetite for clean cooking finance is variable.** ASCENT-REAF's 2025 market assessment estimates the equity need for clean cooking companies at $2 million, compared to $5 million for minigrids, $2.2 million for solar home systems, and $12 million for commercial and industrial DERs. These equity estimates reflect the relative immaturity of clean cooking as an investable asset class—companies are smaller, revenue models are less proven, and consumer financing for cooking appliances is less developed than for off-grid solar. REAF's RBF window is designed precisely to address this gap by demonstrating viability and crowding in commercial capital over time, but this process will take years.
- **Consumer financing must address up-front costs to meet the needs for cooking appliances.** Unlike the off-grid solar sector, wherein PAYGo financing has created scalable consumer credit markets, clean cooking lacks consumer financing infrastructure in most ASCENT countries. Even where electricity is accessible, households that cannot afford the up-front cost of a clean cookstove or electric pressure cooker cannot participate.
- **Digital MRV for clean cooking is nascent.** The challenge of verifying ongoing clean cooking use (rather than appliance distribution) on a national scale remains unsolved across the sector despite the use of digital infrastructure for electricity access like smart meters, geospatial platforms, and digital MRV systems.

Case Study 4:

Modern Cooking Facility for Africa (MCFA)

KEY CHARACTERISTICS

FUNDER:
European Union, Sweden (Sida), Norway (Norad)—managed by Nordic Green Bank (Nefco)

BUDGET:
EUR€61.5 million total;
EUR€34 million active project portfolio;
EUR€8.7 million disbursed by the end of 2025

TIMELINE:
Program design: 2020–2021
Call for proposals: April 2022
Active delivery: 2022–2029
Wind-down: 2030

LOCATION:
Sub-Saharan Africa includes the Democratic Republic of Congo, Kenya, Malawi, Mozambique, Tanzania, Zambia, and Zimbabwe

Geography:
Four million people with access to clean cooking services by 2029; 1.2 million clean cooking services under current funding agreements.

TECHNOLOGY SCOPE:
Tier 4: Electric, biogas, bioethanol, bio-LPG, LPG (selected countries), solar; Tier 3+: gasifier and forced-draft rocket stoves with sustainable pellets/briquettes.

MODEL TYPE:
RBF + catalytic grants + technical assistance; PAYGo consumer financing; technology-neutral, performance-based.

Program Overview and Goals

The Modern Cooking Facility for Africa (MCFA) was established by Sweden and the Nordic Green Bank (Nefco) as a multidonor program to accelerate access to clean cooking solutions and support the development of sustainable clean cooking markets in sub-Saharan Africa. The program reflects donor priorities to increase access to clean cooking technologies while encouraging private sector investment through a market-based approach.

At its core, MCFA addresses structural barriers that have historically constrained the growth of the clean cooking sector. These barriers include limited access to affordable clean cooking solutions for households, underdeveloped supply chains and distribution channels, and limited availability of long-term, risk-tolerant financing for clean cooking companies. By targeting these systemic challenges, MCFA aims not only to scale access but also to build commercially viable and sustainable markets.

The program aims to provide access to clean cooking solutions for up to 4 million people by 2029, reduce exposure to harmful pollutants and improve health outcomes, and reduce emissions in line with SDGs 3, 5, 7, 13, and 15. In addition, MCFA emphasizes gender equality by reducing the time women and girls spend on cooking and fuel collection while promoting their participation in clean cooking value chains.

MCFA was developed through a structured design process, with market scoping and program development conducted between 2020 and 2021. The program was formally announced in November 2021, followed by the

launch of the first call for proposals in April 2022. The program has since been extended until 2029, with some winding-down activities expected to continue into 2030.

The program is currently funded at approximately EUR€55 million. Detailed annual cost breakdowns are confidential, but the funding structure reflects a significant commitment by donors to support long-term market development through blended finance mechanisms.

Target Markets and Technologies

41,000+	24	7	67%
Clean cooking services delivered (end 2025)	Contracted portfolio companies	Countries across sub-Saharan Africa	Clean cooking services purchased by women as primary customers

MCFA is designed to support private-sector-led delivery of clean cooking services in the Democratic Republic of the Congo, Kenya, Malawi, Mozambique, Tanzania, Zambia, and Zimbabwe. The program targets locally registered for-profit companies, referred to as cooking service providers (CSPs), which may operate individually or as part of consortia. These companies deliver clean cooking services directly to end users under contractual arrangements. The portfolio comprises 24 companies that have been selected through two competitive calls for proposals.

Selected Portfolio Companies

MCFA operates across sub-Saharan Africa and reaches households, businesses, and institutions. Most services are delivered in urban and peri-urban contexts, although some portfolio companies focus exclusively on rural markets. Delivery models are decentralized and based on clean cookstoves and fuels rather than centralized infrastructure systems. By the end of 2025, more than 41,000 individual customers had gained access to clean cooking services through MCFA-supported companies (Table 12).

COUNTRY	SELECTED COMPANY AND TECHNOLOGY
Kenya	Better Cooking Company (EcoSafi): high-efficiency biomass stoves with an agricultural waste pellet supply chain; ACE Hybrid Energy (African eCosync Energy): proprietary solar-biomass hybrid gasifier stoves for off-grid coastal communities; HomeBiogas: modular off-grid biodigester systems converting organic waste into clean gas and liquid bio-fertilizer
Tanzania	ENGIE Energy Access Tanzania: integrates eCooking appliances (induction plates and electric pressure cookers [EPCs]) with an existing distributed solar home system portfolio—best example of MCFA's electricity-cooking integration model
Zimbabwe	Lanforce Energy: women-led enterprise designing, building, and maintaining fixed-dome and modular biogas systems for households, farms, and institutions
Zambia	SupaMoto: manufactures and sells clean-burning microgasifier pellet stoves fueled by compressed agricultural waste briquettes
DRC, Malawi, Mozambique	Portfolio companies active; these markets are performing below East African benchmarks

Table 12. Selected Portfolio Companies for MCFA Programs

MCFA supports a wide range of technologies, reflecting a technology-neutral but performance-based approach. Eligible clean cooking services include Tier 4–5 electric, bioethanol, biogas, bio-LPG, LPG (in selected project countries), and solar (thermal and photovoltaic) stoves and Tier 3+ gasifier and forced-draft rocket stoves using briquettes and pellets.

All technologies must meet minimum performance criteria for efficiency, emissions (both carbon monoxide and PM2.5 (fine particulate matter)), and safety. In addition, fuel must be available at least 80% or 95% of the time, depending on the delivery model. The program does not track end-user stacking behavior. Technologies, adoption across the portfolio, and challenges to deployment are shown in Table 13.

TECHNOLOGY	ADOPTION STATUS	KEY CHALLENGES
Electric cooking (EPCs, induction plates) 	Strongest adoption across portfolio	Grid reliability/load shedding; repayment plan calibration; tariff levels; customer perceptions (cost, dish suitability); some companies holding back scale pending carbon offtake agreements
Biogas / biodigesters 	Solid but constrained by cost	High up-front cost of biodigester systems; site-specific installation; farmer dependence on feedstock availability; longer sales cycles
Gasifier stoves (pellets/ briquettes) 	Early stage; most companies nascent	Complexity of operating both stove and pellet supply/ distribution chain simultaneously; most gasifier companies still at early operational stage; company-specific challenges dominating
Bioethanol / liquid biofuels 	Niche adoption	Fuel supply chain reliability; competition with LPG in urban markets
Solar thermal / PV stoves 	Limited scale to date	High system cost; technical complexity; limited consumer awareness
LPG (selected countries) 	Urban transition tool	Restricted to specific countries; fossil-fuel price exposure; carbon finance eligibility constraints

Table 13. Technologies, Status, and Challenges Across the MCFA Portfolio

MCFA emphasizes supply chain integrity across all segments. During due diligence, participating companies must demonstrate viable fuel sourcing and sustainable upstream supply chains. Midstream considerations, including manufacturing, local assembly, and quality testing, are also assessed. All stoves must be tested in accredited laboratories vetted by the CCA during the application phase.

At the downstream level, MCFA focuses specifically on last-mile distribution. Supported companies are required to demonstrate robust distribution networks, availability of spare parts, and reliable operations and maintenance systems. In addition, they must comply with program requirements related to customer support, digital monitoring systems, and a minimum 3–year warranty provision.

Primary Approach and Interventions

MCFA operates as a market-based, blended finance program with country selection driven by donor priorities and target markets determined by portfolio companies. This decentralized approach enables companies to tailor their interventions to local market conditions, customer needs, and business models.

The program combines multiple financial instruments to enhance affordability and scalability. Its core mechanism is RBF, whereby disbursements are tied to the verified delivery of clean cooking services. RBF is complemented by catalytic funding to support earlier-stage companies and by mobilizing private capital along with donor contributions. CSPs frequently combine this support with PAYGo sales models and other consumer financing mechanisms, improving affordability for end users.

A key objective of MCFA is to address the gap between willingness to pay and ability to pay. Portfolio companies develop pricing strategies aligned with customer willingness to pay, often benchmarking against common fuels such as charcoal. The combination of demand-side financing and supply-side incentives helps to bridge affordability constraints and stimulate adoption.

The Hybrid Finance Structure

MCFA's financing model combines three instruments, deployed in sequence to match the company's development stage (Table 14):

FINANCING INSTRUMENT	DESCRIPTION
Catalytic grants	Provide up-front capital (typically 30% to 50% of total program support) to cover companies' localized capital expenditures. This includes equipment, manufacturing setup, distribution infrastructure, and initial working capital. Catalytic grants specifically target earlier-stage companies wherein commercial financing is not yet accessible.
RBF (ongoing)	The program's core mechanism. RBF disbursements are triggered only after the verified delivery of clean cooking services, meaning companies are paid for outcomes, not inputs. Payment is tied to digital monitoring data confirming sustained use (via payment records, smart meters, or Internet of Things sensors as proxies). This incentive structure directly targets the sector's persistent challenge of distribution without use.
Technical assistance (cross-cutting)	A dedicated technical assistance facility covers administrative and operational capacity building across the portfolio. It is specifically used to support companies on two exit-critical dimensions: (1) accessing commercial finance to replace MCFA grant support, and (2) navigating carbon finance—both voluntary carbon markets and Article 6 compliance mechanisms. Technical assistance is MCFA's primary instrument for building the commercial and regulatory capabilities companies need after program support ends.

Table 14. MCFA's Financing Instruments

Technology selection is left to portfolio companies, which choose stove and fuel solutions based on market conditions, cost structures, and customer preferences. Responsibility for operations and maintenance lies with the CSPs. The program's technological focus reflects a design choice made by donors to prioritize high-performing clean cooking solutions.

