UNHCR
The UN Refugee Agency

Access to Clean Energy in Displacement Settings

Case Study: **Ethiopia**

Background

Provision of clean and affordable energy is a key catalyst for sustainable development in all countries. Access to energy enhances access to education and economic opportunities, increases safety and improves the provision of health services; all are components of UNHCR's mandate to protect refugees, asylum seekers, stateless people and others forced to flee.

UNHCR acknowledges the significant challenges that refugees face globally in accessing even basic energy services in displacement settings. Lack of access to affordable, reliable, and sustainable energy solutions further exacerbate the already difficult circumstances that refugees face. However, in line with its mandate UNHCR is constantly exploring the potential for innovative interventions by the humanitarian sector, working together with affected communities, host governments, UN country teams, and various partners from different sectors, to transform the lives of refugees and those forced to flee.

The UNHCR Global Strategy for Sustainable Energy 2019-2025 aims to enable refugees and host communities to meet their energy needs in a safe and sustainable manner, while also addressing protection, health and environmental concerns. UNHCR has adopted the World Health Organization (WHO) definition of clean fuels and technologies based on the impact on refugees' health. Fuel and technologies are considered clean only if they achieve WHO targets for particle matter (PM) and carbon monoxide (CO) emissions. In addition, UNHCR defines the use of biomass in combination with improved technologies as a transitional solution while moving towards more sustainable and cleaner practices.

The UNHCR energy strategy is part of the strategic outcomes set in the Operational Strategy for Climate Resilience and Environmental Sustainability 2022-2025 to respond to the growing global climate emergency. Guided by the Strategic Framework for Climate Action (SFCA), UNHCR focuses on mitigating the impact of climate change and environmental degradation on refugees and their host communities, supporting sustainability by preserving and rehabilitating the natural setting and minimizing the environmental footprint of humanitarian assistance.

This report presents case studies of clean and transitional energy interventions in refugee communities, implemented by UNHCR, government and partners in Ethiopia. Energy-related approaches from these case studies can be adapted and replicated in other refugee-hosting countries, as a mean of meeting the basic needs of displaced people, improving their well-being and, when feasible, creating sustainable livelihood opportunities through the provision of energy. The following case studies are based on experiences in refugee settings and can be adapted to situations of internal displacement as well.

Country Profile
Ethiopia

Country context

The Federal Democratic Republic of Ethiopia is a landlocked country in East Africa with a total size of 1.1 million km^2. Most of the area lies on a plateau, split by the Great Rift Valley. With about 117 million inhabitants, Ethiopia is Africa's second most populous state, after Nigeria. Ethiopia's population is comprised of many ethnic groups, including Oromo (36%), Amhara (24%), Somali (7%), Tigray (6%), and others, with their own languages. The most widely spoken languages are Oromo (34%) and Amharic (29%), the official national language (World Factbook, 2022).

Ethiopia's 2021 GDP was USD 112 billions. The country is the fastest growing economy in the region. For the last 15 years, it has also been one of the most dynamic economies worldwide, with an average year-on-year GDP growth of 9.5%. This rapid growth has resulted in significant poverty reduction. GDP per capita, however, remains comparatively low, at USD 960, and sporadic conflicts pose a threat to its further economic and social development (World Bank, 2022).

Contrary to its fast-growing GDP, Ethiopia remains one of the least developed countries in the world. Approximately 31% of its over 100 million inhabitants live below the poverty line (OECD, n.d.).

