Mapping Indicators for Humanitarian Energy Access and the Decarbonisation of Operations

Supporting the Alignment of Data Practices on Sustainable Energy in Situations of Forced Displacement

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Acronyms

AC	Alternating Current or Air Conditioner/Air Conditioning
BLEENS	Biogas, liquefied petroleum gas, electricity, ethanol, natural gas, and solar
DC	Direct Current
GPA (CU)	Global Platform of Action on Sustainable Energy in Situations of Displacement (Coordination Unit)
HH	Household
HO	Humanitarian Operations
ICS	Improved Cook Stove
IDP	Internally Displaced Person/Population
IWA	(2012 ISO) International Workshop Agreement
kWh	Kilowatt hour
LPG	Liquid Petroleum Gas
MFI	Microfinance Institution
MoMo	Mobile Money
MTF	Multi-Tier Framework (by World Bank's Energy Sector Management Assistance Programme)
PoC	Persons of Concern
PUE	Productive Uses of Energy
SGBV	Sexual and Gender-based Violence
SHS	Solar Home System
VAM	Vulnerability and Mapping
W	Watt
Wh	Watt hour
Wp	Watt peak

Executive Summary

Energy in Humanitarian Situations

Currently, we do not have a comprehensive overview of how many displaced people have access to energy. Despite global efforts to measure and track progress on Sustainable Development Goal (SDG) 7, sustainable energy for all, crisis-affected populations often fall into a "grey zone" as many refugee and displacement situations are under the remit of UN and NGO partners rather than national host governments. In the humanitarian sector, there are no standard procedures and limited guidance on collecting data and information to measure energy access rates or understand the energy needs of crisis affected communities. Overall, there is a dearth of data and quality evidence on the status quo of energy access in settings of displacement. Understanding what indicators and data is needed, and streamlining data collection, analysis, reporting and sharing processes, will play an important role in improving access to affordable and reliable clean energy at scale for displaced populations and their local hosting communities.

There are now over 82 million displaced people worldwide. Overwhelming IDPs make up the majority of this figure, with 48 million people being internally displaced within their countries. A further 26 million people are refugees, 4 million are asylum-seekers, and 3.9 million are Venezulans displaced abroad. The humanitarian sector covers a large number of situations, technologies and cluster priorities, within which energy is a critical need. The core term we use for this report is 'energy access in displacement settings', defined as "ensuring reliable, sustainable and affordable energy access for all displaced people, including household cooking and electricity solutions, energy for enterprises and community services, and decarbonising energy for humanitarian facilities" (Al-Kaddo and Rosenberg-Jansen 2021, p1). This covers refugee communities, who are people forced to flee their country, Internally Displaced People (IDPs) who are forced to move within their own countries, and the host communities who support displaced communities. This report covers all displacement settings, inclusive of host communities, and seeks to understand the range of indicators needed to cover all humanitarian clusters and forcibly displaced situations, including forms of displacement and migration caused by climate change and natural disasters.

Indicators and the Need for Measurement

To support the development of energy data within the humanitarian sector, the Global Platform of Action (GPA) for Sustainable Energy in Displacement Situations has been working with humanitarian sector partners and other stakeholders interested in, or working on, humanitarian energy to outline the types of energy indicators that it might be possible to collect and analyse in humanitarian settings. This document provides an overview of key indicators already used in the development and humanitarian sectors, as well as in-depth specialist indicators for certain focus topics, to inform the work of humanitarian energy policymakers and practitioners. The document focuses on three types of indicators:

- A common set of g**lobal level indicators to measure progress on energy access** and use in situations of displacement (i.e. include displaced populations into the SDG 7 tracking), which could be used to deliver a baseline of global energy access rates in displacement settings.

- Key **indicators needed for project interventions** in order to support the design and monitoring of programmes and projects that increase the access to sustainable energy for displaced people and host communities and the

use of more sustainable energy by humanitarian agencies.

- Essential **indicators on energy costs and greenhouse gas emissions** in order to understand payments for energy and track progress on addressing the climate emergency.

The goal of this report is to lay the foundations to address the data gap by reviewing existing indicators and suggesting the main ways of measuring energy, to inform subsequent data collection by energy, humanitarian, and partner organisations. To do this, the report outlines the key sets of indicators for energy access in humanitarian contexts, to enable standardisation of energy measurement within the humanitarian sector. The discussion of indicators in this document provides a resource to support the alignment of the measurement of energy across UN institutions, partners, the private sector, and current and future partners working on energy access in settings of displacement. Specifically, the report provides an overview of standard ways of measuring energy from the energy access and international development sectors, and seeks to apply them to humanitarian and displacement settings. All aspects of energy are covered, including energy for households, enterprises, community facilities, and humanitarian operations, covering electricity, cooking, heating and cooling needs.

An 'indicator' is defined as a piece of information that can be used to show what a situation is like. Indicators can cover a broad spectrum of issues - including being used to measure baseline, collect information on project feasibility, provide data on existing programmes, and evaluate changes which have already occurred. 'Data and evidence in humanitarian energy' can have many meanings: in the broadest sense, data is simply information about the status-quo or future needs to support decision-making on energy in humanitarian settings.

Standardised energy indicators form an important part of data collection and analysis in humanitarian settings. Having indicators which produce comparable sources of data means that it is possible to analyse evidence across different national and regional settings, and facilitate reporting on global and local progress towards Sustainable Development Goal 7 of ensuring all communities have clean energy access by 2030. Harmonising indicators is important in displacement settings to:

- Allow global tracking of progress towards SDG 7 for displaced people and other UN commitments on energy, such the UNHCR sustainable energy strategy or the Greening the Blue Initiative, through the provision of specific and agreed energy metrics.
- Enable data collection to track progress towards reducing energy costs and emissions as well as measuring the impacts of humanitarian operations to the climate crisis.
- Inform host government plans for incorporating displaced people into national energy access targets and strategies.
- Enable humanitarian agencies and partners to more effectively plan, resource and align their energy programmes with relevant SDG7 targets.
- Enable inter-agency comparison of datasets and analyses.
- Inform evidence-based fundraising as well as support Humanitarian Needs Overviews, Humanitarian Response Plans and any other relevant appeals.
- Ease the process of data sharing and exchanges among organisations and institutions working on energy access (or related) issues, visualising this is a standardised way for comparative analysis.
- Facilitate accountability for energy provision across the humanitarian sector.

GPA Indicators Mapping Process and Global Alignment

This report is based on an 18-month long consultation and learning process between May 2020 and September 2021 during which partners from across the development, humanitarian, and energy access sectors were consulted to establish the core indicators present in the sector. Initial workshops were held in the summer of 2020 to understand the types of indicators currently used within programmes and institutions in the sector, including a collective brainstorming on the humanitarian energy sector's priority needs. Then a series of one-to-one engagements with partners such as UNHCR, IOM, GIZ, and Mercy Corps were held in the autumn of 2020. Advanced workshops on data alignment and evidence sharing were then held with all partners in the winter of 2020 and early 2021. During this process we developed the following resources:

- A number of workshops on data needs to develop knowledge across the sector. A report on these workshops is available online here.

- A data sharing online tool for humanitarian energy data to enable comparison and analysis across programmes and countries.

- A research overview discussion paper to outline the research and data needs within the humanitarian energy sector.

The primary objective of this process was to support the alignment of key humanitarian, development and energy partners around a common framework for energy data collection, analysis and reporting in humanitarian contexts. Such alignment supports progress towards measuring global progress on SDG 7 in humanitarian contexts. Rather than creating new indicators or ways of collecting data, a key tenet of the process was to draw on existing mechanisms and widely used tools and processes across the energy access sector. For example, by building on work done by the World Bank and its Energy Sector Management Assistance Program (ESMAP) on the Multi-Tier Framework (MTF). This report is based on the outcomes of those processes, and builds directly on the World Bank's MTF and Sustainable Development Goal (SDG) 7.