Digitalization is a central element of MCFA's implementation model. Most portfolio companies use smart meters, Internet of Things sensors, and mobile money platforms to track usage and process payments. At the program level, MCFA emphasizes digital tracking of end-user payments that are used as a proxy for usage and inform the amount of RBF earned.

Exit Strategy: Bridge to Commercial & Carbon Finance

MCFA's program is explicitly designed as a bridge, not a destination. The aim is to position portfolio companies to transition from catalytic grant dependence to two self-sustaining revenue streams: commercial finance (e.g., equity, debt, and other private capital) and carbon revenue (from verified emissions reductions). MCFA's technical assistance facility actively supports companies on both pathways throughout the program period.

STRUCTURE	DESCRIPTION
Program manager	Nefco (Nordic Green Bank): manages program operations, due diligence, disbursements, and reporting
Governance	Donor steering committee: European Union, Norway (Norad), Sweden (Sida): strategic oversight and program direction
Due diligence	Outsourced service providers: independent technical, financial, and safeguard assessment of portfolio companies
Technical assistance	Outsourced technical assistance providers: capacity building for CSPs on commercial finance readiness and carbon market access
Digital MRV	Outsourced digital MRV systems provider: independent monitoring, reporting, and verification of clean cooking service delivery
Verification	Independent verification agent: confirms delivery of clean cooking services before RBF disbursements are triggered
Standards body	CCA: accredited laboratory vetting for stove performance testing (all companies must pass before program entry)
Carbon markets	Multiple: gold standard, Verra; Article 6 bilateral mechanisms (host country government partnerships); carbon offtake agreements being developed by portfolio companies
Portfolio companies	Twenty-four contracted CSPs across seven countries including EcoSafi, ACE Hybrid Energy, HomeBiogas (Kenya), ENGIE Energy Access Tanzania, Lanforce Energy (Zimbabwe), SupaMoto (Zambia), and others
End users	Households, businesses, and institutions in urban, peri-urban, and rural markets across seven sub-Saharan African countries

Table 15. Key Implementing Partners and Stakeholders

MCFA is managed by Nefco, with strategic oversight provided by a donor steering committee comprising the European Union, Norway, and Sweden. This governance structure ensures alignment with donor priorities while maintaining operational flexibility. Several functions, including due diligence, technical assistance provision, digital monitoring systems provision, and independent verification have been outsourced to service providers.

Portfolio companies are responsible for implementation, including workforce development, establishing customer support systems, and provision of after-sales services. This includes engaging local technicians, agents, and distribution networks, as well as establishing help desks and maintenance systems.

End users play a central role in MCFA as customers who enter into contractual arrangements for clean cooking services. Their engagement is primarily market-based, but they also contribute data used in monitoring and verification processes.

MCFA is financed through donor contributions, primarily in the form of grants, which are channeled to companies via results-based financing mechanisms. This structure enables efficient allocation of funding based on verified outcomes.

Progress and Impacts To Date

41,000+	1:4	147	69,374
Clean cooking services (end 2025)	Leverage ratio (EUR€8.7M → EUR€37.4M)	Disability-adjusted life years averted	tCO2e/yr avoided

MCFA has made measurable progress in expanding access to clean cooking. Between 2023 and 2025, MCFA-supported companies sold over 41,000 clean cooking services that provided access to clean cooking solutions for a growing number of households and institutions, including 67% purchased by women as primary customers. This confirms MCFA's progress toward gender-responsive market development. The overall clean cooking services target based on current funding agreements is 1.2 million by the end of 2029.

Although household-level savings have not been comprehensively quantified, the transition to clean fuels is expected to reduce fuel expenditures over time compared to traditional options.

MCFA-supported companies have also been successful in mobilizing private and public co-financing, confirming the program's influential role. By the end of 2025, EUR€37.4 million in external funding has been compared to EUR€8.7 million in MCFA disbursements, resulting in a leverage ratio of 1:4. This ratio reflects strengthened business models within the portfolio and MCFA's ability to de-risk early-stage companies and crowd in follow-on capital. Co-financing was sourced from a mix of equity, commercial loans, grants, and carbon-related revenue streams, highlighting the diverse financial pathways emerging across the portfolio.

The program has also delivered measurable health and social benefits. By the end of 2025, MCFA activities had resulted in 147 averted mortality and disability-adjusted life-years, reflecting improvements in indoor air quality and reduced exposure to harmful pollutants.

In terms of economic impact, the program has created 162 direct full-time-equivalent jobs; 114 held by women and 48 by men. In addition, 1,236 operations agents have been engaged, the majority of whom are women, demonstrating the program's contribution to gender-inclusive employment.

Time savings represent a significant benefit, particularly for women. In 2025 alone, total time savings amounted to 32.5 million hours per year due to reduced fuel collection and more efficient cooking solutions.

Finally, by the end of 2025, clean cooking solutions sold with MCFA's support have avoided 69,374 tons of equivalent CO2/yr and 20,921 tons/yr of unsustainable wood harvest.

Key Success Stories and Lessons Learned

MCFA's experience highlights several early lessons learned for clean cooking market development. Some challenges have persisted, particularly with respect to the pace of technology adoption and external conditions. For example, uptake of electric cooking solutions has been slower than anticipated, reflecting infrastructure constraints and cost considerations. Additionally, difficulties in securing carbon off-take agreements and obtaining host country authorizations have limited revenue streams for several companies and delayed scaling.

At the same time, the program has identified key success factors that are critical for effective implementation of a results-based financing model.

Successes

- **Results-based financing aligned with digital MRV creates a powerful accountability system.** RBF disbursements tied to verified delivery (ongoing digital payments by the end customers as a usage proxy) creates a system that incentivizes real outcomes rather than equipment distribution because distribution alone does not guarantee use. Getting incentive levels right through reverse auction to align with market realities and company needs while ensuring cost efficiency is a key success. Investing up-front in digital MRV systems contributes to cost efficiencies and faster disbursement processes over time.
- **Deploying hybrid finance strategies.** Pure RBF funding alone can exclude early-stage companies that cannot finance operations without those payments. Providing up-front grants then switching to RBF during the ongoing delivery phase enables participation and leads to broader impacts. MCFA determines a company's absorption capacity and calibrates funding volumes accordingly. The hybrid finance strategy supports MCFA's exit strategy as well. More companies that can participate and prove their business models will demonstrate bankability to commercial investors and attract commercial capital that will eventually replace MCFA subsidies.
- **Leveraging existing infrastructure.** Electric cooking has proven to be a straightforward business model that offers scalability through structural simplicity. MCFA's portfolio companies provide the appliance and a PAYGo repayment plan, and the customer uses existing grid electricity. There is no parallel fuel supply chain to manage, no complex installation, and no dependence on biomass feedstock. MCFA has found that technology with simpler supply chains scales faster.

Lessons

- **Electric Cooking Uptake.** Electric cooking is highly scalable, but uptake has been slower than anticipated. Grid reliability and load shedding in some regions have made customers reluctant to rely solely on eCooking. Additionally, variable electricity tariffs can affect affordability. These challenges could be addressed with the right combination of utility partnership, product design, and product socialization.

Case Study 5:

Clean Cooking Alliance (CCA)

KEY CHARACTERISTICS

FUNDER:
Government, philanthropic, corporate, and development finance partners.

TIMELINE:
Founded: 2010

LOCATION:
Global, with country-level delivery support concentrated in Africa and South Asia, including Kenya, Sierra Leone, and Nepal

TECHNOLOGY SCOPE:
All-fuels approach supports clean cooking solutions, including electric, LPG, biogas, ethanol, and biomass (high tier), which meet relevant health, emissions, efficiency, and safety standards.

MODEL TYPE:
Systems approach: government delivery capacity; policy and standards; market intelligence; carbon integrity; enterprise and investor support; user insights; global convening; and leadership networks.

Role in sector:
Strengthens the policies, markets, institutions, evidence, and partnerships needed for country-led clean cooking transitions.

Program Overview and Goals

CCA is the clean cooking sector's leading global convenor and ecosystem builder. Rather than duplicating the work of governments, companies, financiers, researchers, and implementing organizations, CCA brings these actors together and develops shared tools and capacity building support that strengthen the conditions for country-led clean cooking transitions.

Since 2010, CCA and its partners have helped move clean cooking from a specialized development issue toward the center of global energy, climate, health, gender, and economic discussions. The alliance contributed to recent sector milestones such as the 2024 Summit on Clean Cooking in Africa, where governments and private-sector partners announced $2.2 billion in financial pledges; clean cooking's elevation within G7, G20, and Conference of the Parties processes; and the growing recognition of clean cooking as an essential component of national energy, climate, and development planning.

CCA has three connected roles: supporting governments to strengthen delivery; building stronger, more investable markets; and convening and stewarding collaborative global partnerships. Its work spans policy and institutional capacity, standards and testing, carbon-market integrity, enterprise and investor support, market intelligence, user insights, and global advocacy.

CCA's comparative advantage is its contribution to increased access by helping governments and companies overcome policy, market, finance, standards, data, and coordination barriers. Based on program and

partner data reported between 2021 and 2025, CCA estimates that 2.4 million households gained access through activities it facilitated or supported. The estimate reflects CCA's contribution rather than direct service delivery and does not capture the wider indirect effects of its ecosystem work.

Target Markets and Technologies

CCA's Systems Model

CCA operates through three interlocking roles (Table 16), each necessary to move from ambition to sustained implementation at scale.

1 SUPPORTING GOVERNMENTS	2 STRENGTHENING MARKETS	3 STEWARDING THE ECOSYSTEM
• Delivery units • National strategies and implementation plans • Fiscal and regulatory reform • Standards and testing • Institutional cooking • Investment-pipeline development	• Enterprise support • Carbon-market integrity • Market intelligence • Investor resources • User insights • Data platforms • Business-model development	• Global advocacy and convening • Cross-sector partnerships • Shared agenda-setting • Knowledge exchange • Public communications • Leadership networks

Table 16. CCA's Roles for System Support

Technology Approach: Fuel-Neutral and Performance-Based

CCA takes a fuel- and technology-neutral, performance-based approach. It supports governments in selecting solutions appropriate to national circumstances and helps build policy, standards, market, finance, and data systems that can support multiple, context-specific transition pathways.