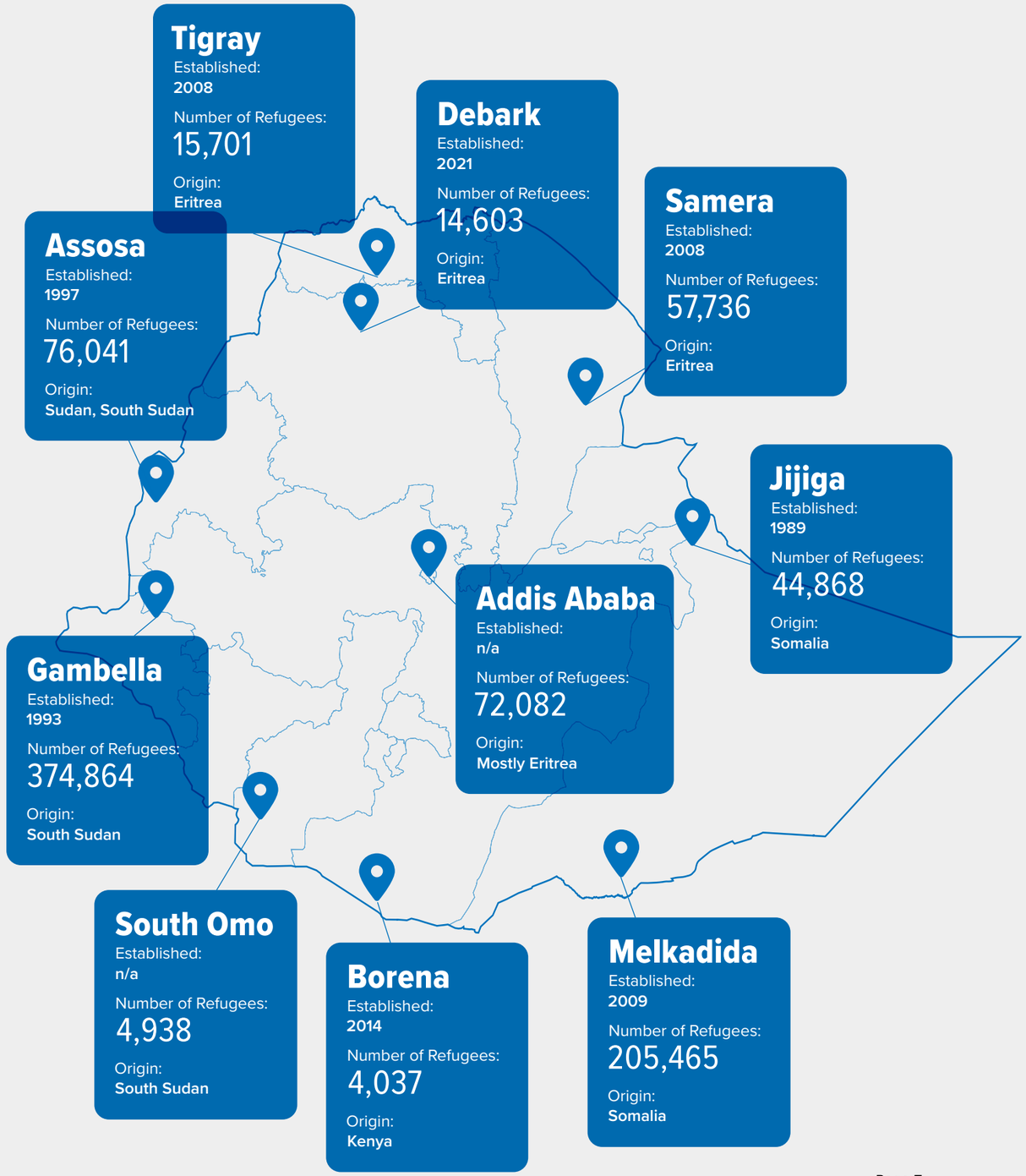
Refugee situation

As of 2022, there are 878,027 refugees and asylum seekers in Ethiopia, most of which live in the 24 refugee camps spread across five regional states (UNHCR, 2022a). The largest groups fled from South Sudan (407,382), Somalia (251,126), Eritrea (162,011) and Sudan (48,445) (UNHCR, 2022b). Following conflicts within the country, around 4.5 million inhabitants are currently internally displaced (UNHCR, 2022b), with another 1.5 million previously internally displaced having returned home (UNHCR,

Ethiopia

Refugee settlements in Ethiopia

Source: UNHCR, 2022, data as of 31st October 2022



2022a). Due to the history and ethnic composition of the region, the boundaries between refugees and local population is not always clear, with populations identifying fluidly with their own nationality (World Bank, 2020a). While refugees and host communities generally have good relations, they still compete over scarce resources. Refugees tend to be poorer than the host communities, with limited access to stable income-generating activities. Nevertheless, the activities of humanitarian actors in areas with refugees are perceived as increasing access to basic services for locals, and awareness of women's rights for the entire population (World Bank, 2020a).

Country Policy Framework

Refugee situation policies

- The country participates in major conventions and human rights instruments, including the Convention relating to the Status of Refugees (1951), its Protocol (1967) and the OAU Convention (1969). Based on these commitments, in 2004 Ethiopia introduced a National Refugee Proclamation (GCR, n.d.).
- In 2016, Ethiopia announced nine pledges related to the needs of refugees, followed by another four pledges at the Global Refugee Forum in 2019 (GCR, n.d.).
- In 2017, Ethiopia implemented the Comprehensive Refugee Response Framework (CRRF) aimed at integrating refugees in national efforts, infrastructures and services.
- In 2019, Ethiopia announced a new Refugee Proclamation, introducing a progressive set of rights and initiatives, such as allowing refugees to obtain work permits and some legal documents, and access primary education and financial services.

National policies relevant to energy access and climate resilience

- Ethiopia ratified the United Nations Framework Convention on Climate Change (1992) in 1994, and the Kyoto protocol in 2005. The country signed the Paris Agreement in 2016 and ratified it in 2017.
- Ethiopia's Growth and Transformation Plan II (GTP II) foresees ambitious goals for the industrialization of the country and for its energy sector, including an expansion of electricity generation capacity from 4.5 GW to 35 GW by 2037 (GIZ, 2020).
- The Energy Law (2013) is aimed at liberalizing the energy market and allowing power generation by independent power producers (IPPs). It includes energy efficiency provisions and supports the Climate Resilient Green Economy (CRGE) programme, which targets carbon-free growth and renewable energy support (GIZ, 2020).

- The 2017 Ethiopian National Electrification Programme (NEP) has set the target of ensuring electricity access for all citizens by 2025, through both national grid extension and off-grid supply (GIZ, 2020).
- In 2018, the government approved a framework engaging private sector investments in the power sector, aiming at enhancing off-grid renewable projects and energy access (Gebreslassie et al., 2022).

Energy situation

Country energy situation

Ethiopia is one of the least developed countries in the world, with about one-third of its over 100 million inhabitants living below the poverty line. It has one of the lowest rates of access to modern energy services. At the same time, due to fast economic growth, energy demand is expected to increase significantly in the coming years. Waste and biomass are the country's primary energy sources and represent about 92% of Ethiopia's energy supply, followed by oil (6%) and hydropower (2%).

Ethiopia produces 9000 GWh of electricity annually; 11% is exported to nearby countries. Most electricity is produced from hydropower sources, with wind energy accounting for the remaining 4%. Currently, the country only exploits 2.5% of its enormous hydropower potential. Geothermal, solar, and biomass are other renewable options with high potential. Ethiopia does not operate any coal or gas-powered fuel plants. Despite the abundant potential for renewable energy, only half of the population has access to electricity. In rural areas, only 27% have access to the electricity grid. This share is progressively increasing thanks to the gradual extension of the national grid and an increasing number of mini-grids and stand-alone systems (International Energy Agency, 2019; Energypedia, 2022; International Hydropower Association, 2022).

Many households in Ethiopia still rely on biomass for cooking, with only 6% using a clean cooking fuel as a primary source. Only 11% of the population lives in urban areas, where access to electricity and cleaner cooking options is higher. In urban areas, 21% of households primarily use electricity to cook. Yet around 70% of urban households use firewood and charcoal for cooking. In rural areas, nearly all households rely on firewood (85%) or other biomass (12%) for cooking (Fraym & Clean Cooking Alliance, 2021).