The work is also explicitly aligned with UNHCR's Clean Energy Challenge and Sustainable Energy Strategy, IOM's Displacement Tracking Matrix (DTM), the GPA's Humanitarian Energy Exchange Network (HEEN) for field practitioners, WFP's Safe Access to Firewood and alternative Energy (SAFE) initiative, the GIZ ENDEV and Energy Supply in Displacement Settings (ESDS) programme, and the Joint Intersectoral Needs Analysis for Efficient and Effective Joint Response Planning (JIAF). Guidance was provided by the GPA steering group members for feedback and discussion during the process, which includes representatives from the following organisations: UNITAR, UNHCR, International Organization for Migration, GIZ, World Food Programme, Food and Agriculture Organization of the United Nations, Chatham House, Practical Action, UNEP, UNDP, Clean Cooking Alliance, Mercy Corps, Sustainable Energy for All, SNV, Lifeline Fund, and the Centre for Sustainable Transitions: Energy, Environment and Resilience (STEER) at Loughborough University.

Key Indicators Outlined in this Report

We have identified 16 core Indicators for Humanitarian Energy which cover access at the household, enterprise, community facility, and institutional levels for both electricity and cooking needs, outlined in the table below. We urge all institutions and projects in humanitarian energy to collect these indicators, and share the results across the GPA community, to enable a global baseline on energy access needs to be produced.

Executive Summary Table: Core Energy Indicators to be Collected Across All Displacement Settings

Energy Needs Location	Key Indicator for Access to Energy (Global Baseline)	Key Indicator for Intervention Assessment (Project Development)	Key Indicator for Reducing Inequality and Emissions (Leave No-One Behind)
Household Electricity	Proportion of Persons of Concern (PoC) population with access to electricity (on or off-grid) (Access %)	Type of electricity in households with access (grid, mini-grid, SHS, solar lantern, standalone diesel, shared diesel, other) (Technology %)	Average household monthly spend on electricity (Spend $)
Household Cooking	Proportion of PoC population with primary reliance on clean fuels and technology for cooking (Access %)	Type of primary cooking fuel (firewood, animal dung, charcoal, LPG, biogas, other) (Technology %)	Average monthly spend on cooking fuels and cooking technologies (Spend $)
Energy for Displaced Enterprises	% of businesses and enterprises with access to electricity (Access %)	Type of energy in enterprises with access (covering both electricity and cooking sources) (Technology %)	Average businesses/ enterprises monthly spend on electricity (Spend $)

Energy Needs Location	Key Indicator for Access to Energy (Global Baseline)	Key Indicator for Intervention Assessment (Project Development)	Key Indicator for Reducing Inequality and Emissions (Leave No-One Behind)
Energy for Community Facilities	% of community facilities with access to electricity (Access %)	Primary (most commonly used) source of electricity in community facilities (grid, mini-grid, SHS, solar lantern, standalone diesel, shared diesel, other) (Technology %)	Average monthly spend on electricity in community facilities (Spend $)
Energy for Operations	% of humanitarian operational facilities with access to electricity through renewable sources (Access %)	Primary source of electricity in HO facilities (grid, mini-grid, solar (AC), solar (DC), diesel/petrol, other) (Technology %)	Average monthly spend on electricity (total) in HO facilities (excluding community facilities) (Spend $). Annualised electricity use related CO_2 emissions (absolute)

1. Indicator Mapping Purpose

This report outlines the key indicators for energy access in humanitarian contexts, with a view to supporting the standardisation of energy measurement in the humanitarian sector. This mapping provides a resource to support alignment of measurement of energy across UN institutions, the private sector, and current and future partners working on energy access in settings of displacement. Specifically, this mapping provides an overview of standard ways of measuring energy from the energy access sector, and their application to humanitarian and displacement settings. The mapping covers all aspects of energy, including energy for households, enterprises, community facilities, and humanitarian operations, covering both electricity and cooking needs.

While some energy assessments and data sources are available within the humanitarian sector, many of these products are outdated, not comparable or do not provide enough detail for decision-makers. Similarly, many existing reports and summaries fail to provide accurate information on the current country-level state of play, or relevant information for those designing new humanitarian or development interventions. Overall, there is a dearth of data and quality evidence on the status quo of energy access in settings of displacement. The goal of this mapping is to lay the foundations to address this gap by reviewing existing indicators and suggesting the main ways of measuring energy, to inform subsequent data collection by energy, humanitarian, and partner organisations.

An indicator is defined as a piece of information that can be used to show what a situation is like. Indicators can cover a broad spectrum of issues - including being used to measure baseline, collect information on project feasibility, provide data on existing programmes, and evaluate changes which have already occurred. Data and evidence in humanitarian energy can have many meanings: in the broadest sense, data is simply information about the status-quo or future needs to support decision-making on energy in humanitarian settings. The question then becomes, which end-users of information require which types of data and which indicators can be used to provide information? In other words, it is crucial to first define the ultimate aim or purpose of the data. For example, is the data needed to help prioritise new interventions, design energy access projects or monitor and evaluate an existing one? Will the data be used for advocacy or decision-making processes, or to report on carbon emissions? Once the purpose is clear, it becomes easier to select key indicators. Harnessing better data in humanitarian contexts is a complicated and challenging topic (Grafham and Sandwell 2020 and Bisaga and To 2021).

This mapping focuses primarily on indicators for the current status of energy use and demand rather than indicators that would provide a methodology for the monitoring and evaluation of existing interventions. In this report, we refer to these current energy use and demand indicators as basic global data. A global energy baseline is needed to help prioritise and systematically make decisions supporting improved energy work in displacement settings and monitor progress towards both Sustainable Development Goal (SDG) 7 on access to affordable, reliable, sustainable and modern energy for all[1] and ESMAP's Multi-Tier Framework (MTF) for assessing energy. The work is explicitly aligned with UNHCR's Clean Energy Challenge and Sustainable Energy Strategy, IOM's Displacement Tracking Matrix (DTM), WFP's Safe Access to Firewood and alternative Energy (SAFE) initiative, FAO's Energy-Smart Food (ESF) Programme, and the Joint Intersectoral Needs

1 The dimensions of energy access included in SDG7 are not easily defined. In this document we do not aim to offer definitions but encourage the reader to think about them critically. See this UN blog to learn about some key debates.

Analysis for Efficient and Effective Joint Response Planning (JIAF), as well as to inform new energy access projects and programmes.

Our analysis supports the Global Platform of Action (GPA) for Sustainable Energy Solutions in Situations of Displacement, and the vision that "Every person affected by conflict or natural disaster has access to affordable, reliable, sustainable and modern energy services by 2030". This report is an output of the data and evidence workstream. This mapping also aligns with the SAFE programme's strategy point 2, data for decision making, and looks to complement data platforms and processes, such as UNHCR's Energy Information System (EIS) and OCHA's Humanitarian Data Exchange (HDX), as well as the World Bank ESMAP programme MTF survey which may be expanded to cover displacement settings after 2021.

1.1. The Need for Alignment and Harmonisation

Currently, many organisations and institutions (including UNHCR, WFP, FAO, and IOM) collect some data on energy access. This data is often for a specific project, for example, for the purposes of designing new projects (needs or feasibility assessments) focusing on electricity access or access to clean cooking, or for monitoring and evaluating existing projects and programmes. However, much of that data is not shared externally and is collected on an ad-hoc basis rather than systematically. Similarly, while private sector and NGO partners within the humanitarian energy sector also collect information, this is often for specific projects or investments. Additionally, it is not always clear how it was collected and the resulting variation within and between datasets makes it difficult, if not impossible, to make comparisons beyond one organisation's internal sources. Finally, there is no single authority currently organising humanitarian energy data, bringing it all together in one centralised location for public access. This report outlines the types of energy indicators that humanitarian organisations can use, and supported the production of "harmonized, standardized, high-quality and usable data on sustainable and safe energy for the humanitarian sector [which] is used and shared for planning, learning, monitoring and evaluation" (GPA 2018, p. 43).