- **Government support.** Country programs can span LPG, biogas, ethanol, electric cooking, and advanced biomass solutions, depending on infrastructure, affordability, performance, and national priorities.
- **Comprehensive lowered emission assessment and reporting (CLEAR) methodology.** Provides a common framework across multiple cooking-energy transitions, reducing fragmentation among carbon-accounting approaches.
- **Enterprise support.** CCA's Venture Catalyst portfolio includes companies working across a wide range of fuels, appliances, distribution models, and customer segments.
- **User Insights lab.** Research examines how households use and combine different fuels and appliances, helping companies and policymakers respond to real cooking practices rather than assumed behavior.
- **Government delivery.** Clean cooking delivery units pursue priorities set by their host governments; Kenya has emphasized institutional cooking, whereas Sierra Leone's strategy spans several clean cooking pathways.
- **Standards and testing.** CCA supports performance-based standards and national testing capacity; for example, Nepal's 2025 criteria for electric pressure cookers and infrared hobs.
- **Clean Cooking Catalog.** Provides a global database of available technology and performance information. Data sources are identified, and inclusion does not constitute CCA endorsement.

Primary Approach and Interventions

CCA's comparative advantage lies in connecting actors and building shared sector infrastructure. Its work does not replace product distribution, fuel supply, project finance, or government implementation. Instead, it addresses the coordination, policy, information, capacity, and integrity gaps that prevent those activities from reaching scale.

Government Delivery and Policy Support

Clean cooking cuts across energy, health, environment, education, finance, gender, and local government portfolios. Responsibility is often fragmented, making implementation difficult. CCA supports country-owned, government-hosted clean cooking delivery Units that provide dedicated coordination and technical capacity. Host governments determine each unit's mandate and priorities, and CCA supports design, technical assistance, partnerships, and peer learning.

COUNTRY	SUPPORT
Sierra Leone	CCA supported the establishment of the Clean Cooking Delivery Unit within the Presidential Initiative on Climate Change, Renewable Energy, and Food Security. The unit works across government and the private sector to advance national priorities. In 2025, Sierra Leone launched its first National Clean Cooking Strategy, led by the Ministry of Energy with World Bank and partner support; the strategy recognized the unit's role in stakeholder coordination. Sustained policy engagement by the unit also contributed to duty reforms adopted through the 2026 Finance Act for specified clean cooking technologies.
Kenya	CCA supported the Clean Cooking Delivery Unit in the Office of the Special Envoy for Climate Change. In 2025, the unit hosted a high-level summit with more than 250 participants focused on financing institutional clean cooking. The summit concluded with the Nairobi Action Plan, a roadmap for transitioning public institutions by 2028. The unit has since supported government coordination, evidence development, and an investment case for schools, hospitals, correctional facilities, and other institutions.
Nepal	CCA has worked with government and sector partners in Nepal for more than a decade. This effort includes a 2022 Country Action Plan and an Asian Development Bank–supported project implemented with the Nepal Electricity Authority and local partners. In 2025, Nepal's standards body approved national criteria for electric pressure cookers and infrared hobs. Digital monitoring within the project has also generated evidence on appliance use to inform future program design and performance assessment.

Table 17. CCA Country Collaborations

Investable Markets: Supporting Enterprises, Investors, and Policymakers

Universal access to clean cooking requires viable companies and supply chains, predictable policy, informed investors, and financing suited to different stages of market development. CCA's market-strengthening work reduces information, capability, and coordination barriers rather than investing directly in every enterprise:

- **Venture catalyst.** Partnering with 27 leading companies, CCA delivered more than 80 tailored projects across 19 countries, addressing business models, operations, sales, customer acquisition, digital systems, investment readiness, and market expansion.
- **Cohort-based enterprise support.** Accelerator and incubator programs provide diagnostic support, technical training, and project structuring for early-stage enterprises, including companies preparing to engage with carbon finance.
- **Digital Innovation Challenge.** Supported four winning companies developing digital solutions to market barriers through technical assistance, network access, and catalytic funding.
- **Business and investor tools.** The Unit Economics Toolkit and related resources help enterprises and investors test assumptions, understand cost drivers, and compare commercial pathways across markets. Webinars and convenings help investors understand clean cooking business models, the roles of blended and carbon finance, and the risks that require careful due diligence.
- **Industry intelligence.** CCA's Industry Snapshot series and Market Intelligence Hub consolidate self-reported company data, public information, and analytical resources to identify trends and reduce information asymmetries.
- **Policy and financial-system support.** CCA works with government counterparts and financial-sector actors to identify regulatory and financing conditions that can improve market entry, investment, and responsible use of carbon revenues. CCA collaborated with regulators in Kenya to identify supportive policy options and delivered a carbon market training for policymakers in Sierra Leone, working through the countries' respective Clean Cooking Delivery Units. Similar regulatory work is ongoing in Nigeria.

Carbon-Market Integrity: Building Shared Infrastructure

Carbon finance is an important source of capital for many clean cooking companies, but its long-term value depends on credible emissions accounting, transparent practices, fair treatment of households, and buyer confidence. CCA plays a leading coordinating role, bringing together standards bodies, governments, project developers, researchers, buyers, and civil society to develop shared integrity tools, including:

- **CLEAR methodology.** The CCA-led Clean Cooking and Climate Consortium developed the CLEAR methodology. CLEAR is the first methodology to cover all common cooking transitions in a single framework, the first created as a public good (available to any standards body), and was developed in collaboration with 250+ stakeholders and incorporating more

than 1,400 public comments. As of December 2025, CLEAR is available for use and is being integrated into standards and projects worldwide.

- **Principles for responsible carbon finance and interim code of conduct.** Endorsed by more than 180 organizations, the principles establish shared expectations around integrity, fairness, transparency, and sustainability. The Interim Code of Conduct translates the principles into practical actions for project developers. Eight organizations piloted the code in 2025, providing evidence for refinement and wider application.
- **Buyer's guide and data resources.** The Buyer's Guide to High-Quality Cookstove Carbon Credits helps companies and investors assess quality and engage responsibly. The Cooking Energy Data Hub and related public resources strengthen the evidence available for project design and methodology application.
- **Capacity building.** CCA has supported financial institutions, regulators, and policymakers in Kenya and Sierra Leone to understand the opportunities, requirements, and risks associated with clean cooking carbon finance.

User Insights Lab: Keeping People at the Center

Clean cooking transitions succeed only when solutions fit people's daily lives and remain affordable, reliable, and useful over time. CCA's User Insights Lab combines ethnographic research, behavioral science, market research, and design methods to create practical public tools for companies and policymakers, including:

- **The People Insights Portal.** Translates in-depth research with Kenyan households into guidance for product design, customer service, marketing, and consumer engagement, initially focusing on electric pressure cooker use in Nairobi.
- **Fuel-stacking analysis.** Helps companies understand why households continue to use multiple stoves and fuels and what changes could support more consistent use of cleaner solutions.
- **Customer and market tools.** Research on efficiency labels, customer experience, affordability, and informal influence networks helps organizations design services that reflect how people make cooking decisions.

Global Convening, Advocacy, and Leadership

CCA and its partners have helped move clean cooking closer to the center of international energy, climate, health, gender, and development discussions. CCA's distinctive role is to connect political momentum with country priorities, shared evidence, practical tools, and the organizations responsible for delivery, including:

- **Global agenda-setting and coordination.** CCA convenes governments, companies, financiers, researchers, implementers, and civil society to align around shared priorities and connect international commitments with country action. Its role is not to own delivery, but reduce fragmentation and ensure that evidence, practical tools, and country experience inform sector-wide decisions.
- **G20.** CCA and partners supported clean cooking's inclusion in the 2020 G20 Energy Ministers' Communique. Under South Africa's 2025 presidency, clean cooking became a standing item in G20 energy discussions and members adopted a voluntary action plan focused on infrastructure investment and technology deployment.
- **Summit on Clean Cooking in Africa.** CCA provided technical and coordination support to IEA and co-hosts of the 2024 summit, wherein governments and private-sector partners announced $2.2 billion in pledges. CCA continues to support follow-through and preparations for the next high-level convening.
- **COP and climate policy.** Clean cooking was explicitly referenced in an official COP30 outcome. CCA's 2026 NDC tracker provides a common evidence base on how 131 low- and middle-income countries address cooking in their national climate plans.
- **Women in Clean Cooking.** Jointly implemented with SEforALL and the Global Women's Network for the Energy Transition, the mentorship program has supported more than 240 women through mentorship, career development, technical learning, and peer connection since 2021.

Strategic and global partners	International organizations, governments, and sector platforms that connect clean cooking with wider energy, climate, health, gender, food systems, and development agendas. CCA works with these partners on evidence, policy dialogue, technical exchange, and global convening
Government partners	Government counterparts in Kenya, Sierra Leone, Nepal, and other priority markets, including presidential offices, energy ministries, regulators, standards bodies, utilities, education and health agencies, and local authorities
Development finance	World Bank/ESMAP, Asian Development Bank, African Development Bank, Nefco, and other development-finance partners supporting policy, investment, enterprise, and country-delivery activities
Carbon methodology and integrity	Clean Cooking and Climate Consortium; carbon standards and Article 6 institutions; International Emissions Trading Association; Stockholm Environment Institute; project developers, buyers, researchers, and the Responsible Carbon Finance Advisory Council
Enterprise and investor support	Clean cooking enterprises, technical service providers, investors, banks, and financial regulators engaged through the Venture Catalyst, accelerator and incubator programs, market-intelligence tools, and finance-focused convenings
Data and research	Research organizations, universities, testing laboratories, market-research partners, and data providers supporting public evidence on technologies, markets, consumers, climate impacts, and enterprise performance
Standards bodies	ISO Technical Committee 285 on Clean Cookstoves and Clean Cooking Solutions and national standards and testing institutions, including Nepal's standards body, which support performance-based criteria, laboratory protocols, and quality assurance
Women's leadership	Sustainable Energy for All and the Global Women's Network for the Energy Transition, which jointly implements the Women in Clean Cooking mentorship program with CCA
Global advocacy partners	Clean Energy Ministerial and Fueling Lives partners, G20 and COP stakeholders, international organizations, civil-society groups, private-sector associations, and global champions working to elevate clean cooking within broader agendas
Broader ecosystem	A global network of governments, companies, financiers, researchers, implementers, community organizations, and development partners that contribute specialized expertise and country experience.

Table 18. Key Implementing Partners and Stakeholders

CCA's distinctive partnership model is designed to complement, not displace, implementing organizations. CCA provides neutral convening and shared infrastructure–including methodologies, standards, market intelligence, policy tools, and leadership networks–that partners can use, adapt, and improve. Because its comparative advantage is at the ecosystem level, CCA assesses its contribution through stronger policies, institutions, markets, coordination, and public goods rather than claiming direct credit for all households reached or finance mobilized across the sector.