Refugee energy situation

According to a 2019 study conducted by the International Renewable Energy Agency (IRENA), only 7% of refugee households had access to electricity, mainly for lighting from a diesel generator and limited to four hours per day (IRENA, 2019). The limited connection to the national electricity grid, scarce firewood, and the high prices for goods at local markets make it difficult for people to cook food, charge their phones, or study and work after sunset (UNHCR, 2021a). Refugees living in formal camps and their surrounding communities almost entirely rely on three-stone stove and biomass for cooking, with firewood serving as the primary fuel source for 85% of the population (UNHCR, 2022). This high dependency on collecting firewood causes deforestation and tensions with host communities. The Ethiopian energy mix in displacement settings results in negative environmental externalities (e.g., deforestation and soil nutrient loss), and also chronic health issues (e.g., indoor air pollution) (Yalew, 2021). Therefore, diversifying and shifting to cleaner energy sources has now become one of the critical energy strategies for the country (FDRE, 2021). Efforts by the humanitarian sector are mainly directed at connecting camps to the national electricity grid, and enhancing clean energy access and promoting alternative fuels.

Development actors and funding of energy programmes

A mapping of development actors in the country shows that the World Bank (WB), the African Development Bank (AfDB), the French Development Agency (AFD), and the United States Agency for International Development (USAID), among others, have significant energy programme budgets and ongoing programs in refugee hosting areas in Ethiopia. As of November 2022, of the overall planned and active development budget of USD 2.3 billion, 94% is provided by the WB, mainly in the form of loans. The budgets for programs covering refugee hosting areas are detailed by the funding agencies and financing mechanisms in figures 1 and 2 below. These budgets are directed into energy activities ranging from large-scale energy sector market and infrastructure improvement activities to electricity access in remote locations and improved cooking solutions.

Large-scale and infrastructure development programs in Ethiopia support the energy situation in refugee settings on the long-term and provide a general framework to improve the energy situation. The following graphs show energy activities ranked according to their relevance to refugee contexts. Figure 3 shows the programme activities with a high

FIGURE 1

FINANCING TYPE BY ACTOR FOR ACTIVE AND PLANNED PROGRAMMES OF MEDIUM AND HIGH RELEVANCE

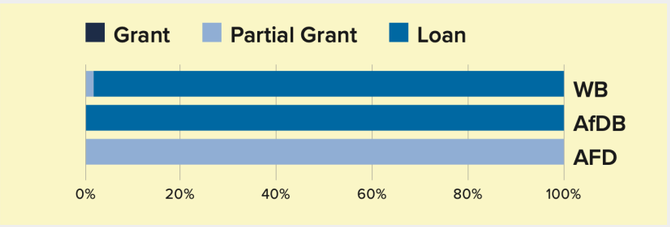


FIGURE 2

ACTIVE AND PLANNED INVESTMENT OF MEDIUM AND HIGH RELEVANCE BY ACTOR: 2.307 MIO USD

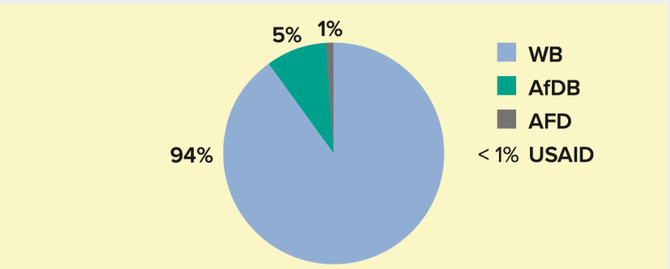
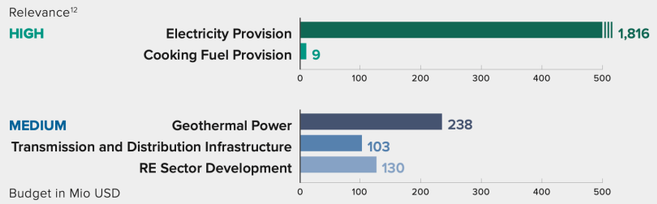


FIGURE 3

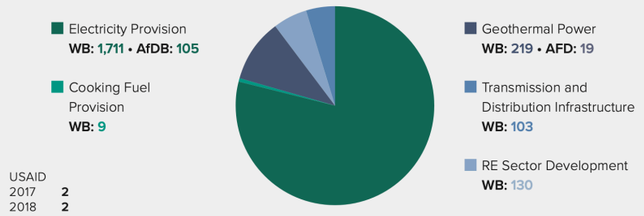
ACTIVE AND PLANNED PROGRAMMES OF MEDIUM AND HIGH RELEVANCE BY TOPIC



Low relevance programmes activities like Enhance Private Sector Engagement, Transnational Electricity Trade Development, Fossil Fuel Infrastructure Development, Administrative and Policy Improvements, Energy Sector Development sum up to **Mio USD 1,723**.

FIGURE 4

ACTIVE AND PLANNED PROGRAMMES OF MEDIUM AND HIGH RELEVANCE BY TOPIC AND ACTOR



USAID
2017 **2**
2018 **2**
2019 **< 1**
2020 **6**

Budget in Mio USD

relevance to refugee contexts in Ethiopia, including electricity provision in remote locations with a budget of USD 1.8 billion and cooking fuel provision with a budget of USD 9 million. The primary funding partners are the WB and AfDB (see figure 4). Programme activities with medium relevance thematic to refugee contexts in Ethiopia include geothermal power, transmission, and distribution infrastructure, and renewable energy sector development, again mainly funded by the WB and AFD.

Overview: UNHCR energy programming in Ethiopia

In Ethiopia since 2011, UNHCR's activities in supporting energy solutions in refugee camps have evolved from distributing firewood and improved cookstoves, towards more diversified cooking and electricity solutions tailored to the local camp conditions, and in line with the HDP (Humanitarian, development and peace) nexus, also linked to recent pledges as part of the Global Compact for Refugees.

Cooking fuel: UNHCR has tried to to provide domestic fuel alternatives for refugee households to prevent informal and unsustainable collection of firewood. This depends heavily on the availablity of local alternatives in areas surrounding the camps. For example, between 2013–2016 the provision of ethanol as cooking fuel produced from local sugarcane factories was explored in western Ethiopia. Charcoal production from Prosopis Juliflora was found sustainable in southern camps near the Somalian border. Five biogas cooking solutions were piloted in 2012 in several settings, including Hilaweyn and Kobe camps. Briquette production using biomass, mostly from agricultural waste and local grass, has also been enhanced in several areas. Since 2016, UNHCR efforts have also included woodlot plantations to provide firewood cooking options for refugees, and planting 150,000 tree seedlings in camps in western Ethiopia.

