



Humanitarian Engineering and Energy for Displacement (HEED)

The HEED Project: multi-level cross sectional impact

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Acknowledgements

The HEED team would like to acknowledge the financial support of the Engineering and Physical Science Research Council (EPSRC) for funding the Humanitarian Engineering and Energy for Displacement (HEED) project as part of the Global Challenges Research Fund (EP/P029531/1). The HEED team would like to thank project delivery partners Practical Action and Scene Connect for their significant role in co-ordinating in-camp activities and providing technical inputs and tools. We would also like to recognise the support of MIDIMAR (Ministry of Disaster Management and Refugees) and UNHCR (United Nations High Commissioner for Refugees) and the contributions of the Global Plan of Action, Chatham House, and the RE4R (Renewable Energy for Refugees) Project (a partnership between Practical Action and UNHCR, supported by the IKEA Foundation).

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More details on the HEED project can found at <http://heed-refugee.coventry.ac.uk>

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The HEED project is funded by the Engineering and Physical Science Research Council (EPSRC) as part of the Global Challenges Research Fund. HEED is led by an interdisciplinary team based at Coventry University, in partnership with the international development charity, Practical Action, and Scene Connect, a social enterprise strengthening communities through the development of ICT products.

This report should be referenced as:

Al-Kaddo, H., Halford, A., Nixon, J., and Gaura, E. (2021). The HEED project: Summary of multi-level cross sectional impact. Humanitarian Engineering and Energy for Displacement (HEED) Project, Coventry University UK. DOI: 10.18552/HEED/2021/0004



Overview

Globally, there are 82.4 million displaced people and 26.4 million refugees.¹ An estimated 7 million displaced people in camps have access to electricity for less than four hours a day,² making them among the most likely groups left behind in the global drive for improved energy access. In settings that are both precarious economically and politically, humanitarian actors need access to design protocols and provision pathways for energy products and services that deliver inclusive, affordable, and sustainable energy systems that benefit camp-based populations now and in the future.

The Humanitarian Engineering and Energy for Displacement (HEED) project's vision is an innovative response to growing recognition of the need to improve access to energy, particularly from renewable energy sources, for populations displaced by conflict and natural disasters. This collaborative project between Coventry University, Practical Action and Scene Connect aimed to explore and document alternative energy ownership, access and sharing models using new technologies, informed by real-time sensor data and community co-design frameworks. This briefing paper overviews three impacts that emerged from the project outcomes that can aid short and long-term improved access to energy and sustainability of energy systems for refugees and internally displaced people (IDPs).

1 UNHCR, 2021. [Figures at a glance: About us](#). UNHCR Ireland.

2 Grafham, O. 2019. Energy access and forced migration. Routledge, p. 208.



Sector impact

Numerous global challenges, such as climate change, natural disasters and increased humanitarian crisis mean that striking a balance between rapid humanitarian relief and goals around sustainability must be considered when implementing sustainable energy interventions. The reliance on different sectors and approaches was important to the learning and success of the HEED project due to the project implementation in two diverse country contexts with multiple project partners. In line with the OECD-DAC definition, we view impact as the “positive and negative change produced directly or indirectly, intentionally or unintentionally, by a development intervention”.³ The project produced significant learning outcomes that contribute to cross-sectoral impact in the following areas: policy, development, and humanitarian action.

- Policy impact: a data portal with survey and sensor monitoring data on the energy usage of household, community and commercial buildings that can aid decision making for policymakers, practitioners, and academics working in the displaced setting.
- Implementation impact: piloting of energy interventions, solar-battery systems design and community ownership models that promote context appropriate energy systems.
- Sustainable development impacts: engaging communities through participation and democratisation of common pool resources to improve access to energy that will build capacity and self-reliance.

3 OECD-DAC, 2018. [Better Criteria for better evaluation revised evaluation criteria definitions and principles for use OECD/DAC network on development evaluation](#). EvalNet, p 11.



Policy impact

Energy data

Research, evidence, and data on energy in the humanitarian sector are critical to delivering Sustainable Development Goal (SDG) 7 for the access of safe, modern, and clean energy for all by 2030. Without a comprehensive overview of access to energy in the displaced setting, it limits designing, deploying, and implementing energy programmes that respond to refugees' energy needs and aspirations. Policy informed by data helps regulate processes and generates innovations that provide livelihoods opportunities and enable humanitarian agencies to implement essential energy services for vulnerable populations. Implementing energy policies in the refugee host country and within the humanitarian sector can also help increase inclusion and energy access for displaced populations.⁴ Including new strategies for integrating the human and social dimensions of energy systems into energy design, planning, and policy-making processes allows for higher levels of inclusion of the displaced populations. Thus, well designed and implementable energy policies can improve energy security, minimise emissions in the national refugee-hosting contexts and improve access for displaced populations.