Harmonising and standardising indicators and data collected on energy access in settings of displacement will allow global tracking of progress towards Sustainable Development Goal (SDG) 7 for displaced people and other UN commitments on energy, such the UNHCR sustainable energy strategy or the Greening the Blue Initiative, through the provision of specific and agreed energy metrics. Standardized indicators will also enable data collection to track progress towards reducing emissions and limiting the impacts of the climate crisis, and nform host government plans for incorporating displaced people into national energy access targets and strategies for better incorporation of sustainable energy solutions. At the implementation level, harmonised indicators can also inform better-tailored energy programme and project design: a comprehensive set of indicators will facilitate a better-tailored design of various energy interventions, and facilitate accountability for energy provision across the humanitarian sector and support the delivery of sustainable energy access for displaced communities.

Overwhelmingly, there is a need to produce high-quality, usable energy data for the humanitarian sector and practitioner partners in delivering sustainable energy solutions. The following sections outline the types of energy categories and indicators that can support the production and analysis of such data.

2. Humanitarian Energy Access Framework

2.1. Energy Access Categories

The broad categories of energy access in humanitarian contexts, which run across refugee camps and IDP settlements in both emergency and protracted situations, include: households (HHs), enterprises and productive uses, community facilities, and humanitarian operations and facilities. These categories are based on ESMAP's Multi-Tier Framework (MTF) (2015) with the addition of humanitarian facilities and operations (which the MTF household survey does not yet specifically include). A short explanation of these categories is provided below:

- **Energy for households** centres on the energy needed for people within their homes. This includes energy for lighting and power, appliances and technologies such as lanterns, kerosene lamps, solar home systems, and basic and improved cook stoves. Some households may also be connected to mini-grids or the national grid. Within this category, three distinct sub-categories are distinguished within household needs: access to electricity, access to cooking fuels and technologies, and access to space heating and cooling where applicable.

- **Enterprise access and productive use** refers to energy access for businesses or income-generating activities, which can be inside or outside of households and can be formal or informal in humanitarian settings. For example, this can include small businesses (for example micro-businesses) within displaced settlements such as mobile phone charging shops, restaurants, and small-scale shops and traders as well as the energy needed for larger-scale productive uses such as agriculture, agro-processing, hospitality, and entertainment. This energy category covers several sub-categories of energy access services for businesses: access to electricity (e.g. for lighting, phone charging, powering different appliances, water pumping); cooking fuels and technologies; heating (for space, products and water) and cooling (e.g. refrigeration); and motive power (energy used to power machinery). While some

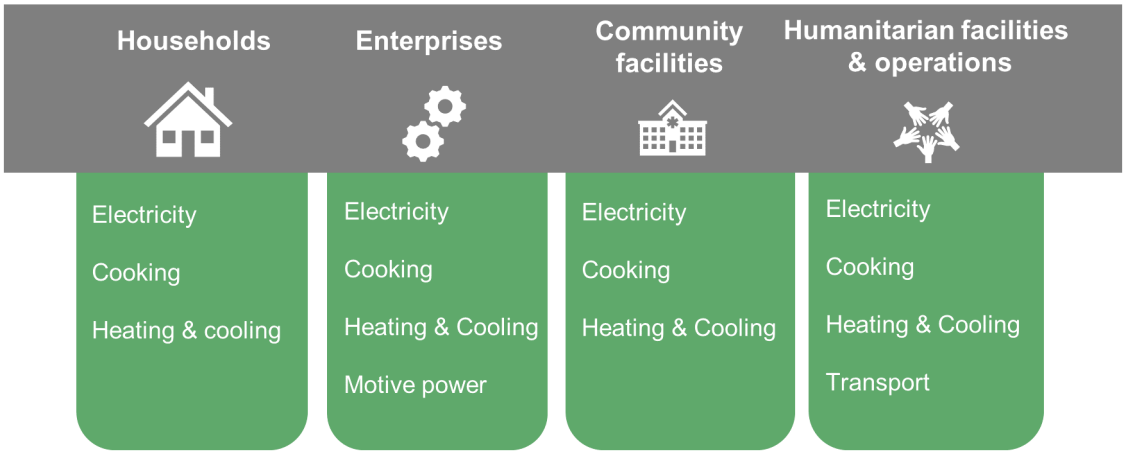

Figure 1. The core categories of energy users and their energy needs in settings of displacement: (from left to right) energy for households, enterprises, community facilities, and humanitarian facilities and operations.

smaller businesses may be able to use off-grid technologies such as solar home systems and lanterns to provide some electricity, larger amounts of power are often needed for productive uses and enterprises.

- **Energy access for community facilities** refers to access to electricity, cooking fuels and technologies, and heating and cooling within public and communal spaces for displaced people. Community facilities and services covered include street lighting, health (clinics, hospitals, etc.) and educational (schools, training centres, etc.) facilities, community spaces, including community buildings (community halls, centres of prayer, etc.), and community water pumping facilities. This energy can come from a range of sources, but often higher capacity power is required from mini-grid technologies or grid connections. Almost all energy needed for community facilities is electrical, as only some facilities need cooking energy or energy for heating and cooling. There are two energy access components in this category: energy access for facilities that do not currently have power (for example, unelectrified spaces where power is needed for street lighting, health clinics, etc.), and energy transitions from unsustainable to sustainable sources (for example from diesel generators to solar power, or to cleaner cooking fuels and technologies from firewood, charcoal or other unsustainable biomass).

- **Energy for humanitarian facilities and operations,** for organisations and institutions (such as UNHCR, FAO, IOM, ICRC and others) which use energy to run their daily activities. This covers operational uses of electricity, energy for cooking, heating and cooling, and transport. The use of electricity, in addition to powering various appliances, also covers water pumping and energy for boreholes[2], and the power needed within humanitarian organisations' facilities (whether inside or outside of the designated displacement areas, such as refugee camps). Operational energy uses can include electricity for core operational provision of humanitarian services, such as energy needed at for public offices (e.g. camp administration), at food distribution points, and in refugee registration or administration spaces, as well as the power needed for compounds and housing staff and energy for transport (land and air). Higher capacity power is needed for operations, and power is often supplied through diesel generator sets (gensets), connection to a mini-grid, or electricity from a national grid. Transitions to more sustainable energy where diesel gensets and firewood, charcoal or other unsustainable biomass for cooking are commonly used should also be considered in this category.

In all these categories, energy can be supplied both on-grid (from a national grid or large-scale energy supplier), or off-grid (through provision of technologies such as mini-grids or small-scale energy technologies - such as diesel generators, individual solar home systems, or products such as lanterns and cook stoves). In many Middle Eastern and South Asian contexts, displaced people often live in camps or settlements close to the grid and therefore some of the indicators in this report consider grid connection. In sub-Saharan Africa, however, this is less common and many solutions need to be supplied off-grid. Similarly, most refugees and displaced people live in urban areas and are reliant on national and local energy supply to access both electricity and cooking resources. As a result, the context questions at the start of this chapter outline includes indicators to measure these types of displacement.