Cooking technology: At the household level, the uptake of fuel-saving stoves like Save 80 and Rocket type (metal) stoves has been promoted through in-kind distribution. Fostering income-generating activities, cook stove cooperatives have been established, receiving training on the fabrication of cookstoves and briquettes in both camps and host communities (e.g., Melkadida and Gure-Shombolla respectively, 2018). At the community level, the first communal kitchen equipped with electric cooking appliances was established in the Mai-Aini camp in 2011, followed by 12 more in subsequent years.

Lighting: The provision of lightning in public places, including inside and around water and sanitation facilities, substantially increases protection and safety. UNHCR interventions in Ethiopian refugee camps prioritized distributing portable solar lanterns and installing solar streetlights, with refugees also trained on how to repair household solar lights in Bokolmanyo camp. While cash-based interventions are still required to supply the most vulnerable households to cover essential electrical devices, UNHCR's cooperation with private sector companies and market-based electricity supply solutions has accelerated since 2015.

Electricity: Being in high-demand by the local refugee community, solar or hybrid mini-grids for communal facilities have been prioritized by UNHCR since 2017. Several mini-grids were installed in Bokolmayo and Melkadida camps to provide electricity to a newly constructed market, a computer centre, a communal television room, a cafeteria, and nearby households and organizations. Fostering the shift from humanitarian interventions to a more sustainable, longer-term approach, and factoring in the need for ongoing operation and maintenance, the mini-grids were handed over to local cooperatives to manage the grids and to sell electricity to the community.

Biogas for cooking

In the Melkadida camp, a biogas digester connected to a slaughterhouse and a school toilet block converts waste into biogas for cooking. Refugees and host community members are part of a cooperative in charge of operating and maintaining the biogas system. The Productive Use of Energy (PUE) sees the cooperative using the biogas to cook ready-prepared meals and then sell them in local market. With the profits from the business activities, the group manages to generate a modest income for the members and funds to maintain the biogas system.

Overview

To reduce firewood dependency and to develop cleaner on-site energy cooking solutions, UNHCR, with the support of the IKEA Foundation, launched a biogas pilot program in the Melkadida refugee camp in 2021. This biogas solution is one of three integrated social business-oriented models implemented by UNHCR. Others include the production of cooking stoves, and the Prosopis Juliflora Transformation Centres. A biogas system was installed with a digester of 10m^3 and connected to a slaughterhouse and school toilets to process animal and human waste. The waste produces clean gas for cooking and lighting, directly in the slaughterhouse (UNHCR, n.d.).

Biogas technical details

Biogas digesters convert organic matter such as animal manure, crop waste, or grass into biogas, which can be collected, piped, and used for cooking and lighting (UNHCR, 2002). The primary purpose of biogas digesters is usually directed towards waste management, including those produced from sanitation facilities: the waste is collected inside

A butcher woman walks home from the host community livestock market in Melkadida, Ethiopia, with a goat she brought to slaughter. Market demand has dropped as people can no longer afford to buy meat. Hundreds of thousands affected by the worst drought in decades and by conflict have been displaced in search of food, shelter and water for their families and livestock.

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the chamber, and gas is created naturally in full safety through a controlled bio-digestion process. During the decomposition of organic matter, in addition to the biogas, a rich organic slurry is produced as a by-product that can be used as fertilizer for soil, to improve agricultural productivity (Yalew, 2021; UNHCR, 2021). In order to maintain the regular production of biogas, the system needs to be fed systematically with organic matter, which in this case comes from a slaughterhouse and a school toilet.

Delivery and business model

A cooperative of 12 refugees and host community members is in charge of the biogas system. The Productive Use of Energy (PUE) component of the programme sees the cooperative using biogas to cook ready-prepared meals that they sell in the local market. With the profits from the business, the group manages to generate an income of approximately USD 290 per month, thereby contributing to the long-term funding of the biogas system (UNHCR, n.d.).

Protection and health

Biogas is a clean and smokeless alternative to firewood for refugees who continue to rely heavily on open-fire cooking and reduces in-door air pollution that causes numerous respiratory health problems. Furthermore, accidentally inhaling biogas does not pose health risks, even in closed, in-door spaces (CiDev, n.d.). Despite the many benefits of biogas, it should be noted that, like other gases, biogas is flammable and must be handled with care.

Acceptability

Biogas is often the subject of misunderstanding, both for the difficulty of management and perceived low gas production. Communities might show some resistance if awareness activities are not adequately conducted before the implementation of the system (UNHCR, 2021). Once initial doubts have been overcome, users generally feel satisfied with biogas cooking because there is no smoke, pots remain clean on the outside, the gas ignites immediately, and cooking is safer and fast.

Refugees and internally displaced people wait for customers at the Melkadida host community livestock market in Ethiopia.

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CONSIDERATIONS ON COOKING WITH BIOGAS

Biogas systems require a large and continuous biomass supply for constant gas production. Before installing a biogas technology, the available supply of waste biomass should be carefully assessed (UNHCR, 2021). For these reasons biogas digesters are usually considered effective if community level facilities are used, rather than at a small-scale/individual household level.

Biogas digesters are very sensitive to a proper feeding process and temperature. Furthermore, the introduction of non-organic materials such as soap or pesticides can impact production. Therefore, the plant must be well maintained to ensure good gas production.

The biogas system requires an intense water supply to process the organic matter feed. Therefore, in areas with an already scarce and demanding water supply, this can be a limiting factor for establishing a biogas production unit.

Transportation of biogas over long distances is expensive as biogas needs to be piped or distributed via tanks and cylinders. Installing the biogas digester close to its point of use helps reduce costs.

Biogas is often subject to misconceptions, as it is known for being dirty and smelly. Even though these have been proven wrong, conducting awareness raising activities (e.g., explaining the biogas digestion process) is crucial to putting the community at ease.