Progress and Impacts To Date

2.4M	$196M	180+	98	80+
Households estimated to have gained access through CCA-supported activities, 2021–2025	Investment in companies tracked by CCA (2024)	Organizations endorsing the Principles for Responsible Carbon Finance	Countries with clean cooking or broader household energy measures in NDCs mapped by CCA's 2026 tracker	Tailored enterprise-support projects delivered across 19 countries

Selected Examples of Ecosystem Reach and Access-Enabling Contribution

Based on program and partner data reported between 2021 and 2025, CCA estimates that 2.4 million households gained access to clean cooking through activities it facilitated or supported. Key clean cooking activities include:

- **Country delivery.** Government-led delivery units and country partnerships helped advance national strategies, duty reforms, institutional cooking plans, standards, and implementation evidence in Sierra Leone, Kenya, and Nepal. CCA describes these as contributions to government-led outcomes rather than results attributable to CCA alone.
- **Global policy and evidence.** CCA and partners contributed analysis, advocacy, and convening to clean cooking's elevation in G20 and COP processes. CCA's 2026 NDC tracker maps the active climate plans of 131 low- and middle-income countries; 98 include clean-cooking-specific or broader household energy measures. The tracker provides a common evidence base for advocacy, investment, and accountability but does not imply that CCA caused those national commitments.
- **Shared carbon market infrastructure and public goods.** CLEAR, the principles, Interim Code of Conduct, Buyer's Guide, and data resources provide common tools that standards bodies, governments, companies, investors, and civil society can use to improve the integrity and consistency of clean cooking initiatives. CCA presents adoption and sector outcomes as shared progress, not as results attributable to CCA alone.
- **Market intelligence and user data.** The Industry Snapshot, Market Intelligence Hub, People Insights Portal, and user-research tools translate company, market, and household data into practical resources. These tools reduce duplication and help enterprises, investors, and policymakers make better-informed decisions while clearly identifying data limitations.
- **Women's leadership.** Since 2021, the Women in Clean Cooking mentorship program has supported more than 240 women across Africa, Asia, and the Caribbean, strengthening professional networks and the pipeline of women contributing to the sector as entrepreneurs, engineers, researchers, advocates, and public officials.

Key Success Stories and Lessons Learned

Successes

- **The Delivery Units model.** The single most persistent structural barrier to clean cooking progress at the national level has been diffuse responsibility across too many government institutions. CCA's Delivery Units model (embedding small, expert, well-resourced teams within the highest levels of government) directly addresses this. The results in Kenya and Sierra Leone in 2025 are compelling: a first national clean cooking strategy, import duty removal on certain technologies, an institutional investment roadmap, and carbon market policy frameworks—all achieved in a single year of operational delivery unit support. The model is replicable, and CCA's delivery units network is designed to scale it across Africa and beyond.
- **Building sector infrastructure.** CCA's investment in sector-level public goods (the CLEAR methodology, the Principles for Responsible Carbon Finance, Code of Conduct, Buyer's Guide, Cooking Energy Data Hub, Clean Cooking Catalog, and Market Intelligence Hub) creates value that compounds across the entire sector. No single implementing program could afford to build these assets; CCA's convening role and scale make them possible.

- **Institutional markets are the most underexploited route to scale.** CCA's 2025 work in Kenya identified an insight that the sector has been relatively slow to act on: schools, hospitals, and prisons have predictable, high-volume, daily cooking demand that is visible and easy to aggregate. Unlike household markets, where adoption is fragmented across millions of individual decisions, institutional markets offer the demand consistency needed to justify significant infrastructure investment and attract commercial finance.
- Customer-centered approaches. Research by the User Insights Lab is identifying customer experience challenges far beyond what companies can see on their user dashboards. Although some findings require a technical fix, in many cases, minor adjustments in customer service offerings could make a notable difference in how much households use clean cooking technologies, and how informal networks are leveraged to promote wider adoption.

Lessons

- **Speed of sector growth.** Despite extraordinary progress, approximately 2.8 billion people still lack access to clean cooking. In sub-Saharan Africa, the scale of the challenge is growing as population growth outpaces access gains in some markets. Scaled and sustained clean cooking implementation remains a challenge even as the underlying lesson remains the same: widescale, systemic change—not small, isolated projects—are the only way to achieve universal access.
- **Carbon market volatility creates risk as well as opportunity.** The concentration of clean cooking investment in carbon-credit-issuing companies (96% in 2024) creates both a source for growth and a vulnerability. If carbon market confidence falters, due to integrity concerns, regulatory uncertainty, or buyer market dynamics, the sector's financing model could be severely disrupted. CCA's heavy investment in integrity infrastructure (e.g., CLEAR, Code of Conduct, Buyer's Guide) is the right strategic response; expanded partnerships are key to ensuring these tools are widely adopted and have the desired effect.

Case Study 6:

Modern Energy Cooking Services (MECS)

KEY CHARACTERISTICS

FUNDER:
United Kingdom Foreign, Commonwealth & Development Office (FCDO) — UK Aid

Lead Implementer:
Loughborough University; World Bank ESMAP and CLASP

BUDGET:
Total programmed budget from 2018 to 2030 is just under £80 million. The program is part of the £1 billion Ayrton Fund for clean energy innovation.

TIMELINE:
2018–2026

LOCATION:
Global but with a focus on sub-Saharan Africa, South Asia, and Indo-Pacific.

TECHNOLOGY SCOPE:
ISO Tier 4–5: Energy-efficient electric appliances (e.g., Electric Pressure Cookers, induction stoves, rice cookers, air fryers); biogas; ethanol; bio-LPG; LPG; hydrogen; ISO Tier 5 gasification stoves, solar thermal stoves.

MODEL TYPE:
Decentralized; research, policy influence, and market development plus in-country demonstrators (Uganda, Tanzania) and challenge funds.

Program Overview and Goals

The MECS program was launched in 2018 by the United Kingdom (UK) Foreign, Commonwealth & Development Office (FCDO) as the lead modern cooking initiative under the Ayrton Fund for clean energy innovation, part of the United Kingdom's International Climate Finance portfolio. Its goal was to break the cycle in global clean cooking advocacy wherein decades of investment in improved biomass stoves had failed to deliver meaningful health, climate, or gender outcomes at scale. MECS has targeted rapidly accelerating transitions from biomass to genuinely 'clean' cooking across the full range of higher-tier technologies.

Although MECS strongly promotes nationally owned multifuel approaches to clean cooking, it realized that the significant investment in increasing electricity access (SDG7.1.1) could potentially be leveraged to include transitions to modern energy cooking. It has built a particularly strong case for energy-efficient appliances that when coupled with grid electricity (where available) offers a lower monthly cost than other urban and peri-urban commercially available fuels for cooking. More recently, there is a growing body of evidence that the increased affordable demand created by cooking with electricity improves the investment returns made into electricity access infrastructure. As a result, MECS has advocated for effective inclusion of cooking loads in an integrated energy and electricity planning across sub-Saharan Africa and Asia. Measurement of electricity use has helped improve the global approach to carbon finance offering greater verification of sustained use.

Led by Loughborough University, CLASP, and ESMAP, MECS generates and applies policy relevant research to support governments and key stakeholders to integrate modern energy cooking into national strategies and planning. It funds feasibility studies, pilots, and demonstrations of clean cooking technologies and

business models and supports scaling of appliance manufacturing and distribution through venture-led research and development (R&D). It also contributes to global market shaping initiatives, including the World Bank Clean Cooking Fund, to unlock public and private investment in the sector.

Since 2024, many of MECS' key learnings on the potential for scaling electric cooking have been embedded within the development of two larger-scale strategic interventions (or demonstrators) for scaling eCooking, which have been delivered in collaboration with the Energy Ministries of Tanzania and Uganda.

Target Markets and Technologies

2.1 Billion

Global target population lacking clean cooking.

Tier 4–5

Technology standard supported.

The MECS 40, 60 by 2030 Challenge

Calls for 40% of all households connected to grid or off-grid electricity to be using it for cooking by 2030, and 60% of households using modern energy for cooking to be generated from low-carbon sources by 2030.

Global Electric Cooking Coalition eCooking Target

Transition to eCooking solutions in at least 10 countries in sub-Saharan Africa, Asia, and LAC by 2030 for a significant (>10%) proportion of households and institutions.

Technology Portfolio

Although MECS is best known for its work on electric cooking, its portfolio covers the full spectrum of higher-tier cooking technologies. Activities range from detailed academic analyses of the clean cooking sector and the wider energy landscapes it is situated within globally, nationally, and locally, through multifuel clean cooking strategy development to detailed analysis of specific technology markets and policy challenges including work on LPG, bio-LPG, biogas, bio-ethanol, solar thermal, high-quality gasifier stoves, and even hydrogen. Nevertheless, MECS is associated with the recent emergence of electric cooking as a viable and rapidly scalable clean cooking solution. The evidence generated by the program consistently points to energy-efficient electric appliances as a viable, cost-effective, and climate- and health-positive solution for grid-connected and minigrid households.

Key learnings include the following:

- By avoiding combustion, eCooking eliminates indoor air pollutants, which liquid or gas fuels still produce and are harmful to health.
- Modern eCooking appliances are more efficient and use less energy than LPG or traditional biomass. Cooking with an electric pressure cooker (EPC) can use 4 times less energy than LPG and 15 times less energy than charcoal.
- Efficient eCooking appliances are typically cheaper to cook with than commercially traded solid fuels (although not collected firewood). The exact savings depend on the baseline type of stove, foods cooked, and local fuel prices but can be substantial, particularly for 'long cook' dishes, such as bean and stew staples.
- Efficient eCooking appliances offer quicker cooking times (in some cases 50% less), automation (avoiding the need for monitoring and enabling multitasking), have no open flames (reducing injury risks), and remove the need for fuel collection, purchasing, or transport.
- Electric cooking enables high-integrity and high-value carbon credits via digital metering and the gold standard metered methodology. Sharing carbon revenues with cooks can enable adoption and sustained usage even among low-income households.
- Electric cooking has a mutually reinforcing relationship with electrification, generating demand and productive use of energy for utilities, which can improve return on investment for expanding electricity infrastructure.

MECS technology for eCooking includes:

Electric Pressure Cookers or EPCs. These devices reduce cooking energy by up to 70% versus open-fire biomass. Suitable for beans, stews, and rice—the core of most East African diets. Savings are made by controlling energy input, and insulating the pan, even when pressure is not used. Lab and field testing across multiple countries confirmed efficiency and cultural acceptability.

- Induction hobs and infrared hotplates. The best solutions for short-duration high-heat cooking such as frying and sautéing but are suitable for most cooking tasks.
- Rice cookers and air fryers. Increasingly viable as a complement to EPCs, with air fryers gaining particular traction in emerging markets.