As Figure 2 below highlights, within households, enterprises, community facilities, and operational spaces, there are many types of technology solutions available. Therefore, the indicators presented in this mapping are technology neutral: they seek to understand which resources are currently used, as well as indicators to measure costs and expenditure. An exception to this is for renewable and sustainable energy: in some contexts, donors or project funders may specifically request that the amount of renewable or sustainable energy is measured, in line with SDG7. Therefore, within the indicators, some specific indicators to capture this are suggested.

Finally, it is also important to measure how energy is delivered and paid for. The middle column in Figure 2 highlights that different actors are responsible for supplying and securing access to energy. While humanitarian organisations take the lead on providing energy for their own operations and often in community facilities, displaced people often bear much of the burden for securing and paying for energy in their homes and businesses. While it is not the purpose of this report to detail delivery mechanisms, indicators are suggested within the mapping that cover a range of supply mechanisms. Importantly, this goes beyond the free distribution of energy products to households, and considers the total energy life of displaced people: including indicators to measure how much energy they access independently from the humanitarian system and how much they pay for it.

2 Power for operating water boreholes (if not manual) can be either categorised as 'community facilities' as it is the communities who use them for obtaining water and is often managed by WASH officers and the WASH cluster, or as 'humanitarian operations' as it is humanitarian organisations who often manage and pay for these facilities. There is no clear consensus on this. We categorise it as mainly across the community facilities and humanitarian operations mainly while recognising the debate within the humanitarian and energy communities, as in humanitarian contexts either the local governments or operational users are responsible for the installation and management of boreholes.

A number of resources are available to supplement this overview of the energy uses in refugee and displacement settings, which further detail the energy situations in various contexts:

- The GPA's Framework for Action which outlines the key issues and priorities in the humanitarian energy sector and the GPA Research Paper on data and research issues.
- A key paper on the definitions and institutions present within the humanitarian energy sector.
- An overview article of the humanitarian clusters and energy access nexus (Thomas et al 2021).
- Seminal publications on energy access such as the MEI Heat, Light and Power report and the Energy Access and Forced Migration Book.
- The EnDev Humanitarian Energy and Micro-enterprises report.
- UNHCR's Energy Information System (EIS) which provides reporting information on some existing UNHCR energy interventions.
- The Moving Energy Initiative (MEI) programme and resources.
- The Coventry University Humanitarian Engineering and Energy for Displacement (HEED) programme on energy needs in Rwanda and Nepal, including energy data portal.
- The Practical Action and UNHCR Renewable Energy for Refugees (RE4R) programme on energy needs in Rwanda and Jordan, including energy survey results in Rwanda.
- The Loughborough University's Modern Energy Cooking Services (MECS) programme, which provides evidence on household cooking needs in humanitarian contexts.

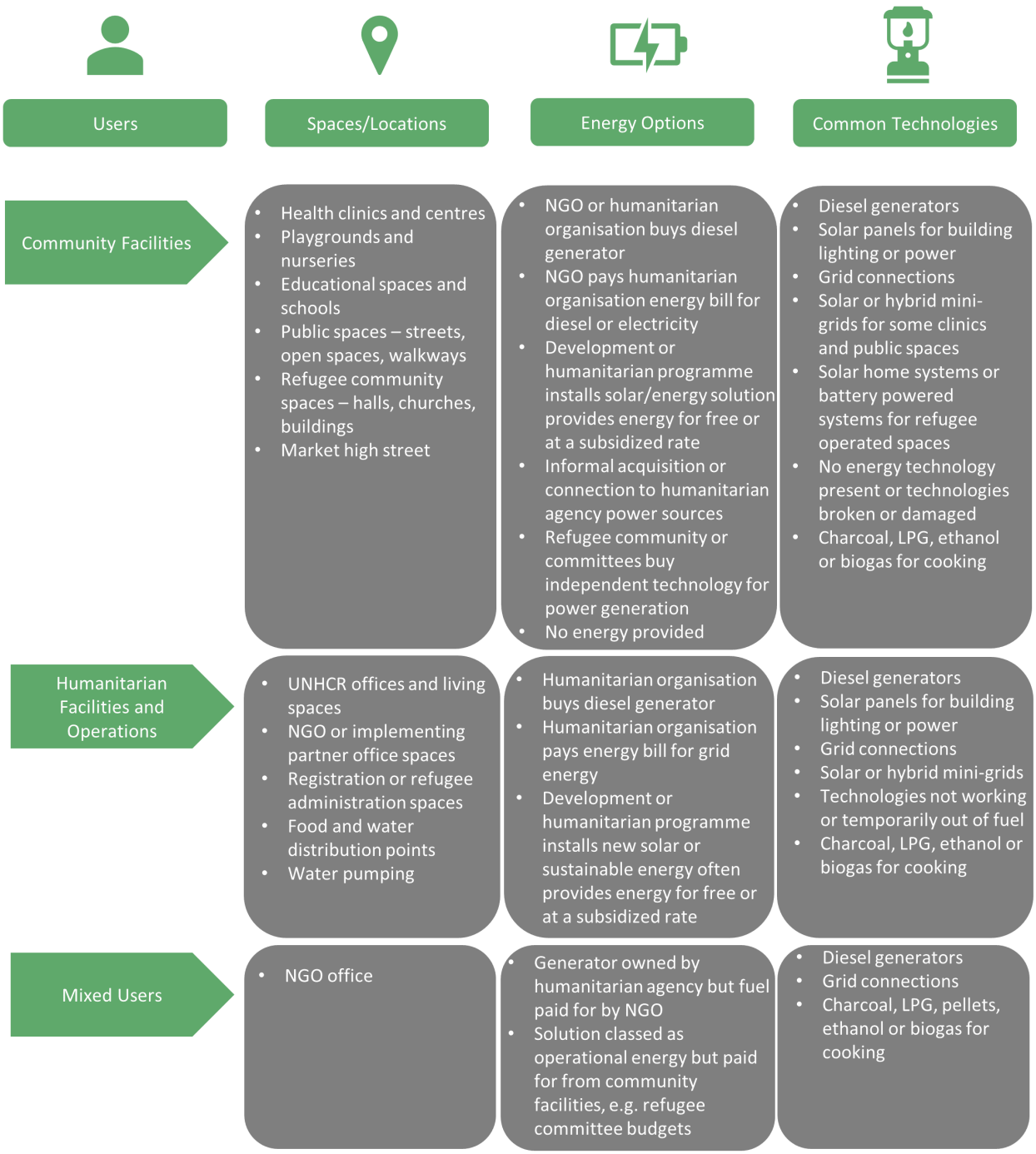

Figure 2. Examples of types of energy users and the locations where they use energy, energy options and common energy technologies

2.2 Indicators for What: Measurement Categories

Indicators can tell us many things about energy access, and it is important to first understand what data will be used for. To suggest the most relevant indicators needed currently by practitioners, this mapping focuses on three elements (global data, project data, and emissions data) in order to:

- Develop a comprehensive **global energy baseline** to include displaced population into the SDG 7 tracking.
- Identify key information needed to develop **projects** to increase the use of (and access to) clean energy in displacement situations.
- c) Demonstrate critical evidence to show the **costs of energy** for humanitarian agencies and displaced people and reporting information on **greenhouse gas emissions**.

Global data is focused on: energy data needed by humanitarian and development decision-makers, such as information on baseline energy access rates in displacement settings, including detailing both cooking and electricity access at the household, enterprises, community facility and humanitarian facilities.

Project and feasibility assessment data contains: energy data for humanitarian agencies and their partners to develop sustainable energy interventions, including detailed information on current energy production and consumption (baseline data), energy needs in households, businesses, community facilities, and operations, as well as financial, regulatory, and market insights.

Costs and emissions data is critical in demonstrating who pays for energy and how, including the kind of business and financing models that can be developed to provide access to sustainable energy. While emissions data is needed to demonstrate progress towards climate change mitigation efforts.