Affordability

Implementing a biogas digester system requires upfront capital for constructing the digester or purchasing plug-and-play devices. Once a system is running and the feeding of organic matters is well planned, gas production happens with limited operating costs - typically the price of producing biogas ranges between USD 0.22 and USD 0.39 per cubic meter of methane for manure-based biogas production (IRENA, 2022).

Self-reliance

The system can generate income from the gas and from by-products, which can be sold as fertilizer. For example, selling biogas as cooking fuel to restaurants, selling products cooked with biogas at the market, and selling fertilizer to farmers. In Melkadida, the system generates enough income to keep the system running and maintained while allowing the cooperative to have profits and save for future investments.

Environment

Organic waste often threatens to pollute waterways and generates uncontrolled large amounts of methane as it decomposes. The strength of biogas technology is precisely that of utilising this organic waste and methane gas, which would otherwise be wasted. In this way, it not only

HOW TO REPLICATE THIS PRACTICE

STEP 1
Assess if continuous production of organic waste is available to feed the system.

STEP 2
Understand the community's conception of biogas and its potential resistance to it. Verify if local legislation does not pose any restriction for the use of biogas.

STEP 3
Carry out a feasibility study to estimate the biogas production and the amount of organic matter and water needed, and the size of the system.

STEP 4
Evaluate payback period based on capital cost & potential monthly revenues, make sure there are no limiting factors for the future use of biogas

STEP 5
Establish a committee or cooperative to operate and maintain the biogas digester and look after the business side of the programme (e.g., waste intake and gas distribution).

reduces greenhouse gas emissions and environmental pollution but also helps with wastereuse, and at the same time providing a clean and renewable energy source.

Lessons learnt from other UNHCR practices

Zimbabwe

Turning animal waste into biogas

In the Tongogara camp, Zimbabwe's biggest refugee camp, UNHCR responded to the problem of animal waste disposal by installing seven biogas digesters. The technology turns animal waste into biogas and produces organic fertilizer that helps farmers make their fields more productive. Before this solution, land fertilizer was expensive and difficult to source, but now it is available for free to the community to use for their fields and gardens. Additionally, the biogas produced is used for cooking and about 20 000 people in the camp enjoy its significant advantage compared to the use of open fire fed with unsustainable firewoodcollection .

Malawi

Innovative waste management solution for piggery

In Malawi, in 2021, a piggery was set up and managed as a volunteer and communal project by refugees. However, they faced the problem of pigs generating a lot of faecal matter. UNHCR, with the support of a private sector supplier, installed five biogas digesters. The systems are connected to the piggery, and the gas is directly piped to a communal kitchen accessible to the more than 50,000 refugees living in Dzaleka camp. In this case, the biogas solution solves the problem of disposing of animal matter, provides an alternative to firewood cooking, and reduces the deforestation caused by uncontrolled firewood collection.

Electrical communal kitchen

Since 2017, in various Ethiopian operations, UNHCR has set up 24 electrical communal kitchens connected to the national electricity grid, serving more than 3,600 households. The aim is to make use of affordable electricity prices in the country, while ensuring a clean cooking alternative to firewood. The electrical communal kitchens are managed by a local committee elected by its users that oversees planning time slots for the families, organizing cleaning and ensuring appropriate waste disposal.

Overview

To improve access to clean cooking in refugee camps, UNHCR has installed electric communal kitchens in various operations across Ethiopia, where access to the national electricity grid is available. For example, in Adi-Harush and Mai Aini refugees camps in Ethiopia's Tigray region, since 2017 UNHCR has built 17 electric communal kitchens to ensure that even the most vulnerable groups can use clean energy for cooking and baking. In the Sherkole refugee camp, Assosa region, UNHCR has set up three communal electric stoves, and three more are planned for 2023. In Asayita and Berhale refugee camps in the Afar region, UNHCR has set up four cooking facilities, of which two are currently operational (UNHCR, 2021; UNHCR, 2022). However, due to the cost and availability of the infrastructure, electric cooking in Ethiopian refugee camps is currently limited to shared facilities and not yet extended to the household level.

Communal kitchen details

One communal kitchen covers the needs of 150-200 households. Each kitchen has ten stoves or ovens (1500 W each), eight sinks with flow-re-

stricted taps, internal lighting for night-time use, four bins, two sanitizer dispensers, and four electric kettles. Shading nets and dining furniture are installed in the premises of the kitchens to provide areas for families to eat or for children to play while the parents cook. Doors and windows are carefully designed in the kitchens to ensure appropriate ventilation (Norwegian Refugee Council, n.d.).

Delivery model

UNHCR, donors and operational partners (Danish Church Aid (DCA), International Commitment for the Development of Peoples (CISP) and Ethiopian Evangelical Church Mekane Yesus Development (EECMY) and Social Service Commission) cover the expenses of setting up the electrical communal kitchens, including the cost for national grid connection, water supply, and waste management solutions. The communal kitchens are free-of-charge for the refugees to cook food either provided in-kind or bought in the local market. Additionally, UNHCR established a management committee of refugees to operate and maintain each kitchen. The committee manages the use of the kitchen and establishes rules and regulations for all users. This includes planning time slots for

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CONSIDERATIONS ON ELECTRICAL COMMUNAL KITCHENS

As common kitchens are used by a large and diverse number of people, it is necessary to consider different cooking practices, the location (urban vs. rural), cultural habits (i.e., a preference for cooking on the ground), gender, age and diversity.

Experiences show that people prefer to cook in their own kitchen. However, for specific situations such as emergency or where a clean cooking option is urgently needed, communal kitchens offer a good solution.

Different options for food storage should also be investigated between communal fridge or in separate containers. A clear and functioning waste management system should be part of the planning and running process, including hygiene promotion and water supply infrastructure.

Establishment of a management committee is essential for organising the cooking slots among families and to look after the operation and maintenance of the facility.

An electrical communal kitchen might not cover the entire camps cooking needs, which is why it best to consider alternative options to the existing cooking fuel in the camps.

