

## DADAAB REFUGEE CAMPS, KENYA

### SOLAR ENERGY AND ENERGY EFFICIENCY

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#### BACKGROUND

The Dadaab refugee camps face complex challenges with regards to energy supply for pumping of water, cooking and lighting. The area in which the five camps are located is remote and not connected to the national power grid. Consequently, both the refugee and host communities rely on firewood, kerosene and spot lights. Fuel is used to pump water from most of the boreholes. However, Dadaab is also relatively windy and characterized by hot and dry weather and therefore has potential for the use of renewable energies.

The installation of solar powered street lamps and provision of lanterns and energy efficient cooking stoves not only improve the lives of refugees, but also contribute to their protection. The night can be dangerous for women and girls living in camps that lack adequate lighting. Solar lamps and lanterns make communal areas and residential blocks safer. Fuel-efficient stoves also play a protection role, because their use means women and girls spend less time fetching wood. In isolated areas they are at risk of sexual and gender based violence.

Yann Arthus-Bertrand



Another advantage of energy efficient equipment is that by using less fuel, funds can be saved. This is an important factor in camps that have been depending on donor support for more than 23 years.

The goal is to find new solutions and to upgrade existing projects to the

next level. Hereby, the wider refugee community should benefit as well as the local Kenyan community who has been hosting refugees since the establishment of the first camp in 1991.

#### SOLAR ENERGY

Over the years, UNHCR has undertaken various pilot projects aiming at harnessing solar energy for water management, street lights, cooking, household lighting, charging of cell phones and powering of cooling facilities for storage of medicine and perishable products.

##### Solar Energy for Water Management

So far, two of the 30 boreholes in the Dadaab camps and surrounding areas use solar photovoltaic power. 27 of the 30 boreholes function on diesel powered generators, while the 30<sup>th</sup> borehole is for standby use. All 30 boreholes are located within the Merti Aquifer ground water system. The depth of aquifer penetration is 150 - 180m and the discharge varies between 25 and 60m<sup>3</sup>/hr.

In efforts to save fuel, a hybrid of PV solar and diesel generator was first installed in a borehole situated in Hagadera camp. A second PV solar stand-alone was set up in Ifo 2 camp.

This complementary use of two or more energy systems is known as *hybrid power system*. Hybrid power systems can be defined as a combination of complementary energy generation systems based on renewable energy or mixed renewable energy source – with a backup of diesel powered generator or other petroleum fuels.

On a sunny day, the Hagadera system pumps between 160 and 192m<sup>3</sup> of water from the borehole to an elevated steel tank using photovoltaic power. A diesel generator operates on cloudy days to supplement the solar panels. This reduces diesel fuel consumption by up to 60%.

The operational concept of the hybrid system is that solar PV will be the first choice of supplying load to the borehole, which pumps water to a storage tank for the time solar power is available i.e. during the day. A diesel generator set will be a secondary source of energy, specifically when solar energy cannot meet the threshold energy required to pump the water i.e. during the night.

The benefits of photovoltaic solar - diesel hybrid systems are:

- Improved reliability and energy services
- Reduced emissions and pollution
- Continuous power supply
- Increased operational life
- Reduced cost, and more efficient use of power

The 29 boreholes deliver about 10,000m<sup>3</sup> of water per day in the five Dadaab refugee camps. The experiences gained from the boreholes with the first two solar modules will be used in the planning for the other 27 boreholes.



Photovoltaic modules and solar power inverter at borehole in Hagadera

UNHCR/Dadaab

## Solar Street Lights

750 solar street lights will be installed in the camps and selected host community sites over the coming months in the frameworks of the 'Light Years Ahead' project funded by the Canadian International Development Agency (CIDA). So far, 163 solar street lights (funded by IKEA and the European Union/ECHO) have been installed in the camps. As they have frequently been subject to vandalism, measures have been taken to better protect the assets.