Currently, the scarcity of energy-related data in the humanitarian sector is due to the complexity of refugee hosting contexts. Data is needed to understand the energy needs and usage of populations, the availability of infrastructures in the context, and the socio-economic, development and political environments within the host countries. The absence of this data affects policy and decision-making within the humanitarian sector and for energy stakeholders, such as national governments or the private sector. Without data that informs policies, the implementation of efficient and cost-effective energy systems and projects for displaced communities will continue to be slow and unsustainable. One of the HEED projects contributions has been to identify and collect evidence and data on energy within the refugee and displacement contexts in Rwanda and Nepal.

4 Miller, C.A. et al. 2015. Socio-energy systems design: a policy framework for energy transitions. *Energy Research & Social Science*, **6**: 29–40.



CASE STUDY: Energy data portal

To address the gap in humanitarian energy data, the HEED Data Portal hosts a large body of data collected from sensor monitoring and surveys conducted in three refugee camps (Gihembe, Nyabiheke, and Kigeme) in Rwanda and four sites for internally displaced people in Khathe, Nepal. The data portal evidences the ways people interact with static and portable solar lighting, clay cookstoves and energy use in communal spaces in complex, infrastructure-less settings.

Energy assessment surveys of 1,000 respondents, including households, entrepreneurs, and those responsible for community facilities, such as schools and health clinics are found in the data portal. The surveys include data on the energy usage of household, community, and commercial buildings. They are evidential of how refugees in Rwanda and IDPs in Nepal have access to and use of electricity, lighting technologies, cooking technologies and fuels, energy priorities, and ownership of the energy products.

This open access repository also contains sensor monitoring data collected from an IDP settlement in Khathe, Nepal. The data gives insights into electricity usage, its costs and sufficiency in grid-connected sub-metered scenarios. In Rwanda, the sensor data was collected from three camps: the Nyabiheke camp, from a standalone solar system for a community hall and 40 solar mobile lanterns. In the Kigeme camp, data was collected from a PV-battery micro-grid for two nurseries buildings and a playground and stove use monitors; and the Gihembe camp, data was collected from eight solar streetlights, including four advanced streetlights.

The Data Portal also includes the design details of the energy interventions, including protocols on designing solar systems for communal lighting and buildings with low-cost intelligent sockets and light sensors for remote metering and control for all the interventions.



Implementation impact

Co-creation of energy services

Sustainability of energy interventions are attributed to a number of issues, which range from the technical to the socio-cultural, institutional and economic aspects of implementation.⁵ The HEED project produced energy interventions that provided greater access to education and livelihood opportunities in addition to the technological energy solutions in the camps. The interventions relied on co-design and co-creation methodologies, which were employed both in the Rwanda and Nepal refugee and displacement contexts. These methodologies helped implement energy systems impacts that are both longer term and sustainable for the communities in the complex displacement contexts.

Community co-creation of energy interventions positions the needs of refugee and displaced communities at the centre of energy programmes to become active participants in energy governance and technological skills development. Funding alone for technological innovation-driven solutions is not sufficient to produce robust energy eco-systems in the displacement context. The existing approach to energy access will continue to embed aid dependence unless prior to deployment of energy interventions communities are engaged. Community co-creation will build technological skills, draw upon local resources, and open up a range of community ownership models that increase the sustainability and longevity of energy interventions using new technologies.

CASE STUDY: Mobile sensor solar lanterns: Nyabiheke Camp

Solar lanterns can provide cheaper lighting for longer durations, offering a sustainable alternative to kerosene and other fossil fuel-based lighting technologies. When no other forms of electricity is available in homes, solar lanterns as a discrete intervention have the greatest positive impact on the lives of refugees, particularly women and children.⁶ To understand how solar lanterns are currently being used by people living in camps, HEED distributed 40 mobile solar lanterns, designed with a sensor to record movement and usage, to Congolese refugees living in Nyabiheke camp. The data gives insights into the frequency of use, mode of lantern use, for example whether the lantern was used static or mobile/ indoor or outdoor), distances the lantern travelled by households at night, and the type of usage in-doors. Exploring how and in what ways mobile lanterns are used in the domestic and communal spaces allows for understanding to what extent mobile lanterns are gendered. In future, this data could improve solar lantern designs by reflecting the lived experience of women in the displaced setting.

5 Terrapon-Pfaff, J. et al. 2018. Impact pathways of small-scale energy projects in the global south – Findings from a systematic evaluation. *Renewable and Sustainable Energy Reviews*, **95**: 84–94.