HOW TO REPLICATE THIS PRACTICE

STEP 1
Check if the site is connected to the national electricity grid and assess connection costs and electricity pricing. Plan for water supply or waste management and check for regulatory and institutional requirements.

STEP 2
Review current cooking practices as well as the available cooking infrastructure on site. Understand cooking habits, gender age and diversity issues, and cultural differences within the refugee population.

STEP 3
Design communal kitchens adjusted to site-specific infrastructure. Choose the number and size of kitchen units needed to provide access for the overall population.

STEP 4
Organize material and service flows. Coordinate the implementation with communtiy leaders and local authorities.

STEP 5
Support the establishment of a facility-based communal kitchen committee from operational modalities and rules, including kitchen maintenance, repair works,cleaning etc..

families, setting up opening and closing hours, organizing a cleaning roster, and ensuring appropriate waste disposal. (UNHCR, 2016).

Protection and health

Electrical communal kitchens provide refugees with an alternative to cooking with firewood. Electrical cooking is smoke-free, reduces indoor air pollution and the risk of fire hazards. However, electric stoves bring the risk of electric shocks – which can be prevented by having well-insulated wiring that is regularly inspected.

Acceptability

In general, cooking is an activity everyone prefers to do in the privacy of their own kitchen, in or around their shelter. However, people may be willing to adjust their preferences in situations of emergency, or when firewood availability is a major barrier to cooking. To meet the needs of diverse users and increase acceptance by a community, the kitchens must be designed taking into consideration socio-cultural behaviours, cooking practices, eating habits, gender and ethnic relations, water and sanitation infrastructure and waste disposal solutions.

Affordability

A significant upfront cost is needed to establish an electrical kitchen, especially if the national grid needs to be extended to reach refugee camps. However, in some countries like Ethiopia, electricity represents a cost-efficient cooking option in the long run compared to other clean energy sources (e.g. LPG). As of 2022, the price for electricity for households in Ethiopia was 0.006 USD per kWh.

Self-reliance

The establishment of electrical communal kitchens may helps phasing out distribution of ready-made meals (Norwegian Refugee Council, n.d.). A kitchen management committee consisting of both refugee and host community members takes care of the kitchens' maintenance, a usage schedule and kitchen rules. It makes sure that the kitchens are operating smoothly on a continuous basis.

Environment

Shared cooking facilities reduce the number of cooking fuel and facilities used per person, thereby efficiently utilize cooking energy and appliances as compared to firewood and associated stoves. Furthermore, existing electricity connections can also be extended to power fridges, making food last longer and preventing food waste.

Yemeni and Ethiopian women attend a cooking course for nationals and refugees at Nefas Silk Polytechnic College in Addis Ababa.

Lessons learnt from other UNHCR practices

Greece

Cultural and contextual considerations for setting up of communal kitchens

The communal electric kitchens set up by UNHCR at displacement sites in Greece have highlighted the need to consider different cultural and contextual aspects. For example, the common social practice of men making afternoon tea discourages women from accessing the kitchen. To overcome this problem, small electric boilers with designated power outlets were provided in separate spaces. In other settings, certain ethnic groups preferred not to cook with different communities. Hence, establishing predefined shifts between culturally homogeneous users reduced such tensions. Finally, awareness raising campaigns have proven helpful for better community acceptance. ■

Solar energy cooperatives

Six solar-powered mini-grids and several renewable energy systems, such as solar streetlights and solar home systems, were installed and distributed across Ethiopia's refugee camps and managed by refugees and host community members, forming officially registered cooperatives. Such solar energy cooperatives serve the need for affordable and clean energy in Ethiopia and enhance capacity building, create jobs, generate income, and ensure a self-sustaining service to the community on the long run.

Overview

In 2017, UNHCR, with the support of the IKEA Foundation, established five cooperatives of 10 refugees and host community members each, and provided them with various energy training. The cooperatives serve the community covering various services, such as installation of solar equipment, after-distribution maintenance, and operation of solar-powered systems. UNHCR has engaged solar cooperatives to manage the electricity produced by the six 150kW peak solar mini grids installed in the camps, serving more than 1,300 refugees and host community members (UNHCR, 2021). Additionally, the cooperatives installed 1,100 solar streetlights serving 70% of the camp's population (UNHCR, 2021) and are tasked with monitoring and maintaining the units. Furthermore, in 2021, the solar cooperative distributed and installed 24 solar home systems for households, as a UNHCR pilot project for household lighting access, and 40 more households in 2023 (UNHCR, n.d.).

Details on solar energy cooperatives

Cooperatives are membership-based groups, typically involving an equal number of refugees and host community members. They aim to

Before the energy cooperative, many households cannot afford the small solar phone chargers and batteries available at local markets since the areas are not connected to the national electricity grid. Until recently, diesel-powered generators were the only option for locals and refugees running small businesses and restaurants. In 2017, UNHCR and the IKEA Foundation provided equipment for solar-powered grids to be established in Dollo Ado refugee camps. In a region increasingly affected by climate change, solar power answered the need for energy in the camps to be clean and sustainable, while the establishment of cooperatives to run them is generating much-needed income.

On the photograph: Yazan Abdullah (green t-shirt and blue UNHCR cap), Energy Officer, based at the Melkadida Sub-Office at work, inspecting the power grid, solar panels, and talking to refugees to inquire the use of the solar power.

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support sustainable income-generating opportunities for their members community (University of Oxford, 2020). After going through three-month technical training at a local college, the cooperatives are able to maintain the solar mini-grids as well as distribute and repair solar devices. They become the primary local energy provider, helping transform the lives of hundreds of families who can now access energy for their household or for running a business (UNHCR, 2021a). Cooperatives usually elect a chairperson and a deputy chairman (one from the refugee camp, one from the host community), who are replaced every 6-12 months.