Figures 3 and 4 below showcase the range of evidence and information needed by the humanitarian sector. These topics could be addressed by any number of indicators. Within this document, the core recommended indicators within the tables at the start of each section are separated into key global indicators in the left column and key project specific indicators in the right column. This categorization is not intended to be limiting but rather to present the potentially key indicators for those working at different purposes. For example, those working at the global level may wish to use many of the indicators listed under the 'project data' heading and vice versa. The indicators presented can also be used for research purposes, and by the private-sector, policymakers, donors and those looking to address wider sectoral needs. The numbering in the long list of indicators does not represent importance but rather it is used to make it easier for the reader to navigate the list.

The indicators and metrics presented in the sections below have - in most cases - been developed and adapted from existing standard practice across the energy access sector. They were discussed and debated during a workshop on data standardisation and are suggested ways of measuring energy in humanitarian contexts, as a result of consultation with GPA partners and workstreams members and other relevant stakeholders.

For global-level energy measurement, several factors were identified as important through initial consultations within practitioners.

- Indicators which provide data for tracking SDG 7, for both cooking and electricity for displaced communities. This requires understanding the global state of play in delivering energy in settings of displacement and is likely to require indicators aligned with SDG 7 reporting.
- Harmonized indicators, which support the comparability of information across and between institutions. This suggests that where possible, it will be important to align indicators and use the same metrics within organisations.
- Embedding research and learning on energy within humanitarian systems, including understanding what progress is being made and what types of energy support are most effective in different humanitarian settings.
- Highlighting the needs for evidence on costs and emissions to inform global debates on development and climate change.

The diagram below highlights these issues, but also suggests other areas where global-level data is needed throughout the humanitarian system.

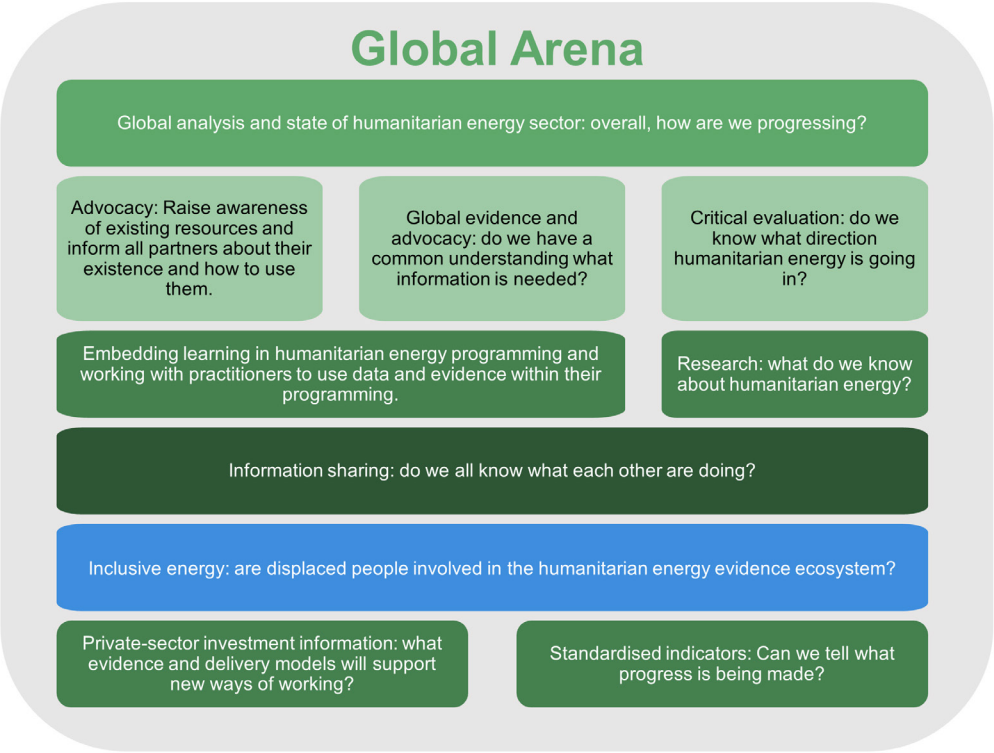

Figure 3. Data linked to global indicators.

For project and programme-level energy measurement, several factors were highlighted as critical initial areas of focus:

- Indicators to support energy feasibility assessments. Such indicators focus on understanding the energy that displaced people and humanitarian operations need, how much they pay for it, and situational analysis to support humanitarian action.
- Detailed programme design indicators have also been identified as a priority area, including the need for specific information on which technologies and delivery models would work best for supplying end-users and data that support effective programme design.
- To some extent, it was agreed that monitoring, evaluation and learning (MEL) indicators and project reporting are covered within individual agency and organisation reporting requirements, e.g. UNHCR's Energy Information System (EIS) or WFP's COMET system.
- Project specific climate and cost reporting.

The diagram below provides a summary of the types of programme data that could be useful for humanitarian agencies, the private sector, and implementation partners.

For evidence on **costs of energy** for humanitarian agencies and displaced people and reporting information on greenhouse gas **emissions**, several key indicators are already in use across the energy and climate sectors. Several key areas of measurement were suggested:

- Indicators to measure the contribution of the humanitarian sector in terms of global emissions.
- Evidence on the impact emissions and pollution are having on local environments and to what extent the humanitarian sector is contributing to the global climate crisis.
- Data on the costs of the provision of energy and to what extent this burden lies with displaced people.

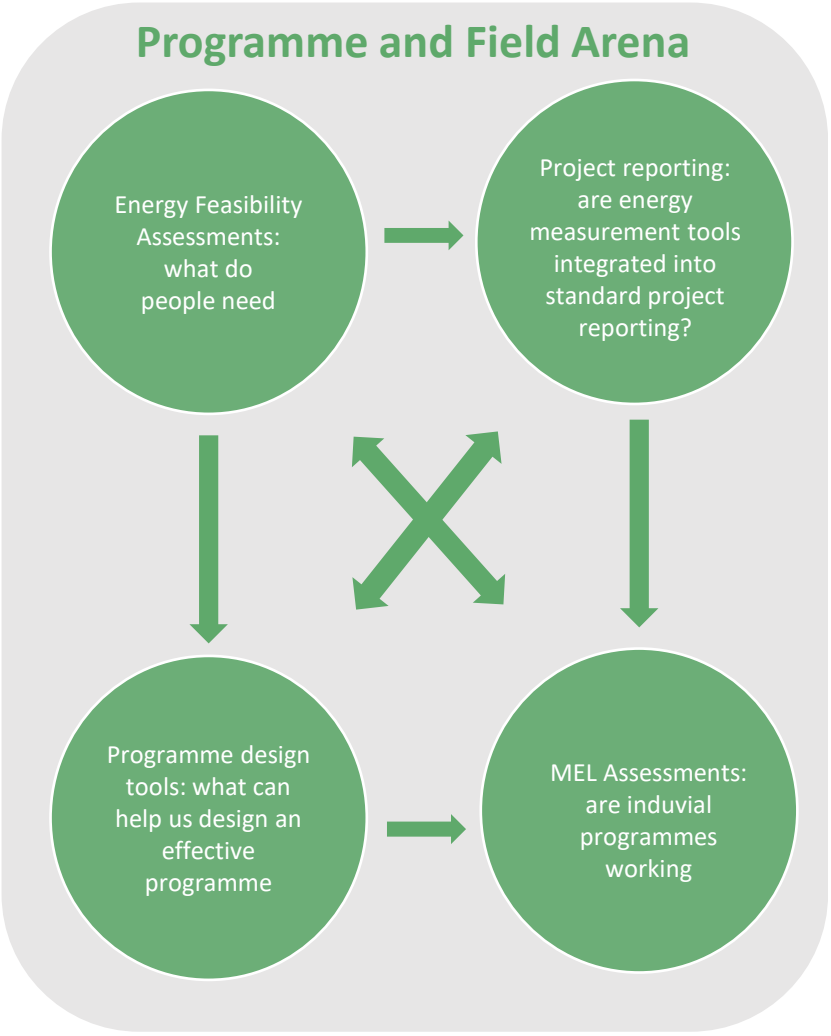

Figure 4. Data for programme and field implementation.

