GPA
GLOBAL PLATFORM FOR ACTION

unitar
United Nations Institute for Training and Research

Feasibility of E-Cooking Transition in Rohingya Refugee Camps and Host Communities: Summary

September 2025

Authors: Carine Buma (GPA)

Reviewers: Dr. Iwona Bisaga (GPA/NORCAP), Aimee Jenks (GPA), Dr. Robinson Benjamin (IOM), Christopher Bender (SAFE+2 Coordinator), Pilar Pedrinelli and Hugo Drawin (UNHCR).

1. Background

Bangladesh hosts one of the world's largest refugee populations, with over 1 million Rohingya refugees residing in 33 IOM and UNHCR managed camps across Ukhiya and Teknaf in Cox's Bazar, as well as Bhasan Char Island. The majority arrived during the 2017 crisis, when military crackdowns in Myanmar's Rakhine State forced approximately 740,000 people to flee into Cox's Bazar. This mass and rapid displacement placed immense pressure on the environmentally fragile Cox's Bazar.

Also, energy access for cooking emerged as a critical humanitarian and environmental challenge as refugees depended heavily on firewood, mainly collected from surrounding forests, for cooking, leading to severe deforestation (estimated at three to five football fields per day) and heightened tensions with host communities (UNHCR, 2017). In response, UNHCR conducted a comparative analysis across multiple fuel options which identified Liquefied Petroleum Gas (LPG) as the most viable solution at the time. As such, a large-scale LPG transition programme was launched in 2018 by UNHCR and IOM, distributing single-burner stoves and cylinders to refugee households. Since then, over 200,000 Rohingya refugee households have received free LPG asset and refills from IOM and UNHCR. A 2019 study carried out by the International Union for Conservation of Nature (IUCN) revealed that the LPG rollout contributed to an 80% decrease on forest reliance by refugees (IUCN, 2019).

The environmental, social, and health benefits of this LPG roll out program has been widely documented. However, the rising cost of import-dependent LPG, declining funding availability, and policies that prevent refugees from earning income have challenged the sustainability of maintaining a stable LPG supply, thereby increasing the risk of reverting to the use of firewood for cooking. These challenges have resulted in partners exploring alternative financially and environmentally sustainable clean cooking solutions - a technology or combination of technologies or transition scenarios - for the refugees and surrounding host communities.

Against this backdrop, UNITAR, through the Global Platform for Action (GPA) on Sustainable Energy in Displacement Settings, in collaboration with IUCN and Practical Action (PA), conducted a study between 2024 and 2025 to assess the technical, operational, economic, and financial feasibility of introducing solar PV-powered e-cooking appliances in the Rohingya refugee and host community households.

This document presents a high-level overview of findings from the e-cooking pilot and recommendations for future work.

2. Methodology

A baseline survey (Nov–Dec 2024) covered 400 refugee households (Camps 21, 1W, 19, 20Ext) and 600 host households in Ukhiya and Ramu to assess household characteristics, cooking practices, and energy use. A market survey was also carried out to examine fuel and technology availability and pricing.

Photo: Baseline survey in the refugee camps (IUCN)

Following the baseline survey, a small-scale solar PV e-cooking demonstration (Jan–Mar 2025) was conducted in 20 refugee and 20 host households. Each were provided with a 3 kW PV system, battery backup, and three electric cooking appliances – an electric pressure cooker (EPC), infrared stove, and induction stove – for 7 days. Public demonstrations were also held for wider feedback. Findings informed initial carbon finance modelling and cost–benefit analysis, with results for the modelling component to be published after incorporating partner inputs and data from the forthcoming larger e-cooking pilot to be conducted under the FCDO-funded Transforming Humanitarian Energy Access (THEA) project between October 2025 and September 2026.

3. Findings from the e-cooking pilot

3.1. Baseline findings

Demographics: Household size is similar across refugee and host community households (5.82 and 5.81 respectively), though refugees live in clustered shelters made with bamboo and polythene while host community households live in larger and more permanent structures mostly made with brick.

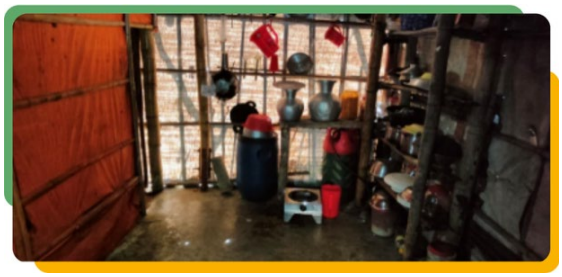

Photo: A shelter in one of the refugee camps (Photo: IUCN)

Education: 22% of refugees have no education, while most have only primary (43%); 18% reached high school and 17% received religious education. In contrast, 92% of the host community completed at least primary school.