Although coverage of the camps with solar street lighting has so far been very low, substantive impacts have been realized including:

- Reduction of incidents of crime in residential blocks and sections.
- Improved security along paths and roads leading to public amenities such as markets, bus stops, mosques, schools, social halls, water storage tanks, and boreholes.
- Protection against vandalism of communal assets.
- Local traders in Hagadera camp have appreciated the installation of solar street lights as they directly contribute to increased profits. This has also improved relations between refugees and members of the host community.

UNHCR/Dadaab

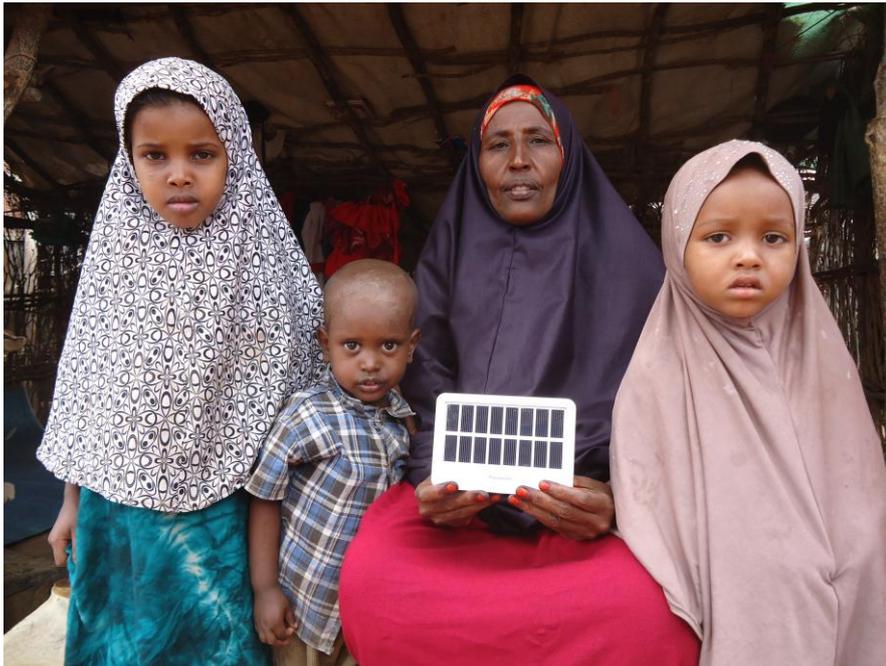


Solar street light in Ifo 2

### Solar street lights installed since 2012 and distribution planned for 2014 (CIDA)

	Dagahaley	Ifo 2	Ifo	Hagadera	Kambioos	Host Community
IKEA & ECHO funded	23	45	20	43	32	
CIDA funded	121	115	144	150	70	150
<b>TOTAL</b>	<b>913 solar street lights in all five camps and host community by the end of 2014</b>					

## Portable Solar Lamps and Cell Phone Chargers



Family in Kambioos with Panasonic solar lamp

Small solar lamps have impacted very significantly on the welfare of beneficiaries. They increase the safety of women and girls in the camps and enable school children to improve their academic performance. Solar lights have also helped to minimize cases of poisonous bites by scorpions, camel spiders and snakes at night, especially during the rainy season.

During past distributions, women at risk were selected as the main recipients of solar lanterns with a special focus on female headed households and survivors of gender based violence. This is a way of addressing risks arising from poor lighting systems in the camps coupled with lack of male partners to offer them protection.

Solar lanterns also offer additional features such as phone and computer charging.

### Solar lanterns and lamps distributed since 2010 and distribution planned for 2014 (CIDA)

	Dagahaley	Ifo 2	Ifo	Hagadera	Kambioos	Host Community
Panasonic				200	50	
IKEA & ECHO funded	3,400		3,720	4,152		3,848
CIDA funded		5,000			4,000	
UNHCR Korea and Envt.		6,000	2,372	140		
Waka Waka Foundation					141	
<b>TOTAL</b>	<b>33,023 solar lanterns in all five camps and host community by the end of 2014</b>					

## Solar Energy for Income Generation and Education

Solar energy has also proven to be useful in support of income generating activities for both refugees and their host community. An example is businesses which offer cell-phone charging services in Hagadera by using solar gadgets. Solar energy is also used to power communal milk cooling kiosks in Alinjgur and Welmerer. Predominantly youth benefit from capacity building in the area of ICT through the support of the Norwegian Refugee Council (NRC) and Microsoft Corporation.