- Analysis on inclusive energy and indicators which can be used to demonstrate how displaced people are included within the energy access system.

The indicators proposed in section 3 outline the specific suggested indicators needed for these focus areas as well as considering how to measure energy access needs more broadly. In the case of stakeholders such as the private sector, it is expected that prior to starting any projects in humanitarian settings a full feasibility study would be conducted independently. However, they could benefit from the data collected based on this mapping and from proposed indicators themselves which can serve as a guide in designing such studies.

To understand the range of energy access needs in different settings of displacement for project or programme design, an understanding of the following different components is required, as demonstrated in Figure 6 below.

These components are cross-cutting across the humanitarian cluster system and are outlined below:

1. The Population of Concern and national policy context: policies and regulations concerning displaced populations, such as citizenship or residency options, or lack thereof; access to camps for non-camp residents and non-humanitarians (e.g. for individuals not involved in humanitarian work).

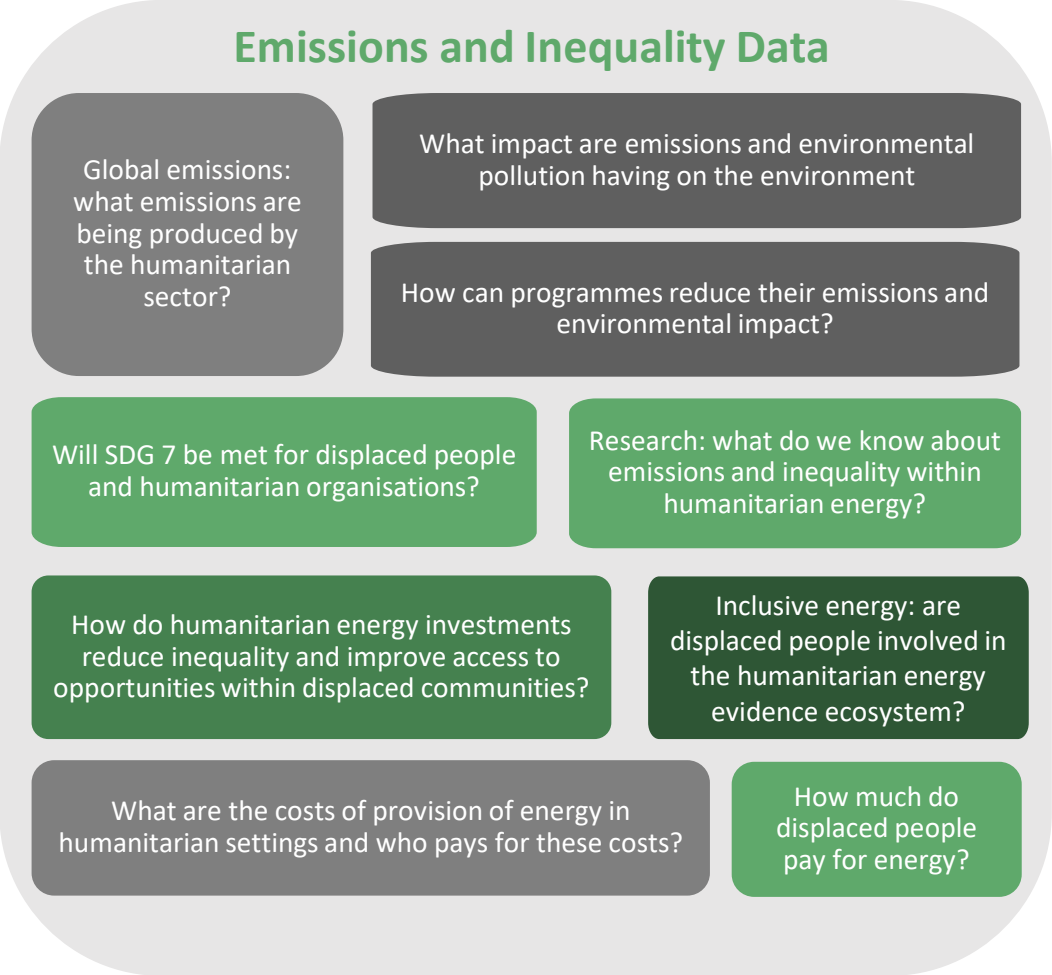

Figure 5: Emissions and Inequality data.

2.3 Different Energy Contexts and Cluster Priorities

Different humanitarian contexts require different forms of energy support. For example, providing energy solutions in a rural refugee camp in Sub-Saharan Africa will not be the same as supporting the needs of internally displaced people living in urban areas in the Middle East.

2. Understanding the context of displacement and needs of the host population. Insights on the displaced population include general demographic information, such as the total population size, number of HHs, typology of the PoC settlement (e.g. camp, urban, slum, rural) and details on current energy use: grid or off-grid electricity connections, types of fuels used, energy expenditure, energy needs etc. The same applies to the host population who are

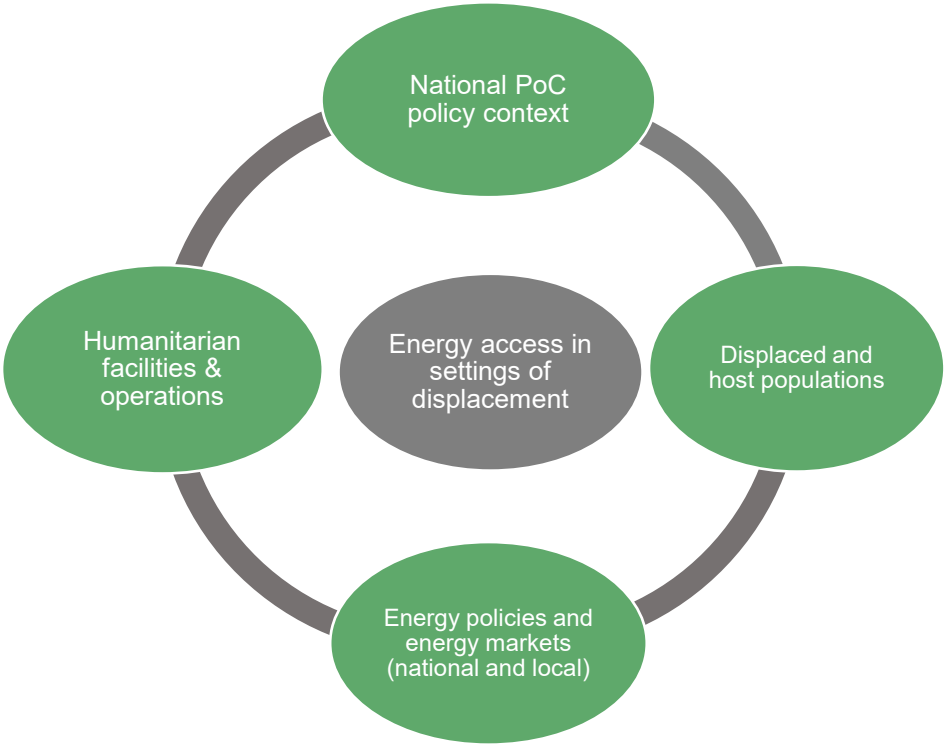

Figure 6. Key areas of interest for stakeholders interested and/or operating in settings of displacement.

also a part of the displacement setting and might face similar energy access challenges as displaced people themselves. While not repeated, most indicators cover both Persons of Concern (PoC) and the host population, effectively using the same indicator to cover the different communities.