Delivery and business model

The cooperative sells electricity produced by the mini-grid at an affordable price for refugees, charging by the appliances in use. The tariff is fixed and agreed upfront with the community (e.g., electricity for one bulb is 50 birrs/month (USD 1), while for a fridge is 2000 birr/month (USD 37)). To ensure that all refugees benefit from the programme, most vulnerable users get a lower tariff. The income generated allows the cooperative to pay their salaries and to cover the maintenance costs for the system (except for the battery replacement, which usually exceeds

their purchasing power). For the solar home systems pilot, UNHCR provided the money for the cooperatives to procure and install the devices, which are then owned by the households. The after-service repair fees are paid by the households directly to the cooperatives, when needed. For solar streetlights a monthly community-based contribution (2 birrs per household (USD 0.04)) is set up for minor maintenance. A board of various camp representatives manages the community contribution fund and decides on the repairs. Spare parts for solar streetlights are financed and procured by UNHCR as they are not available on the local market.

Protection and health

Since the COVID-19 pandemic, energy cooperatives have been helping to power health facilities, quarantine quarters, and food distribution centres, visibly improving the quality of the service provided. The cooperatives also monitor and maintain solar streetlights for lighting at night, reducing GBV risks (UNHCR, 2021a).

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CONSIDERATIONS ON SOLAR ENERGY COOPERATIVES

A cooperative establishment must be supported by complementary infrastructures, (micro-) finance offers, and institutionalized technology and business training.

The further growth of solar mini-grid is not limited by demand, but by the size of the solar mini-grids themselves, as the established grids are currently nearing their maximum capacity and would require further upfront capital resource for their extension.

Cooperatives, including refugees and host community members, have the potential to improve social cohesion. Coordination structures, membership rules, and decision-making roles are crucial for the cooperative's long-term success.

The degree of market integration of the activities, including linkages to existing supply chains and economic actors on the local market need to be considered, as it represents one of the main determinants of success of established cooperative models.

The equipment managed by the cooperative should be considered based on the purchasing power of the cooperative and the availability of spare parts on the local market.

HOW TO REPLICATE THIS PRACTICE

STEP 1
Review the country's legal, regulatory and institutional framework concerning solar-powered mini-grids, cooperative establishment, and refugee working permits.

STEP 2
Identify a relevant market-based business model around electricity demand and supply, building upon pre-existing economic activities within the community.

STEP 3
Design a long-term plan for the targeted business model and affiliated cooperative to gradually achieve independence from humanitarian external support.

STEP 4
Recruit and train interested members from refugee and host community. Develop clear rules for cooperative coordination, including equitable responsibility among members.

STEP 5
Coordinate with local authorities to officially register the cooperative and get working permits for the members, according to the national legal framework.

Acceptability

Integrating new technologies is more widely accepted when the local population is involved in the installation and after-sales service. By providing livelihood opportunities, social benefits such as strong working relationships, enhanced dignity, and self-esteem are achieved among the cooperative's members. Programmes designed with the active participation of both refugees and host communities helps increase the acceptance of refugees by the host community (ILO, n.d.).

Affordability

Through the sale of electricity generated by solar-powered grids and devices, new jobs are created, and income is generated. In addition, some cooperatives include a special electricity tariff or even a free-electricity agreement for most vulnerable households. The initial investment cost and vocational trainings are a grant, while the cooperatives' savings cover the cost of repair, spare parts, maintenance and staff salaries. (UNHCR, 2021a).

Self-reliance

Solar energy cooperatives ensure technology sustainability. With a growing number of clients and an increasing demand for electricity, the cooperatives can maintain the existing mini-grid and eventually invest in new equipment. As a result, the 50 members of the cooperatives have become less dependent on humanitarian aid, proving that the programme supports local economies, boosts local infrastructure, and enhances refugees' self-reliance (UNHCR, n.d.).

Environment

Solar energy cooperatives provide an environmentally-friendly alternative to diesel-powered generators as they use sunlight as renewable energy source for electricity production. However, local sourcing and recycling of system components at the end of the unit's lifetime might prove challenging, as current e-waste recycling solutions are at an early stage.

Lessons learnt from other UNHCR practices

Morocco

Crafts cooperative set up by UNHCR in Morocco

In Morocco, UNHCR helped refugee women develop crafts cooperatives. As people-centred businesses, the cooperatives provide important services and goods for refugees that are otherwise unavailable through other enterprises. The nature of working collectively in a joint business, helped improve resilience among refugees. Since the cooperatives are well grounded in local communities, it is easier for refugees to be accepted by their host communities, fostering better inter-community relations.

Uganda

Solar kiosk managed by refugees and host community members

As part of the Energy Solutions for Displaced Settings (ESDS) programme by GIZ and UNHCR, eight energy kiosks were set up in four settlements selling energy items, including solar lanterns, while also serving as an e-waste management hub. The kiosks also offer basic computer training and phone charging. Each energy kiosk is operated by a cooperative of 10 to 15 refugees and host community members. Private solar suppliers have been encouraged to build supply chains for energy kiosks using a finance performance-based funding scheme. To account for the limited purchasing power of refugees, solar lamps can be purchased in monthly instalments, and the most vulnerable groups are supported with cash assistance to meet their energy costs. ■

Solar water pump for agriculture

To ensure a continuous water supply for the 45 hectares of land managed by 90 farmers from both refugees and host communities, UNHCR set up a solar water pump system to replace an existing diesel water pump. The farmers are part of an agricultural cooperative that manages the entire irrigation system (solar water pumps and the canal network to supply the 90 individual plots), to collect membership fees to cover the operational and maintenance costs and the salary of two technicians.

Overview

Most water pumping systems set up in refugee camps depend highly on humanitarian financial resources and a substantial part of UNHCR's operating budget. Solar-powered water pumps offer a low-cost and environmentally friendly alternative to the widespread fuel-operated motor pumps (International Water Management Institute, 2018). In Melkadida refugee camp, UNHCR, with the support of the IKEA Foundation, established a 56kW peak solar power water pump system that runs two solar pumps. The pumps provide 3,600 litres of water per hour, operating for four hours every second day. This pilot project aims to reduce carbon emissions and the farmers' reliance on diesel-powered pumps. The system pumps water from the nearby river and serves 45 hectares of land cultivated by 90 farmers. The solar water system, installed in 2022, is operated and maintained by a cooperative of farmers interested in looking after the system to sustain its production.