Occupation: Before displacement, 53% of refugees were farmers, but this dropped to 1% in Bangladesh due to restrictions on land ownership. Current livelihoods include day labour at 40%, NGO work at 23%, camp activities at 15%, and small trade.

Household income and expenditure: Over half of refugees earn under BDT 5,000 ($42) a month, 10% have no income, and 38% earn BDT 5,000–20,000 ($42–167), compared to 74% of host households earning BDT 10,000–40,000 ($83–333). Refugees spend an average of BDT 8,596 ($72) monthly, 72% on food despite WFP vouchers, while hosts spend BDT 19,180 ($160), with 59% on food.

Access to electricity: 97% of host households are grid-connected, but 96% of them face load-shedding, with 85% experiencing three or more daily outages, mostly during peak cooking hours and worst in summer (93%). However, refugees have no grid access; 90% lack electricity entirely and 10% rely on small solar systems or solar PV mini-grids.

Access to clean cooking: As per Table 1, refugees largely depend on single-burner LPG stoves (97%), while most host households use mud stoves (92%), with some clean stacking through LPG (55.1%) and electric stoves (14.8%).

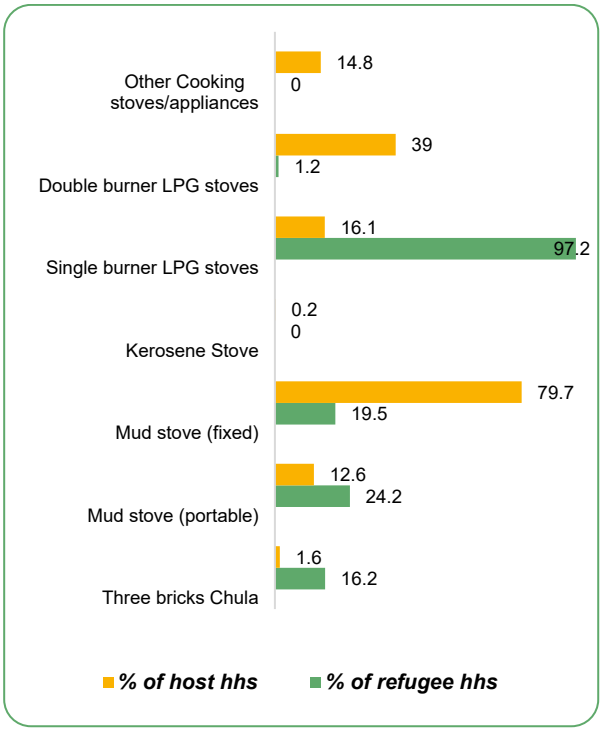

Figure 1: *Stoves used for cooking*

Refugees' experience with LPG use: Despite regular refills from IOM and UNHCR, over 96% of refugees run out early, with 49% facing monthly depletion. During such shortages, 67% use firewood (~2.1 kg/day, often with leaves/twigs), while about 40% obtain extra LPG from resellers, relatives, or other households. 56% of refugee households face difficulties refilling cylinders, mainly from transport costs (30%), carrying heavy cylinders (26%), and long queues (21%).

Dietary habits: Rice is the staple food, cooked daily in both refugee and host households, with 81% of refugee and 85% of host households preparing it at least three times daily.

Willingness to use e-cooking: 83% of refugee and 63% of host households expressed willingness to introduce e-cooking, citing time savings, reduced fuel costs, improved health, and safety as main reasons.

Pricing of cooking fuels and technology in the local market: The 54 market surveys

conducted reveal that rice cookers are the most common e-cooking appliances in the market, sold in all surveyed shops; infrared (91%) and induction (77%) stoves are fairly common, and EPCs remain limited (36%) and most expensive (Table 1). Most consumers pay in cash (62%), some use credit (20%), and a few pay through instalments. Adoption is constrained by high costs (29%), unreliable electricity (23%), and operating costs (17%).