3. Humanitarian facilities and operations: Energy use in humanitarian operations refers to the types of fuels and technologies used for accessing electricity (grid, off-grid, e.g. diesel, solar etc.) and cooking, as well as other energy required for critical operational needs (e.g. heating or cooling of administration facilities, pumping for water provision etc.) of humanitarian organisations. While energy access is generally facilitated for humanitarian operations, it tends to rely on non-renewable sources, such as diesel, and calls for the application of improved solutions and renewable energy in order to comply with the SAFE strategy and to ensure a reduction in the humanitarian sector's GHG emissions.

4. Energy policies and energy market environments (national and local/location specific): national energy policies and strategies, including policies on energy products and services (e.g. duty exemptions on renewable energy systems) as well as the place of energy access for displaced populations in a given country (e.g. is it included in the national targets and planning? Are there existing grid connections or future (planned) grid connections in the refugee camps or settlements?). Additionally, energy market assessments examine the status quo of energy services and products provided at both the national and local (in the location) level, e.g. presence of renewable energy companies, available energy products etc. This is of particular interest to stakeholders willing to access the energy markets in settings of displacement, such as the private sector. Understanding the local policies and regulations on issues such as duties and duty exemptions on energy products, presence and scale of existing private sector operations (the competitive landscape), etc. can inform market entry decisions and project/ programme design from the commercial standpoint. Note that while host communities are not listed out separately under each category of indicators, nearly all the indicators apply to host communities in the same way as they do to displaced communities, with the exception of those specifically referring to the displaced status and related aspects.

5. Sector Needs: Energy and Humanitarian Clusters. The Inter-Agency Standing Committee (IASC) Cluster System coordinates overarching action across a range of technology and intervention areas, such as water, protection, health and logistics. The cluster system was adopted in 2005 to increase the effectiveness of emergency humanitarian response. Each cluster has a lead agency responsible for coordinating the delivery of humanitarian assistance within that sector. The diagram below suggests a preliminary overview of the areas where energy interlinks with the cluster system. Notably, there is currently no official cluster for energy. Therefore, this mapping approaches energy across and within these

clusters. Structured by traditional energy access categories (households, enterprises, community facilities and humanitarian operations), rather than attempting to detail which indicators might be most useful per cluster. Further details is provided in the annexes on which indicators might be most useful for each cluster.

2.4 Data Collection and Assessment

It is not expected that all stakeholders working on energy access in settings of displacement are going to collect all the data based on the list of indicators outlined in this document. Nor is it expected that the GPA Coordination Unit or any single organisation will be in charge of all data collection or analysis. Rather, the goal is that different stakeholders will work together to produce and analyse evidence, while doing so in line with organisational and project processes and needs. For example, an organisation working specifically on energy access for livelihoods might only be interested in collecting data on indicators focused on productive uses of energy. Data might then be collected either by the same organisation or a relevant partner (e.g. a consultant, a research company or an academic institution) and analysed either internally or by the partner. Evidence can then be disseminated through various partners, including the GPA and its members.

To support the development of data in humanitarian energy, UNHCR and WFP are currently working on assessment methods and how to collect data. In the case of UNHCR, the energy team in Geneva have produced a draft guidance note on how to collect and analyse energy data, entitled From Assessment to Investment in 2020[3]. These resources are intended to support the development and measurement of energy information in humanitarian settings. While this report outlines what types of indicators it is possible to use in humanitarian settings, work on assessments seeks to understand how to collect this information through energy and feasibility assessments, and as a result is a natural next step in data discussions.

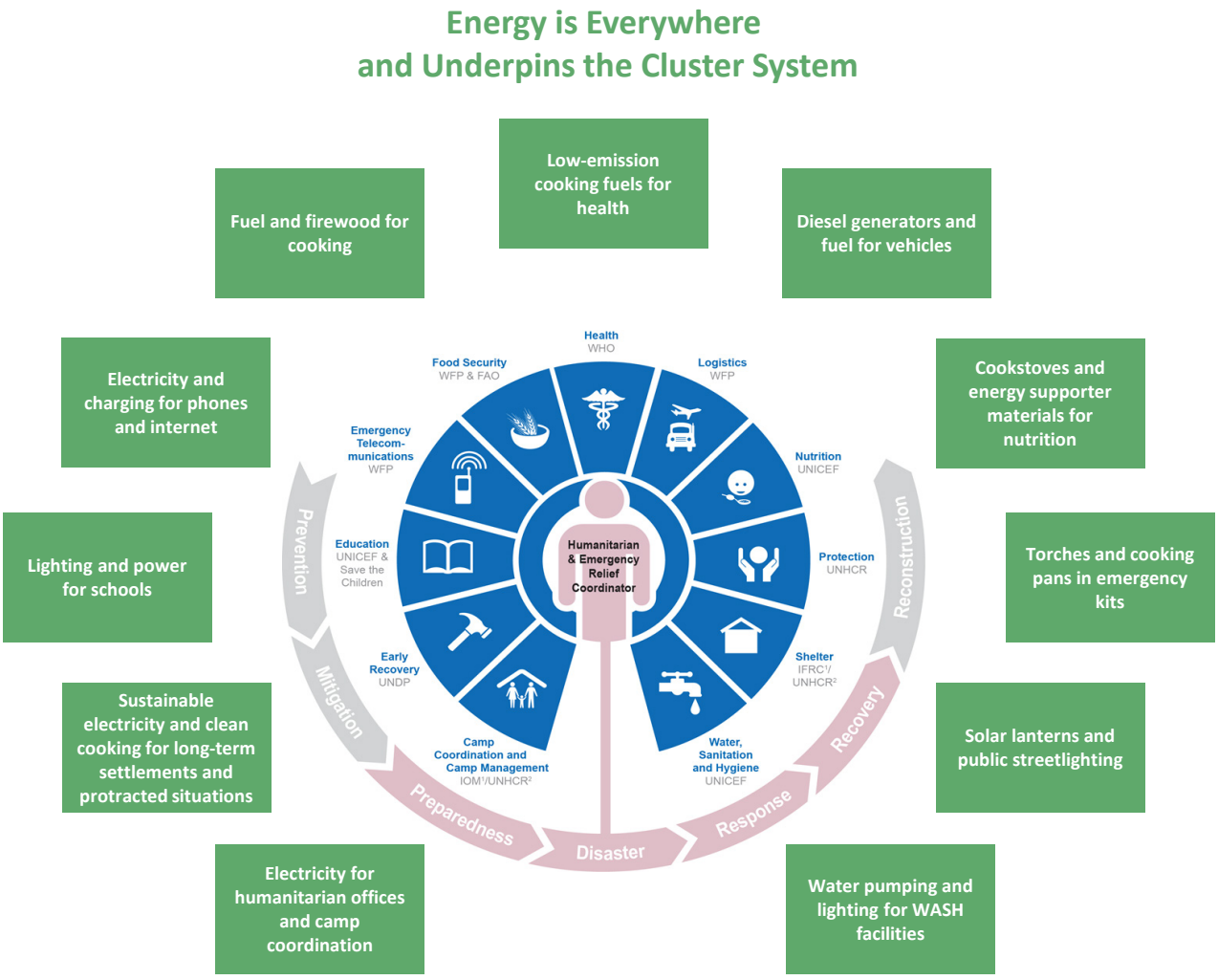

Figure 6. Key areas of interest for stakeholders interested and/or operating in settings of displacement. Figure adapted from the work of Peter Thomas, Sarah Rosenberg-Jansen, and Aimee Jenks (2021) journal paper on understanding the humanitarian cluster system and energy priorities.