- Other electric cooking appliances with variable significance in individual markets include electric frying pans, microwaves, slow cookers, injera stoves, electric barbecues, and a variety of breadmakers, including electric chapati makers.
- Electric kettles are a frequently overlooked electric cooking appliance.
- There is also a growing range of institutional and commercial electric cooking appliances being deployed including larger-scale EPCs; induction woks; commercial electric boiling pans (tilting kettles); electric combi ovens; electric griddles, fryers, and grills; and electric steamers. Institution and commercial cooking often occur during the day, thus creating demand outside the peak load evening hours.
- MECS research has also shown the growing opportunities for solar-home-system-integrated eCooking including support for the development of direct current appliances: demonstrating eCooking viability particularly where integrated into wider income-enhancing interventions like solar irrigation.

Primary Approach and Interventions

Foundational Research and Training

MECS, funded by the UK government, has become recognized as a leading global research and innovation program on the multiple complex dynamics of clean cooking and has conducted research on a wide range of topics to inform and influence a transition to modern energy cooking globally. It has also worked with key global partners to embed the latest thinking across the wider clean cooking community and beyond. Key accomplishments include:

- Key landmark publications include The State of Access to Modern Energy Cooking Services (ESMAP 2020) which defined a new multitier framework to measure and accelerate clean household energy transitions globally and Cooking with Electricity: A Cost Perspective (ESMAP 2020), which presented the case for the affordability of electric cooking solutions across multiple geographies.
- MECS' thinking on multifuel approaches to national clean cooking planning provides the foundation for the approach developed in the African Energy Commission's (AFREC's) 2024 publication, Sustainable Scaling: Meeting the Clean Cooking Challenge in Africa, which promotes the incorporation of clean cooking into core national energy transition policies rather than treating it as an isolated issue.
- Beyond these strategic interventions, MECS has produced more than 450 research papers covering the full range of key clean cooking topics. Particularly influential reports focused on incorporating eCooking into electricity planning; understanding behavioral change in clean cooking adoption; piloting experiences of different eCooking technologies and approaches; carbon finance; approaches to RBF; health impact methodology development; black carbon measurement and methodology development; and cooking cultures and the relative costs of cooking with different fuels.
- MECS has also supported the development of a series of planning support tools (e.g., those developed by ESMAP) and is working on national integrated energy planning approaches inclusive of clean cooking.

Technology Accelerators

MECS has implemented a series of technology accelerators that have funded leading developers, and entrepreneurs to solve key performance and cost challenges that act as barriers to the commercialization and scale-up of modern cooking innovations. These technology accelerators use a competition-based approach to drive new ideas and performance. Since 2018, MECS has launched 10 technology accelerators, supporting 69 research and innovation projects, and stimulating R&D of more than 100 novel clean cooking technologies and business models. Specific accelerator challenge fund programmes have included:

- **MECS-TRIID:** Multifuel focused on early-stage, small-scale research, turning bold ideas into pilot-ready concepts; ECO: Supported pilot studies and market assessments across multiple countries to scale up electric cooking. COSMO: Explored integration and resilience of e-cooking loads within solar and AC mini-grids. MECS-SC2 (Sparking the Cooking Supply Chain): Targeted the distribution and supply chain activation of thousands of energy-efficient electric cooking appliances. STARSS: Tested stand-alone and rooftop solar configurations paired with clean cooking devices

MECS is also currently targeting interventions within institutional settings (including nonschool settings [e.g., prisons, feeding centres in camps] exploring infrastructure development, appliance development, payment mechanisms, and ongoing costs for the emerging institutional eCooking sector); eCooking in commercial settings and further work on alternative liquid fuels (e.g., bio-LPG, biogas, hydrogen, ethanol).

The MECS Investment Portfolio

In 2024, CLASP was incorporated into the MECS program as its third Tier 1 partner to provide venture building R&D support. Through CLASP, MECS provides business development support to promising venture studios, investors, and individual companies in the eCooking space around user preferences, product performance, market entry, and investor readiness. The intent is to build up pioneering "lead firms" delivering access to modern energy cooking that are capable of leveraging private capital, achieving impact at scale, and shifting whole markets including public, investor, and policymaker perceptions. MECS investment portfolio includes:

- Three high-potential, early-stage clean cooking companies have been identified and onboarded with a number of additional companies across varied geographies currently being assessed for support. Each will receive tailored business-relevant R&D grants and complementary technical support.
- CLASP is also working with venture studios to launch new locally led businesses focused on eCooking solutions spanning technical and market mapping; design and prototype development; lab and field testing; and user experience research.
- CLASP also runs an investor network through the FCDO-funded Low Energy Inclusive Appliance that presents targeted investor educational materials pertaining to the eCooking sector to more than 40 investors on a quarterly basis.
- Early engagement with companies such as BURN manufacturing and ATEC bio have led to scaled deployment of tens of thousands of induction stoves with built-in digital monitoring to provide verifiable data to access carbon financing. For BURN, the support for manufacturing along with their Tier 3 fuelwood stove, has led to 7.4 million stoves deployed, with 81 million tonnes saved of carbon dioxide equivalent across 10 countries. A number of similar companies are emerging across the MECS countries.

MECS Market-Building Activities

MECS has also been supportive by providing opportunities to convene on the emerging eCooking sector and developing new approaches to financing clean cooking with a particular focus on carbon finance. Their market-building activities include:

- The Global Electric Cooking Coalition (GeCCo) is an initiative launched at COP28 in Dubai by MECS and SEforALL, as well as the Global Energy Alliance for People and Planet and Energizing Development, to mobilize finance and accelerate electric cooking use in at least 10 countries in Africa, Asia, Latin America, and the Caribbean over the next 7 years. MECS currently acts as the secretariat for GeCCo.
- ESMAP as a Tier 1 partner of MECS hosts the ESMAP Clean Cooking Fund—a $500 million World Bank Fund that is the first-ever fund to scale-up investments in the clean cooking sector and aims to scale-up public and private investments by co-financing World Bank and other multilateral development bank lending operations, encouraging technology and business innovation, and linking incentives with verified results.
- MECS commissioned and supported the development of the gold standard methodology for Metered & Measured Energy Cooking Devices, including subsequent refinements (v1.1 and v1.2). It also contributed technical evidence that informed the evolution of Verra VM0050 (Energy Efficiency and Fuel-Switch Measures in Cookstoves) and developed the MECS Metered Methodology for Article 6 to extend metered approaches to compliance markets.
- A focus of MECS/ESMAP collaboration centres around the incorporation of the latest approaches to outcome finance (including that related to carbon, health, gender, forestry, biodiversity and super pollutants) within World Bank clean cooking interventions. This is being developed under the UK's Pioneer Outcome Fund and an associated UN Climate and Clean Air Coalition-funded project focusing on embedding MECS knowledge within World Bank operations in Africa and South Asia.
- MECS has supported multiple International organizations through technical and policy advice and provided technical and policy advice to national ministries including support for national clean cooking and eCooking strategy development (e.g. in Kenya, Uganda, Tanzania, Nepal, Malawi, and Laos).

- An emerging area of work involves the convening of energy sector regulators and national utilities around the demand enhancement potential of electric cooking loads and their implications for tariff design, grid strengthening, and national forecasting. The success of an on-bill financing pilot in Tanzania (see callout) is generating significant interest.

On-Bill Financing: A Sector First

TANESCO's on-bill financing scheme, Konekt Umeme, Pika kwa Umeme, piloted with MECS in 2025 and launched officially by TANESCO in June 2026, is a landmark innovation for the clean cooking sector in Africa. Rather than relying on microfinance institutions or PAYGo companies, the utility enables customers to acquire eCooking appliances by paying a deposit and then repaying through a percentage of their electricity token purchases. This approach removes the need for a separate credit product and leverages the existing billing relationship between the utility and its 5 million customers. The pilot initially targeted Tier 1 (normal domestic) tariff customers before expanding. This approach was designed to include rural and lower-income households over time. The target is to reach 1 million customers by 2029.

Country Demonstrators

In 2023, a £15m extension to the program was announced at COP28 in Dubai to facilitate demonstrators of clean cooking innovations to be funded by FCDO country posts. Two of those demonstrators have now been implemented: one in Tanzania and one in Uganda (two of the countries where MECS had built a sizeable evidence base over the preceding years).

TIMELINE	ACTIVITIES
2018–2024	Predemonstrator MECS Research and Coalition building: evidence generation; policy engagement; minigrid and solar home system pilots; market ecosystem mapping
May 2024	Tanzania launches its National Clean Cooking Strategy 2024–2034, a major policy win influenced in part by MECS advocacy
2024–2026	Phase 1: Tanzania eCooking Scale and Support Program: £3.5m, 6 workstreams, 16 contracted delivery partners
2025	TANESCO becomes the first utility in Africa to enable customers to pay for eCooking appliances through on-bill financing.

Table 19. Case Study: Tanzania Demonstrator

In Tanzania, the eCooking demonstrator program has been organized around six coordinated workstreams that address the full 'jigsaw' of what is needed to accelerate a sustained cooking transition: enabling environment, supply chain, and consumer demand.

WORKSTREAM	DESCRIPTION
1. National awareness campaign	Fern Consulting, a professional Tanzanian marketing firm, ran a national awareness campaign using social media, influencers, radio, and TV. The campaign was endorsed by the Ministry of Energy and aligned with the National Clean Cooking Communication Strategy and directly addressed the widespread misconception that clean cooking is unaffordable.
2. TANESCO eCooking program	MECS supported Tanzania's national utility TANESCO and knowledge partner TaTEDO-SESO to create eCooking champions among TANESCO's 6,000 staff, who then advocated within their communities. Most significantly, TANESCO piloted on-bill financing in 2025, and launched it as their own program in June 2026, becoming the first utility in Africa to enable customers to pay for eCooking appliances in a new way. Customers pay a deposit, then repay gradually as they purchase electricity tokens. This approach directly addresses the up-front cost barrier.
3. Institutional eCooking (schools)	In partnership with the WFP and SEforALL, MECS is transitioning 36 government-run primary schools to eCooking, with a longer-term target of 200 schools. The National Carbon Monitoring Centre is exploring how carbon financing can support and fund this institutional transition to create a replicable model for scaling institutional clean cooking.
4. Repair and maintenance	As the eCooking market grows, after-sales service is critical to ongoing use. MECS has developed a training curriculum with Vocational Education and Training Authority (VETA) and National Council for Technical and Vocational Education and Training (NACTVET) to certify technicians nationally with 460 technicians trained so far. FixChap's app-based platform connects these technicians, creating accessible, professional repair services across Tanzania.
5. Quality and standards	Working with the Tanzania Bureau of Standards, MECS has developed draft minimum energy performance standards for EPCs, induction hobs, and rice cookers, in addition to a safety standard for air fryers and a consumer labeling process.
6. Sustainable supply chains	Two seed funds have supported supply chain development: one for early-stage new market entrants, another for experienced eCooking distributors. MECS is working with other partners (e.g., UN Capital Development Fund) to develop a commercially sustainable supply chain that can grow in parallel with rising consumer demand.