## Solar Energy in Offices and Compounds of Humanitarian Agencies

Offices and compounds of humanitarian agencies in the Dadaab operation depend on electricity through generators. In order to save costs for fuel, UNHCR and partners have piloted various solar energy based solutions with good results.

- Solar panels provide power for radio communications and internet connectivity as a back-up to diesel generated power in the UNHCR office.
- A Solar powered compound perimeter fence lighting system is operated by the International Rescue Committee (IRC) in Hagadera Hospital.
- Office lighting and machine operations are solar driven at the FaIDA field office in Alinjukur and the NRC field office at Dagahaley camp site.
- Solar powered water chlorination dozers and pumps have been adopted in the UNHCR compound.

## ENERGY EFFICIENT STOVES

The settlement of more than 350,000 refugees in Dadaab has put the environment under severe stress. Trees have been cut down all around camps. As a result, refugees no longer have enough firewood within their camp sites and the competition among them and their host community over the use of natural resources is seen as a potential source of conflict. The use of fuel efficient items not only helps to protect the environment and to mitigate conflicts over natural resources but also reduces risks for women and girls who are collecting firewood.

### Energy Efficient Stoves (household size)

Since the establishment of the first Dadaab camp in 1991, various agencies and donors have been involved in the fabrication and dissemination of energy efficient stoves. One example is the NGO International Lifeline Fund (ILF) which was active in the Dadaab camps until the end of 2013.

More recently, the United Nations Centre for Regional Development (UNCRD) has procured 3,500 Envirofit Stoves to be distributed to both refugee and host communities.

In addition, over 24,500 Maendeleo Portable Stoves will be distributed in the frameworks of the CIDA Light Years Ahead Project. Beneficiaries of the CIDA and UNCRD stoves have been selected by focusing on child headed households, foster families as well as persons who are elderly, extremely ill or disabled. This distribution plan ensures that every household in the relatively new camps, Ifo 2 and Kambioos, is covered with an energy efficient stove.

Fuel-efficient stoves mean women and girls spend less time fetching firewood and are therefore less exposed to sexual and gender based violence. The new stoves save up to 40 per cent fuel. There are also health benefits as the distributed stoves cause less smoke than traditional cooking equipment.



*Stove testing exercise*

## Energy efficient stoves distributed since 2012 (in addition to ILF stoves) and distribution planned for 2014 (CIDA)

	Dagahaley	Ifo 2	Ifo	Hagadera	Kambioos	Host Community
ECHO funded	3,000	3,000	3,000	3,000	1,500	
CIDA funded	5,500	7,000	5,500	3,318	3,200	
UNCRD Environfit Stoves	600	600	600	600	400	200
<b>TOTAL</b>	<b>41,018 energy efficient stoves distributed to households in all five camps and host community by the end of 2014</b>					

## Energy Efficient Stoves (large scale)

In March 2014, 45 energy efficient stoves were installed by UNHCR and an organization called InStove in primary schools in all five camps, hospitals, the MDR-TB Ward and the Safe Haven in Ifo camp. These stoves use advanced design principles to maximize fire power and fuel efficiency while minimizing harmful emissions. A 60 liter stove can feed up to 400 people daily, and a 100 liter stove can feed up to 700. The stove is designed to operate on small pieces of wood, the ideal size being in the range of 3-5cm diameter.



UNHCR/Dadaab

Installation of a stove for school feeding program and demonstration of its fuel efficiency

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## Links:

Web portal on Somali Displacement:

<http://data.unhcr.org/horn-of-africa/regional.php>

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