6 Harrison, K. et al. 2020. Why off-grid energy matters? An impact performance report. UK: 60 Decibels.



Sustainable development impact

Participation and democratisation

Sustainable energy solutions and investments in refugee contexts help generate and promote environmental and social impacts, both directly and indirectly in the contexts. The HEED project falls in line with the Sustainable Development Goals (SDGs), primarily from the energy access perspective due to the implementation of energy interventions (SDG7.1). However, the project contributed to skills development and the inclusion of participants through democratisation processes during the project implementation, thus leading to inclusive societies or SDG16. The project sought to create development impacts through participation and inclusion of energy stakeholders, mainly the marginalised communities within the refugee and displacement contexts.

Ownership of assets by refugee communities is not currently the norm. Discussions with communities around access to energy encourages community-based decision making, democratisation and infrastructure that builds community capacity and resilience. Providing space for socio-technical solutions to emerge from conversations with refugees, IDPs, practitioners and other energy stakeholders is critical to mobilising community engagement. HEED delivered a number of community Design for Displacement (D4D) workshops in Nepal, Rwanda, and the UK to clarify desired energy outcomes, inform design protocols, and identify robust demand patterns ahead of system design. Similarly, hosting Energy for End-Users (E4E) community workshops in Nepal and Rwanda created a space for refugees and IDPs, especially women and young people, to explore how they would design and manage the day-to-day use and maintenance of the proposed systems. These workshops proved to be instrumental in designing and piloting of community co-designed energy models that worked towards community participation and democratisation through communal responsibility for the use of solar interventions.



CASE STUDY: Empowering communities

Empowering community representatives in the management of communal energy resulted in a diverse range of social and community activities taking place, such as people cooking and eating together. There were also formal community activities that were essential to education and governance within the refugee camps, which included extra-curricular teaching and leaders' meetings. As an outcome of community democratisation processes is community leaders in the three refugee camps in Rwanda and Nepal are still engaged in the management of the interventions showing the potential of alternative energy ownership models and how refugees and IDPs can self-govern energy resources to improve conditions.

Empowering communities also means providing safe spaces and engaging with all participants in the communities. For instance, during the co-designing solar streetlights workshop in Gihembe, Rwanda, participants expressed concerns about responsibility for the security of the lights due to previous lighting projects being subject to theft and vandalism. The consultation of the community for solutions led to the transfer of responsibility to the local camp leaders of each quarter empowering them to nominate individuals to carry out the security of the lights at each location. Subsequently, the community became active actors in generating sustainable solutions to protect the interventions encouraging communal ownership of the streetlights. Further, demonstrating democratisation at the camp level based on agreed solutions.

In addition to this, the recent COVID-19 pandemic, committee leaders oversaw the repurposing of the nursery building in Kigeme, Rwanda to allow students from the University of Kigali to use the building to power their laptops and to connect to wireless internet. Subsequently, the community became more confident in generating sustainable solutions to protect the interventions demonstrating democratisation at the camp level based on agreed solutions.



HEED resources and contact information

The [HEED Data Portal](#).

The [RERT Tool – the renewable energy and recommendation tool](#) (RERT).

Website & social media

 www.heed-refugee.coventry.ac.uk

 [@heed_energy](https://twitter.com/heed_energy)

Publications

Briefing Papers

Gaura, E., and Nixon, J. 2019. Remote sensing technologies and energy applications in refugee camps in *Energy Access and Forced Migration*, ed. Grafham, O. London: Routledge, p 158–169. doi: [10.4324/9781351006941-11](https://doi.org/10.4324/9781351006941-11)

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Humanitarian Engineering and Energy for Displacement (HEED)

Since the introduction of the UNCHR global strategy on Safe Access to Fuels and Energy (SAFE) in 2014, humanitarian responses to refugees and internally displaced people (IDPs) have sought to deliver safe and sustainable energy provision. By focusing on the lived experiences of refugees and IDPs in Nepal and Rwanda to understand energy usage in refugee camps and settlements, the HEED project will develop, and contribute to, innovative responses which address demands for improved energy services.

Our research, led by key experts in the fields of engineering and social science, is looking for solutions that will provide crucial guidance on creative approaches and technologies to clean or fuel-efficient cookers, alternative and sustainable fuels, and solar-powered lighting, which will build the resilience of refugee communities.

Our partners

The HEED project, is led by an interdisciplinary team based at Coventry University, in partnership with the international development charity, Practical Action, and Scene Connect, a social enterprise strengthening communities through the development of ICT products.



Contact us



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This research has been funded by the EPSRC Global Challenges Research Fund (Grant N° EP/P029531/1).



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