Table 20. The Six Workstreams

Looking Forward

The Tanzania Demonstrator has recently been extended for an additional year. Activities to be delivered include: a smart meter study wherein MECS is collaborating with TANESCO to determine whether existing smart meters can detect eCooking behavior (a low-cost digital MRV approach that could enable real-time tracking of eCooking adoption on a national scale without dedicated monitoring hardware) and a nationwide series of live demonstrations and roadshows directly addressing cultural and perceptual barriers to eCooking adoption, complementing the mass media awareness campaign of the initial phase.

Key Implementing Partners and Stakeholders

Lead organizations	Loughborough University (Centre for Sustainable Transitions: Energy, Environment, and Resilience (STEER)), ESMAP, and CLASP joint research and program delivery
Funder	UK FCDO via the £1 billion Ayrton Fund
Funding type	Grant funding (research and innovation program)
Government partners	Multiple; the most important include Kenya (supported development of National Clean Cooking Transition strategy), Tanzania, and Uganda (collaborative Demonstrator programs), Malawi (supported eCooking roadmap), India (state-level collaborations under the Accelerating eCooking Uptake in Africa and South Asia (ACUASA)), Rwanda (ACUASA collaboration on institutional eCooking), and Nepal; GeCCo country members as of July 2026: Uganda, Laos, Somalia, Sierra Leone, Nigeria, Rwanda, Burundi, Kenya, Madagascar, Malawi, Ethiopia, and Kerala State, India
Development finance	ESMAP provides deep ties into all aspects of World Bank programming including ASCENT and Mission 300, and strong collaboration with the African Development Bank (helped secure $20 million of investment in eCooking in projects across Kenya, Tanzania, and Uganda)
Supply chain	Long-term engagement with multiple companies via the MECS Challenge funds and CLASP's venture investment portfolio; CLASP has strong engagement with capital providers such as Acumen, Shell Foundation, Persistent Energy, Manufacturing Africa, Trade and Development Bankk, and Equity Bank under their investor network; MECS partnership with Lightrock in development of the Sampa bulk-purchasing platform; emerging engagement with global eCooking appliance manufacturers in Turkey, India, and China
Standards bodies	Growing partnership with the International Electrotechnical Commission
Wider MECS research and innovation community	MECS' work has directly informed clean cooking developments in more than 25 countries. The 10 technology accelerators have supported 69 research and innovation projects, stimulating research and development of more than 100 innovative clean cooking technologies and business models in partnership with multiple businesses, research institutions, and other organizations. Innovative communication channels such as the Kenya-based eCooking community of practice WhatsApp group (currently nearly 750 members) provides ongoing support and interaction.

Table 21. MECS Global Program

In-country lead	Tanzania: Ministry of Energy, Clean Cooking Unit (policy and coordination)
Utility partner	TANESCO: on-bill financing, staff awareness campaign, smart meter collaboration
Institutional	WFP and SEforALL: schools eCooking transition (50–200 primary schools)
Standards body	Tanzania Bureau of Standards: minimum energy performance standards development and consumer labelling
Tech/vocational	FixChap; VETA and NACTVET: technician training curriculum integration
Marketing	Fern Consulting: National Awareness Campaign
After-sales/tech	FixChap: curriculum development, delivery of training sessions, app-based technician network for eCooking repair
Carbon finance	National Carbon Monitoring Centre: carbon credits for institutional eCooking
Supply chain	Seed fund grantees (four major distributors + seven SME start-ups as of Phase 2 workshop)
Community engagement	Community engagement is embedded across workstreams. TANESCO's 6,000 staff serve as grassroots eCooking ambassadors within their communities. The roadshow and demonstration program reaches households directly. FixChap's technician network creates local employment while extending consumer trust and appliance longevity.

Table 22. Tanzania Demonstrator Case Study

Progress and Impacts To Date

4.5M	$80M	2.5M tons
people reached with stoves	program spend to date has	of emissions CO_2 equivalent saved to date

Examples of MECS impacts include:

- MECS has conducted a variety of cooking diary studies, kitchen lab appliance testing, market assessments, and field pilots across multiple countries since 2018, generating one of the most comprehensive evidence bases on clean cooking (and particularly electric cooking) viability in low- and middle-income countries.
- Within this evidence base, it is the work on electric cooking that has had the most impact. Field evidence consistently demonstrates that: (a) most dishes can be cooked on a combination of modern eCooking appliances; (b) modern eCooking appliances use less energy than alternatives (cooking with an EPC can use 4 times less energy than LPG and 15 times less energy than charcoal); (c) efficient eCooking appliances are typically cheaper to cook with than solid fuels; and (d) efficient eCooking appliances offer quicker cooking times (in some cases 50% less), automation, safety, and remove the need for fuel collection, purchasing, or transport.
- The MECS gender framework guides program design, ensuring gender considerations are built into demand creation, technology selection, and supply chain development. Time savings from eCooking are a documented benefit: reduced cooking time frees women's time for education, livelihood activities, and rest. MECS field studies have tracked time use changes as part of a cooking diary methodology.
- At the same time, MECS research has recognized the importance of adopting a multifuel approach, supporting solutions such as eCooking, biogas, and bioethanol, along with transitional options (LPG, improved biomass) where appropriate. The multifuel approach is centered on consumer choice, providing options for different market segments to help ensure no one is left behind (e.g., households without reliable or affordable electricity who may not be able to access eCooking). The approach is based on the reality of fuel and stove 'stacking'. Transitions to modern cooking are expected to involve households adopting increasingly 'modern stacks' (i.e., combinations of clean fuel-stove technologies).
- MECS focuses on eCooking within this modern stack because it leverages and amplifies the benefits of global electrification efforts already underway and supports progress across multiple SDGs while aligning with more efficient pathways. MECS's evidence also

demonstrates that when part of electricity planning, the predictable demand of eCooking can enhance the financial return on investment in electricity infrastructure for both grid and off-grid systems, switching from previous expenditure on other fuels. Even with near-full-cost-recovery electricity tariffs, efficient eCooking can result in monthly running costs that are lower than before.

- The structure of MECS's two National eCooking Scale and Support Demonstrator programs in Uganda and Tanzania (six simultaneous workstreams covering awareness, utility partnerships, institutional markets, repair, standards, and supply chains) reflects a hard-won lesson: no single intervention is sufficient. Awareness without appliance availability fails. Appliances without after-sales service fail. Standards without enforcement fail. The coordinated multiworkstream model is more complex to manage but far more likely to create a self-sustaining market as countries look to realize their ambitions for accelerated eCooking transitions.

Key Success Stories and Lessons Learned

Successes include the following:

- MECS's most significant impact lies in its policy influence rather than direct deployment numbers. By systematically building an evidence base and engaging global stakeholders over multiple years, MECS has gradually shifted the global debate on clean cooking. This approach takes time but creates long-term change that outlasts any individual program.
- MECS advocacy for electric cooking has quietly been translated into increasingly tangible results. Ten years ago, few observers would have assigned a significant role to electricity in the future trajectory of clean cooking transitions in Africa. Today, the IEA's latest modeling suggests that, under an accelerated access pathway, electricity could provide clean cooking access to around 17% of people currently lacking it in Africa, with electricity use for cooking increasing by 65 terawatt-hours by 2040—equivalent to around 15% of today's African electricity generation. Other analyses suggest far sharper acceleration as the opportunities are realized. This points to an important underlying shift in how cooking is understood: cooking must be seen not simply as a household energy problem, but as a potential driver of electricity demand, appliance markets, and broader energy-system transformation.
- Finance is beginning to respond to this opportunity. Development banks are increasingly incorporating clean and electric cooking into energy-access, climate, and energy-transition programs. In Uganda, for example, the African Development Bank approved an $8.79 million Uganda biogas and electric cooking project in 2025, with financing from its Climate Action Window in addition to support from the UK and government of Uganda. It has approved similar programs in Tanzania and Kenya and other initiatives are in the pipeline. Meanwhile, eCooking is being featured more heavily in World Bank programming.
- Climate finance and carbon markets are also an increasingly important part of this picture. The emergence of outcome-based instruments offers a way of linking up-front capital to verified climate and development outcomes while carbon revenues can provide an additional income stream for clean-cooking businesses. The World Bank's $200 million Clean Cooking Outcome Bond in Ghana is a particularly significant example: it mobilizes around $30.5 million of private capital for projects expected to provide cleaner cooking to 1.3 million people, including through electric cooking, with part of investors' returns linked to carbon credits generated under Article 6 of the Paris Agreement. As carbon markets place greater emphasis on additionality, transparency, robust measurement and contribution to national goals, eCooking (with its appliance-level electricity consumption and verified changes in fuel use) has the potential to become one of the strongest pathways for developing high-integrity cooking credits at scale. In Asia, carbon finance can leverage existing infrastructure; for example ATEC has implemented the cook-to-earn concept in their project in Bangladesh and Cambodia, enabling households access to clean cooking solutions while generating income through their cooking practices.
- The private sector is consequently becoming more central to the transition. Companies are increasingly active across appliance manufacturing, distribution, consumer finance, energy services, and carbon development while innovative financing models are beginning to shift some of the up-front cost and risk away from households. The role of utilities is particularly important and remains relatively underdeveloped. Electric cooking can represent a significant new source of electricity demand, potentially improving system utilization and creating additional revenues for utilities, but this requires utilities to see cooking as part of their core customer

and demand-management strategies. This shift means incorporating eCooking into load forecasting, tariff design, appliance financing, customer engagement, and grid-planning decisions. It also creates opportunities for utilities and appliance companies to collaborate on targeted incentives and demand-response approaches, particularly where cooking demand can be diverted from system peaks.

- The TANESCO on-bill financing innovation demonstrates that utilities, not just development finance institutions or PAYGo companies, can be powerful delivery channels for eCooking. By embedding appliance financing into the existing prepayment meter system, which 5 million customers already use daily, TANESCO has created a distribution mechanism with national reach and zero additional infrastructure cost. This is a replicable model for any country with a functioning utility and high prepayment meter penetration.
- Together, these developments suggest that the sector is entering a new phase. The question is increasingly not whether electric cooking can work, but where and how it can scale most effectively—and how different forms of capital, policy, and market intervention can be aligned to make that happen. The emerging model is one in which public finance absorbs early-stage risk, development banks help build infrastructure and markets, carbon finance monetizes climate benefits, utilities integrate cooking into electricity-system planning, and private companies deliver products and services to consumers at scale. The challenge now is to turn these promising examples into repeatable market models across the Global South while ensuring that eCooking is deployed where it delivers genuine consumer, system, and climate value along with other appropriate clean-cooking solutions.