Technology details

A solar water pump system is essentially an electrical pump system run by solar panels. A typical solar-powered pumping system consists of a

set of solar panels that powers an electric motor, which in turn powers a borehole or surface pump. The water is often pumped from the ground and streamed into a storage tank connected to a gravity fed system. The tank stores the water for use when sunlight is unavailable. These water systems do not include energy storage provided by batteries, providing another cost saving.

Delivery and business model

UNHCR has provided seed capital and technical assistance to install the solar water pumping system and replace the existing diesel pump. The farmers used to collectively pay for the fuel to run the diesel pump, supported by humanitarian grant. However, the diesel pump's high operating cost limited the pumps' operating time, which affected agricultural production. After the solar conversion, the agricultural cooperative, comprising of 45 refugees and 45 host community members, took over the management of the solar water pump. The operation and maintenance of the entire irrigation system (pump and channel network for 90 individual plots) are handled by two technicians (each from the hosting and refugee community) who were trained on-site by UNHCR's implementing partners. The solar-powered systems reduced cost of pumping water allows farmers to increase their income through improved product quality and lower operating costs. The cooperative collects a monthly fee from its members, covering operating and maintenance costs, including the salaries of the two technicians.

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CONSIDERATIONS ON SOLAR WATER PUMP FOR AGRICULTURE

Depending on the model, water pumps can either be solar-powered or hybrid (solar + diesel generator). However, existing fuel-based motor pumps cannot be converted into electrical pumps and need to be replaced.

When not utilised, the water is often stored in an elevated tank providing gravitational storage at sunset. The tank eliminates the need for costly energy storage provided by batteries.

Solar water pumps are known for their long lifespan compared to diesel-powered water pumps, while the payback period for solar water pump systems depends on the fuel price and consumption in the area

Whereas running costs are low, high upfront capital is needed to purchase and install a solar water pump and irrigation system. Additionally, the budget for maintenance costs and spare parts must be factored in at the planning phase.

Solar-powered water pumps are generally easy to maintain because they only have a few mechanical parts, reducing the need for repairs and replacement parts. However, maintenance and spare parts availability are still required, and routine check-up must be planned and costed.

HOW TO REPLICATE THIS PRACTICE

STEP 1
Review the country's legal, regulatory and institutional framework and assess national standards, regulations or incentives for solar water pumps.

STEP 2
Identify the water demand based on irrigation practices, crop types, cultivated areas, and season avelability. Assess the water availability of nearby sources and determine the safe level of exploitation.

STEP 3
Carry out a feasibility study for various solar water pumping solutions, including hybrid options, to guide decisions on techno-economical scenarios and the local availability of the system compontents.

STEP 4
Involve all interested parties, including water users, local authorities, and existing water suppliers, to discuss delivery models (grants, subsidies, etc.) and possible business plans.

STEP 5
Establish a cooperative or a working group of refugees and host community members to operate and maintain the system. Provide training on technical operation and maintenance and basic business skills.

Protection and health

Accessible and clean water is necessary for drinking but also for agriculture. Over 60% of the world's population depends on agriculture for survival, according to the Food and Agricultural Organization (FAO) (Healing Waters, 2022). In many refugee contexts, farmers need to rely on labour-intensive rope and bucket to fetch water from wells or expensive diesel or petrol-based water pumping systems to irrigate their crops. Solar-powered water pumps offer a solution that improves food security and increases community wellbeing.

Acceptability

Solar water pumps provide a reliable water source and can be a solution for areas with limited access to electricity. This allows farmers to grow their crops better, leading to higher production and better income than diesel generator-powered irrigation systems. Solar-powered water pumps generally have fewer maintenance requirements and are considered more friendly to operate.

Affordability

Solar water pumps have a high capital cost to install but low operating costs. Conversely, fuel-operated water pumping systems have higher operating costs due to constant need for fuel supply and maintenance. Assuming the capital cost is provided by donor funding, the savings overshadow the initial investment required to install the system, and users can bear the operating and maintenance expenses.

Self-reliance

By supplying a consistent amount of water, solar water pumps allow farmers to have a more stable crop production and therefore provide them with higher incomes, which can be used to keep the water pumping and the irrigation system flowing.

A man fills up a fumigation device in Melkadida Farm 1, in Melkadida, Ethiopia.

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Environment

Solar water pumping uses renewable energy and represents an environmentally friendly alternative to fuel-powered pumps. Care should be taken when installing solar water pumps to ensure groundwater is used in a sustainable manner and avoid overexploitation of natural resources. When a grant or other financial arrangement covers the initial capital costs, the water supplied is more economical to the users than the actual situation, and they may be incentivized to increase water use which needs to be regulated. (CTCT, 2022)

Lessons learnt from other UNHCR practices

East Africa

Lessons learnt from solar water pumping systems in refugee camps

Several water pumping systems have been installed in refugee camps in Kenya, Uganda, South Sudan, and Sudan; some powered entirely by solar energy, others by a hybrid combination of solar systems and generators. To ensure solar system sustainability, several factors need to be considered, namely: parts replacement, reliable solar installers, service agreements, downsized systems, and backup solutions.

Bangladesh

Solar water pumps providing clean drinking water for refugees

In 2018 in Cox's Bazar refugee settlements UNHCR installed five solar-powered water systems improving the daily supply of safe, clean drinking water for the large refugee population. The pumps run entirely on electricity generated through solar panels and feed 70,000 litre tanks that are chlorinated to eliminate the risk of spreading water-borne diseases. The water is then distributed through pipes connected to strategically installed taps throughout the site. With this system, UNHCR provides 20 litres of safe and clean water per refugee per day. ■

Cover photo:

In 2017, UNHCR and the IKEA Foundation provided equipment for solar-powered grids to be established in Dollo Ado refugee camps. In a region increasingly affected by climate change, solar power answered the need for energy in the camps to be clean and sustainable, while the establishment of cooperatives to run them is generating much-needed income.

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UNHCR, Private Partnerships and Philanthropy
UN City, Marmorvej 51
2100 Copenhagen Ø
Denmark

www.unhcr.org