Table 1: *Price of e-cooking appliance in local market*

Appliance	Average price	
	BDT	~USD
Rice Cooker (1 kg)	1,794	15.0
Rice Cooker (1.5 kg)	2,190	18.3
Rice Cooker (2 kg)	2,740	22.8
Induction Cooker	3,676	30.6
Infrared Cooker	3,520	29.3
Electric Pressure Cooker (6 L)	6,500	54.2

3.2. E-cooking demonstrations

Findings from the e-cooking household demonstrations are summarized below

- **Energy generation and consumption:** Average daily energy generation was 5.10 kWh for refugee and 5.12 kWh for host community households, while consumption was lower at 2.96 kWh and 3.20 kWh respectively.
- **LPG savings:** During the demonstration, LPG use in the camps fell by 76.6%.
- **Cooking times and duration:** Most meals took 30–90 minutes, with breakfast often before solar hours and dinner after sunset, underscoring the need for battery storage.
- **Appliance preference:** Infrared cookers led at 46%, followed by induction at 29% and EPCs at 22%.
- **Time savings per meal:** Induction stoves saved 22 mins, EPCs 20 mins, and infrared stoves 18 min.
- **User satisfaction:** 91% found the appliances easy to use, and 97% believed e-cooking would lower costs.
- **Key barriers**: Most common challenges reported for e-cooking transition include affordability, security concerns, infrastructure fragility, unreliable electricity supply, and fears of losing LPG support.

4. Recommendations

Outlined below are some recommendations from this study for the next phase:

- Expand the sample from 40 to several hundred households with randomized selection for more robust results
- Monitor over a longer timeframe and across seasons to capture variations in generation and cooking behaviour. Also install data loggers in all participating households for precise monitoring of energy use and system performance.
- Develop system maintenance and dust management strategy for solar panels.
- Use smaller, more cost-effective systems, as the 3 kWp PV systems with batteries, inverter, and three appliances used in the pilot were too expensive at over $2,600.
- Incorporate household safety and security protocols, including user training on safe appliance use, fire prevention, and electrical handling, as well as measures to reduce the risk of theft or damage to equipment.

5. Conclusion

The study confirms that solar PV-powered e-cooking is technically viable, socially accepted, and environmentally beneficial, with strong willingness to adopt among refugee and host households. However, scaling will require a phased, community-centred approach, with economic and financial feasibility as a major determinant. While further pilots are underway by the GPA, Mercy Corps and other partners such as CARE Bangladesh to assess the feasibility of introducing e-cooking in the Rohingya refugee camps, **LPG remains the most financially viable option for now**, as

confirmed by analyses conducted by UNHCR and partners in 2017. This will likely continue to be the case until a more cost-effective solution - or a combination of technologies and transition pathways - is identified.

Preliminary findings indicate that the PV systems used in this pilot, costing over $2,600 per unit, are not scalable, underscoring the need for smaller and more affordable alternatives. Household-level solar PV e-cooking solutions have already been piloted in several displacement and humanitarian contexts. Examples include Pesitho's ECOCA induction systems, priced at under $1,000 per household, which have been deployed in East African countries such as Malawi's Dzaleka refugee camp and Uganda's Bidibidi settlement, as well as in other regions, alongside ATEC's induction-based technologies priced at about $1,000 depending on system size.

While preliminary environmental and economic/financial modelling was carried out as part of this study (results not presented here), a more comprehensive modelling exercise will be undertaken in the next phase of the pilot, through the Transforming Humanitarian Energy Access (THEA) Bangladesh pilot project (October 2025 – September 2026).

With support from UK Government funding, through the Transforming Energy Access (TEA) Platform, THEA will implement a larger pilot involving a few hundred refugees and host-community households. This phase will test PV-powered e-cooking systems in the camps and appliance-only models in host communities, pilot market-based financing mechanisms to enhance affordability for host households and establish appliance repair hubs with training for local volunteers and technicians to ensure sustainable maintenance.

6. Acknowledgement

This e-cooking feasibility research was delivered by the Global Platform for Action on Sustainable Energy in Displacement Settings – United Nations Institute for Training and Research (GPA-UNITAR) and partners (IUCN and Practical Action) as part of its work to identify sustainable and scalable energy delivery models in humanitarian settings. The study was funded by the UK Foreign, Commonwealth and Development Office (FCDO) through the Modern Energy Cooking Services (MECS) programme. We extend our sincere thanks to UNHCR and IOM Bangladesh for their valuable review of the reports and continuous support throughout implementation.

The findings of this research have directly informed the design of an upcoming e-cooking pilot, which will be implemented by Mercy Corps in the Rohingya refugee camps and host communities in Cox's Bazar, Bangladesh, under the Transforming Humanitarian Energy Access (THEA) programme, also funded by FCDO via the Transforming Energy Access (TEA) Platform managed by the Carbon Trust. Further updates on its implementation will be shared in due course.