Lessons learned include the following:

- **Electric cooking uptake.** Despite strong evidence and growing policy support, consumer adoption of eCooking has perhaps been slower than hoped for across MECS country programs. The primary barriers are interconnected: up-front appliance cost, limited awareness of affordability, and perceived risk of trying a new technology. The comprehensive MECS Demonstrator programs in Uganda and Tanzania with their focus on on-bill financing; supply chain development; awareness campaigns; roadshows; standards and certification; and repair and maintenance directly respond to these barriers—but they also demonstrate that progress will require a sustained, multiyear effort.
- **Grid reliability.** Electric cooking requires reliable power. In areas where electricity is intermittent, households cannot depend on eCooking as their primary cooking method. Most households retain their old stoves, and so fuel stacking can overcome grid outages. MECS's research has addressed this through battery-supported eCooking pilots and solar-home system integration, but grid quality needs to improve rapidly along with eCooking promotion for the model to work at scale across peri-urban and rural areas.
- **Supply chain vulnerabilities**. Early pilots in Tanzania and other countries revealed that spare parts availability and after-sales service were weak links. Without technicians who can repair EPCs, households revert to biomass when appliances fail. MECS's investment in the FixChap technician network and national vocational curriculum design within the Demonstrators program is a direct response.
- **Challenges of institutional cooking.** Transitioning institutions to eCooking is a relatively recent addition to the MECS portfolio. School transitions under the MECS Demonstrators have proven more complex and costly than anticipated; due, for example, to the need to upgrade electrical infrastructure and improve kitchen security, highlighting the need for early, multistakeholder engagement. Diverse financing mechanisms and local capacity building are essential for ongoing delivery but the opportunities for innovative partnerships between government departments, financiers, appliance/project developers, and utilities are immense.
- **Unlocking consumer acceptance.** Early resistance to eCooking from some observers centered on concerns about whether electric appliances could cook local dishes and whether pressure cooking affected taste. MECS has invested heavily in cooking diaries, cookbooks, and live demonstrations. Evidence that most local dishes can be cooked on EPCs and induction hobs was essential to unlocking consumer acceptance, and the MECS cookbooks and other awareness-raising activities have become widely used tools for encouraging behavior change.

Section 3: Lessons Learned, Gaps, and a Way Forward

The clean cooking sector has developed well past the proof of concept. The case studies presented demonstrate that RBF, blended capital stacks, carbon credit methodologies, and digital monitoring are now reasonably understood and increasingly standardized across implementers. Though the programs presented have substantial differences in their structures—a bilateral research program, multilateral lending platform, regional financing facility, industry association, and the sector's global convening body—all of them recognize the importance of these innovations in accelerating clean cooking access globally.

However, despite persistent progress, an emerging gap remains: sector deployment at scale is not matched by the necessary financing, government integration, and market infrastructure needed to support it.

3.1 The Implementation Gap in Clean Cooking Projects

Across all six case studies, the case for clean cooking is well established with substantial health, time-saving, economic, and environmental benefits; yet this value is not consistently translated into financeable, sustainable projects at the pace or scale that the sector's own targets require. The need for clean cooking access is well evidenced and growing, particularly in sub-Saharan Africa, where population growth is outpacing access gains in some markets. However, the financing and delivery incentives available remain insufficient to drive deployment at the pace required, hindering further market integration. More than a shortage of capital commitment or investor interest, the constraint to scale access is a combination of revenue uncertainty, cost-structure mismatch with available financing instruments, and uneven market readiness across countries.

MCFA's portfolio data illustrates this gap well. Performance varies substantially by country: companies in Tanzania and Kenya are scaling faster than those in the Democratic Republic of Congo, Mozambique, or Zimbabwe—a gap attributable to mobile money penetration, grid reliability, and private sector maturity rather than to differences in the financing instrument itself. Identical financing mechanisms will not produce identical results across markets, and program design should account for this variation rather than treat country rollout as a uniform pipeline.

Some programs have begun to respond to this directly. ASCENT's Program-for-Results instrument ties disbursements to verified outcomes (i.e., electricity connections, clean cooking access, and utility performance metrics) rather than inputs, reducing the risk that capital is deployed without translating into real access. CCA's delivery units are embedded in governments and assist in securing financial resources by aligning clean cooking activities across departments.

Despite the urgent need for clean cooking access, the persistent gap between project revenues and costs results in caution among many private clean cooking companies and their financiers. This project-level gap is partly a function of capital costs and partly a function of uncertainty in revenue streams.

The Multitechnology Sector Creates Changing Cost Dynamics

Clean cooking is inherently multitechnology. Capital expenditure remains the dominant cost driver for most clean cooking technologies, particularly biodigesters, EPCs, induction appliances, and LPG distribution infrastructure. The sector cannot rely on a single technology, so cost reduction is achieved by tailoring solutions according to the relevant market.

WLGA's LPG Roadmap for Africa shows that sub-Saharan Africa currently consumes roughly 4 kg per capita of LPG against a 2030 target of 25 kg per capita in 11 identified high-opportunity markets. Reaching this target would require $4 billion a year in capital investment compared to the $2.2 billion pledged at the 2024 IEA Summit on Clean Cooking in Africa, signaling that current commitments do not yet match the level of investment needed to drive this change.

Forward7's biodigester programs in Bangladesh, Indonesia, India, and Nepal show that per-unit subsidies remain necessary to bring biodigesters within reach of smallholder farming households, and ASCENT-REAF's own market assessment puts the equity need for clean

cooking companies at roughly $2 million. This investment is smaller than that for minigrids ($5 million) or solar-home systems ($2.2 million), reflecting how much earlier the clean cooking asset class is than others relative to adjacent DER sectors.

Financing and Regulatory Frameworks Drive Costs

Beyond technology cost, companies face operational and financing costs that are heavily shaped by national regulatory environments. Where consumer financing infrastructure is immature, companies must absorb working capital risk that, in mature off-grid solar markets, is increasingly carried by PAYGo lenders. Furthermore, where carbon credit market access requires multiyear offtake negotiation, companies face elevated transaction costs and delayed revenue recognition relative to simpler voluntary-market sales. As financing risk and project immaturity increase, the cost of capital rises, which increases overall project costs and further dampens investor appetite—a feedback loop that well-designed support mechanisms can break, but when left alone tends to reinforce itself.

Uncertainty in Revenue Streams Hinders Long-Term Project Viability

These case studies demonstrate that viable clean cooking business models typically rely on combining more than one source of revenue or support: a subsidized up-front kit cost, a results-based financing payment tied to verified delivery, and, increasingly, carbon credit revenue. However, each of these revenue streams carries its own forecasting difficulty.

Carbon Credit Revenue Volatility Creates Risk

Carbon credit revenue has become a critical growth engine for the sector. CCA's tracking data shows that 96% of investment into tracked clean cooking companies went to firms issuing or preparing to issue carbon credits. Yet, this concentration is also a source of risk. MCFA reports that some portfolio companies are deliberately pacing the scaling of eCooking deployment to protect the addition of their carbon claims while offtake agreements are finalized. As a result, the financing mechanism intended to accelerate delivery can, in the short term, constrain it. Any program building carbon credit revenue into its core financing model should plan for the multiyear lead time often needed to secure credible offtake agreements; the added cost and complexity of Article 6 host-country authorization relative to voluntary markets; and a noncarbon fallback financing plan in case market confidence or pricing shifts.

Uncertainties From Verified Usage Versus Distribution

Companies can have a hard time verifying sustained use of clean cooking technologies when compared with initial distribution, leading to further revenue uncertainty. Households frequently continue using biomass fuel alongside a newly adopted clean cooking technology and most programs have only partial visibility into how this affects long-run revenue and impact. MCFA notes candidly that usage and drop-out data have so far been collected at the company level but not yet analyzed in aggregate across its portfolio. Without better fuel-stacking and sustained-use data, both carbon credit buyers and results-based financiers are pricing with uncertainty.

Distribution Precedes Underlying Support

Supportive infrastructure must precede or accompany distribution. Sustained use is not guaranteed by equipment distribution alone. Variability in electricity tariffs, fuel availability, equipment repairs, or replacement can lead customers to revert to solid biomass cooking.

3.2 Key Implementation Design Limitations

Across the six programs, lagging clean cooking deployment is mainly attributable to the following recurring design limitations:

- **Consumer financing infrastructure is underdeveloped relative to equivalent sectors.** PAYGo and other consumer credit mechanisms for cooking appliances remain far less mature than the equivalent infrastructure built for off-grid solar over the past decade, even though the up-front cost barrier they address is just as significant for cooking as for power.
- **Verified, sustained-use data remains the exception rather than the rule.** Without better measurement of fuel stacking and continued use after initial distribution, neither donors nor carbon credit markets can fully and confidently price the value that clean cooking projects deliver, holding back both public and private capital.
- **Fragmented government coordination capacity is often the binding constraint, not capital or technology.** Clean cooking cuts across energy, health, environment, education, and gender portfolios, and in many countries no single institution is accountable for it, slowing the policy response needed to unlock private investment.

- **Carbon credit market access creates a structural dependency that is not yet fully de-risked**. Multiyear lead times for credible offtake agreements, evolving integrity standards, and the added complexity of Article 6 mechanisms mean that a financing model built primarily around carbon credit revenue carries timing and market confidence risk that smaller or newer companies are poorly positioned to absorb.

3.3 A Way Forward: Closing the Implementation Gap

Closing the implementation gap requires action on two fronts: decreasing the difference between project costs and revenues for individual companies and projects and better recognizing and monetizing the system-level benefits that clean cooking delivers. The case studies presented in this report highlight methods for closing this gap, organized around three pillars: policy and regulation, supply chain and delivery, and financing.

Policy and Regulation: Establish Government Capacity and Integrated Planning

Successful clean cooking implementation depends on selecting the right governing body and integrating cooking demand into national energy and infrastructure planning, rather than treating it as a parallel, competing program stream. The case studies highlight the following actions to do so:

- **Embed dedicated government capacity.** CCA's delivery units model (small, expert teams embedded within the highest levels of government in Kenya and Sierra Leone) produced, within a single year of operation, a National Clean Cooking Strategy, the removal of import duties on clean cooking technologies, and an institutional financing roadmap. A single empowered institutional host, whether a delivery unit, a long-term bilateral partnership (like those MECS built with Tanzania and Nepal), or a national strategy is consistently associated with faster, more consistent progress compared to overlapping responsibility across ministries.
- **Use results-based or outcome-tied disbursement instruments.** ASCENT's use of the Program-for-Results instrument and MCFA's RBF structure both tie public disbursement to verified delivery, reducing the risk that public capital is spent without translating into real, sustained access. India's Direct Benefit Transfer of LPG (developed with WLGA) demonstrates the same principle on the consumer side: paying subsidies directly into verified recipient accounts reached 213 million enrolled customers.
- **Regulate the cylinder model and enforce it.** WLGA's roadmap identifies clear, enforceable regulation centered on the cylinder recirculation model and comprehensive cylinder safety standards. Ghana's customer-owned cylinder model resulted in a 20% decline in consumption from its 2011 peak before the country committed fully to the Cylinder Recirculation Model in 2023; conversely, in Kenya widespread illegal cross-filling deters companies from investing in assets competitors will use. Supportive regulation only functions where compliance is enforced.
- **Set explicit national targets and standards.** Nepal's 2025 approval of national standards for eCooking appliances and Tanzania's draft minimum energy performance standards, both developed with MECS, illustrate how clear and enforceable technical standards protect consumer adoption and underpin the credibility of carbon credit claims.
- **Integrate cooking demand into electricity and energy access planning.** ASCENT's decision to house DERs and clean cooking within the same financing pillar, and MECS's research-driven case for planning electricity and cooking together in Tanzania, both demonstrate that integrated planning creates mutual reinforcement: solar home system and minigrid companies can extend naturally into eCooking once electricity infrastructure exists, and minigrid developers gain a financial incentive to plan for cooking loads that improve their own viability.

Supply Chain and Delivery: Build Diversified, Sustainable Delivery Models

A diverse portfolio of clean cooking technologies and delivery channels is critical to reaching the range of household, institutional, and rural contexts the sector must serve while avoiding overreliance on any single fuel pathway. Examples of this diversification include:

- **Match technology to context rather than prescribing a single pathway.** Forward7's technology-inclusive approach (i.e., using LPG in urban and peri-urban Africa, electric appliances where grid or solar infrastructure allows, biodigesters for rural smallholder farming communities in South and Southeast Asia) produces higher adoption and more sustainable use than deploying one technology everywhere regardless of local conditions. WLGA frames LPG as an immediate replacement for harmful traditional fuels while electrification proceeds. Its portability is an advantage. LPG enables rapid deployment of cooking and heating capacity where no preexisting energy infrastructure is available.

- **Invest in after-sales service and repair infrastructure from the outset.** MECS's experience in Tanzania showed that early pilots without adequate spare parts availability or trained technicians resulted in households reverting to biomass when appliances failed; its subsequent investment in the FixChap technician network and a national vocational repair curriculum directly addresses this potential failure point.
- **Build the underlying fuel and distribution infrastructure, not just the appliance.** Distributing equipment does not guarantee use. Forward7's investment in LPG filling station infrastructure in Zambia recognizes that subsidizing a stove or cylinder is insufficient without the supply chain to keep it filled; the same logic applies to ensuring accessible biodigester feedstock supply and electric power grid reliability. Supportive infrastructure needs to be accessible, affordable, and resilient. This ability will not only support scale but also sustained use. Important considerations to build underlying infrastructure include fuel supply chain, local storage capacity, local manufacturing/equipment reserves, and repair networks. These considerations will support sustained use requirements such as a reliable fuel supply, affordable refill/recharge, working equipment, durable appliances, sustained demand, and sector resilience.
- **Prioritize institutional markets as an underexploited route to scale.** Schools, hospitals, and similar institutions offer predictable and high-volume cooking demand that is easier to finance and monitor than fragmented household markets, as demonstrated by Turkey's school conversion program (WLGA); Forward7, SEforALL, and WFP's Platform for Clean Cooking in Schools; and CCA's institutional investments in Kenya.
- **Build local research, workforce, and supply chain capacity.** Forward7's engagement of university students in Kenya and Tanzania for field data collection, and MCFA and Forward7's local technician and distribution agent training build the human capital base that a self-sustaining clean cooking market requires beyond the life of any single program.

Financing: De-Risk Projects and Build a Credible Bridge to Sustainable Capital

To close the project-level financing gap and avoid market failure, support mechanisms are needed that decrease project costs, mitigate revenue risk, and provide a credible bridge from concessional to commercial and carbon credit financing. Examples of financial de-risking across the case studies include:

- **Sequence concessional, results-based, and commercial capital deliberately.** MCFA's hybrid model is a useful template for new entrants to adapt. The model incorporates catalytic grants for up-front cost followed by RBF tied to verified delivery and dedicated technical assistance to support the eventual transition to commercial and carbon credit financing as an exit strategy.
- **Close the consumer financing gap.** MECS and TANESCO's on-bill financing model in Tanzania embedded appliance repayment directly into the existing electricity billing relationship rather than relying on a separate credit product. In Rwanda, Forward7 and Bboxx's smart valve PAYGo model more than doubled the average household LPG consumption by removing the need for a large up-front refill payment. Both mechanisms are highly replicable approaches to close the consumer financing gap that remains one of the sector's most significant unaddressed barriers.
- **Mobilize private co-financing.** MCFA's 1:4 leverage ratio (EUR€8.7 million in disbursements mobilizing EUR€37.4 million in external co-financing) and MECS similar 1:4 private co-financing leverage ratio demonstrates that well-structured concessional capital can bring in private investment. Tracking and reporting this ratio should be a standard feature of clean cooking financing facilities.
- **Invest in verified usage measurement as a financing prerequisite, not an afterthought.** Programs that move beyond distribution counts to payment data, consumption monitoring, or smart meter detection of usage—as MCFA, ASCENT, and MECS are beginning to do—generate the evidence base that both donors and carbon credit markets increasingly require to price clean cooking projects accurately.

- **If carbon credit markets are seen as a requirement, build carbon credit market integrity infrastructure before scaling carbon-dependent financing where applicable.** CCA's CLEAR methodology, Principles for Responsible Carbon Finance, Code of Conduct, and Buyer's Guide to High-Quality Cookstove Carbon Credits collectively lower transaction costs and build the market confidence that an increasingly carbon-dependent sector financing model requires. Any program building a carbon credit revenue stream into its model should plan to align with this emerging integrity infrastructure rather than develop parallel standards. CLEAR's approach assesses emission reductions against the solid biomass and charcoal a project displaces. Carbon eligibility and methodology design should apply technology-neutral, merit-based criteria to cooking solutions, rather than blanket exclusions by technology type.
- **Look beyond carbon revenue for long-term project financial viability.** Recommend that carbon credit revenue, if required, serves as a bridge during early-stage growth as opposed to a company's sole source of long-term financial sustainability. For example, MCFA reported companies deliberately slowing deployment to protect the additionality of pending carbon claims, indicating how dependence on carbon revenue can constrain the very delivery it was supposed to accelerate. Program design may support carbon finance but should only do so as one component of an early-stage capital stack that graduates toward diversified, sustainable revenue over time, as opposed to a mainstay of a company's long-term financial model.

Section 4: Synthesis: Lessons Learned for Successful Implementation

Clean cooking holds significant value for households, health systems, and national economies, offering both economic and noneconomic benefits. By understanding value capture strategies, addressing the implementation gap, and engaging the right institutional and private sector partners, a viable pathway to scaled clean cooking access is within reach. International collaboration is critical for sharing lessons learned and accelerating the deployment of effective clean cooking delivery models worldwide. Achieving the scale of access the sector has targeted will require continued, coordinated action. Key takeaways from the case studies have been distilled across the areas of policy, supply chain, and financing.

To help close the remaining implementation gap, the following actions are identified from the case studies.

POLICY AND REGULATION	SUPPLY CHAIN AND DELIVERY	FINANCING
• Embed dedicated government capacity (e.g., delivery units) to coordinate clean cooking across ministries • Integrate cooking demand into national electricity and energy access planning • Set and enforce national appliance and fuel standards • Regulate and enforce cylinder recirculation model and safety standards • Use outcome-tied disbursement instruments (e.g., Program-for-Results, RBF)	• Match technology to local context rather than a single prescribed pathway • Invest in after-sales service, repair, and technician networks from the outset • Build underlying fuel and distribution infrastructure, not just appliances • Prioritize institutional markets (schools, hospitals) as a route to scale • Build local research, workforce, and supply chain capacity	• Sequence concessional, results-based, and commercial capital deliberately • Close the consumer financing gap (on-bill financing, PAYGo) • If seen as a requirement, build carbon credit market integrity infrastructure before scaling carbon-dependent financing • As required, support carbon finance as an early-stage bridge, without long-term reliance • Mobilize and track private co-financing leverage • Invest in verified usage measurement as a financing prerequisite

Table 23. Closing the Implementation Gap Actions

4.1 Policy and Regulation

Successful clean cooking programs rely on defined government roles and a long-term, integrated planning horizon. Embedding clean cooking within national electricity and energy access planning, as ASCENT and MECS both demonstrate, ensures that cooking demand is addressed as part of the core energy access rather than as a parallel, under-resourced initiative. Government delivery units or equivalent coordinating bodies, as CCA has shown in Kenya and Sierra Leone, can produce national strategies, regulatory reform, and investment roadmaps within a single year of operation. Outcome-tied disbursement instruments, such as Program-for-Results financing or results-based financing more broadly, align public and donor capital with verified delivery rather than inputs alone.

4.2 Supply Chain and Delivery

A diversified, context-matched portfolio of clean cooking technologies and delivery channels is critical for reaching the full range of markets the sector must serve, from urban LPG users and rural smallholder biodigester operators to grid-connected electric cooking households. Investment in after-sales service, technician networks, and underlying fuel or distribution infrastructure determines whether initial adoption translates into sustained use. Institutional markets, including schools and health facilities, represent a comparatively underexploited opportunity for predictable, high-volume, financeable demand that the sector should continue to prioritize.

4.3 Financing

To close the implementation gap and avoid market failure in transitioning markets, support mechanisms are needed that decrease project costs, mitigate revenue uncertainty, and provide a credible, deliberately sequenced bridge from concessional and commercial capital to carbon credit financing. Closing the consumer financing gap, particularly through utility on-bill financing and expanded PAYGo models, is one of the most replicable, near-term opportunities identified across the six case studies. Tracking private co-financing leverage and investing in verified usage measurements should be treated as standard practice for any new clean cooking financing facility.

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October 2026

This work was authored, in part, by the National Laboratory of the Rockies (NLR), operated by Alliance for Sustainable Energy, LLC, for the U.S. Department of Energy (DOE) under Contract No. DE-AC3608GO28308. Funding provided by the U.S. Department of State. The views expressed in this report do not necessarily represent the views of the DOE or the U.S. Government, or any agency thereof, including the Department of State.

NLR/TP-7A40-101171