3 For further information on this, please see UNHCR 2019 Energy strategy.

3. Indicators: Energy Measurement in Humanitarian Settings

The indicators proposed below suggest how energy data can be measured and assessed within humanitarian settings. They are intentionally designed to cover a range of camp and urban settings, emergency and protracted situations, and refugee and internally displaced populations. Within such a range, energy contexts can vary considerably. Therefore, sometimes it is necessary to use multiple indicators instead of just one. In each section, the first table outlines the key indicators proposed for each energy category for essential global and project needs. This information has been identified as critical to understand the basic energy situation in any location. A second, longer, table in each section then presents a range of indicators that can be used to develop in-depth information or create detailed energy assessments to inform programme design or reporting.

Broadly, the indicators under each category contain the following metrics (or classifications):

- Energy access: who has access, where, and how.
- Energy technologies and fuels being used: types of situations and resources.
- Spend on the technology or fuel in use: payment and cost of resources.

Where applicable, metrics which cover energy capacity (in Watts or Watt-hours), sufficiency or availability (in number of hours or coverage of energy needs), reliability, efficiency of the technologies used, and impact (for example feeling of safety, well-being, fuel collection time and ease of use, particularly from a gender perspective) are also included. The classification section of the longer tables (the column on the far right) suggest the ways in which the indicators can be measured, but are not comprehensive survey questions and would need to be further developed for rigorous data collection.

The Multi-Tier Framework (the MTF by the World Bank's Energy Sector Management Assistance Programme -ESMAP) provides considerable guidance on how to measure energy access and undertake data collection through their surveys and questionnaires. Many of the indicators have been developed and adapted using the MTF framework and associated surveys.

3.1. General Population, Policy Regime, and Energy Market Information

General indicators are non-energy specific and cover some of the basic socio-demographic characteristics such as size of the refugee or IDP population (as well as host population), household size, household head, income etc. Unless specified that an indicator refers to a host community, these indicators focus on the population of concern, refugee camps, IDP camps, urban settings, or other displacement settings, including returnees[4]. Such indicators are necessary to understand the energy context in which responses and energy programming can take place. This section also covers indicators on the local policy regime and status quo of the local energy market in order to help paint the picture of the current and future energy market development prospects.

The majority of the indicators outlined in this section are already used by humanitarian organisations, either through internal agency and operational mechanisms (for example, UNHCR's Energy Information System (EIS) and WFP's Vulnerability Analysis and Mapping (VAM)), or by processes such as the Joint Intersectoral Analysis Framework

4 We distinguish returnees as a separate group who are within their own country but often unable to return to their homes. While they are similar to IDPs in their status, their circumstances differ (returning refugees rather than solely internally displaced). They might face unique challenges and often do not settle in camps.

(JIAF) or the IOM Displacement Tracking Matrix (DTM). While we do not suggest that dedicated energy assessments will be needed to collect all this information directly (i.e. through primary data collection), it is likely that any energy programming or intervention will need to consider these factors as important contextual information before designing solutions. Therefore, such information will need to be collected from secondary sources or by contextual analysis.

Key Indicator (s) for Global Data Needs	Key Indicator (s) for Project Data Needs
GENERAL POPULATION INFORMATION	
Total PoC population (total number) Total number of PoC households	Average monthly household income ($) (excl. Cash distribution but including remittance) Average monthly household income of host population ($)
Total host population within 20km[5] (total number) AND total number of host population households	Monthly PoC household cash distribution received ($)
What is the national hosting context? (rural or urban camps, rented/owned/informally occupied property or land in urban or rural areas, private hosting arrangements, integrated/non-integrated rights)	% of PoC households with access to vital household non-food items (NFIs) (protracted crisis OR sudden onset)
Availability of financial services in the location (Yes/No and list all relevant)	% of population with access to mobile money (MoMo) and financial services (e.g. MFIs, savings groups etc.)
ENERGY POLICY REGIME AND ENERGY MARKET	
National energy strategies (electrification and cooking) (qualitative details, including any decentralisation of energy access)	Are settings of displacement included in the national energy access strategies? (electrification and/or clean cooking) (Yes/no and qualitative detail on how and where) *Is there a commercial market for clean energy products?*
Do PoCs have the right to paid employment?	Can PoCs access financial services, such as Mobile Money or micro-finance?
Is the private sector involved in the national energy access strategy (electrification and/or cooking)? (Yes/No and details on how and how many are present in the country)	Is the private sector involved in the provision of energy access (electricity and/or cooking) in the location[6]? (Yes/No and details on how and how many are present in the location)
Number of renewable energy companies in the country (specify for electricity access and access to clean cooking)	Number of renewable energy companies in the location (specify for electricity access and access to clean cooking)
Average monthly revenue of private sector providers offering energy access solutions (electricity (non-renewable sources); electricity (renewable sources); clean cooking solutions (specify) at national scale.	Average monthly revenue of private sector providers offering energy access solutions (electricity (non-renewable sources); electricity (renewable sources); clean cooking solutions (specify) in the location

5 The UNHCR Clean Energy Challenge Baseline lists out 20km, 10km and 5km to determine the area of the host community. We have selected 20km as the broadest area.

6 Location here means the displacement location, whether a refugee camp, an IDP settlement or any other area which can be described as a location hosting displaced populations.

Key Indicator (s) for Global Data Needs	Key Indicator (s) for Project Data Needs
Total number of energy access products sold to date (in the location)	Average number of energy access products sold per month (in the location)
Is there a national-level subsidy scheme for energy access (electrification and/or cooking)? (Yes/No and details)	Is there a subsidy scheme for energy access (electrification and/or cooking) in the location? (Yes/No and details)
Current total national renewable energy generation vs set targets (specify)	Current % of total energy access through renewable sources in the location
Is there a national monitoring, reporting and verification system for greenhouse gas emissions in place?	Is there a monitoring, reporting and verification system for greenhouse gas emissions in place, in the location?
EXISTING ENERGY INTERVENTIONS	
Number of energy interventions with population of concern (historic and current) in the location	Type of energy interventions with PoC (qualitatively detailed, including number of people or households impacted)
Number of energy interventions with host population (historic and current) in the location	Type of energy interventions with host population (qualitatively detailed, including number of people or households impacted)
% of households with access to modern energy (Tier 3 or above for electricity and improved cooking solutions)	Average household monthly spend on energy (electricity/lighting and cooking) (Spend $)
Total global amount of investment in humanitarian energy ($)	Total amount of project funding spent on energy interventions in the setting of displacement
Number of people directly supported on accessing energy solutions and products (might be measured as a percentage)	Dedicated new project funds for sustainable energy projects ($) in the location
Number of jobs created or livelihoods supported by energy interventions (number)	Humanitarian agencies strategy and coordination of energy access delivery approaches in place (Yes/No and details)
Number of people provided with energy assets, services and technologies	Breakdown of people supported by different stakeholders (humanitarian organisations, private-sector, national governments, NGOs, etc.) (qualitative study).
Coordinating group on energy access established in the location? (Yes/No and details)	Type of delivery model or partnership process used to deliver energy interventions (e.g. private provider working under an energy programme or independent private provider) (qualitative description)
	Presence of a dedicated energy expert within humanitarian organisations or partners in the location? (yes, no and details)

Indicator / Data point	Metric / classification
GENERAL (POPULATION)	
1. Origin of PoC	Name (Country)
2. Total PoC	Number
3. % of vulnerable groups in PoC (% elderly, % ill, % physically challenged, % children, % women)	Vulnerable groups (%)
4. % of male and % of female in total PoC	Gender (%)
5. Total of PoC shelters/households	Number
6. Average PoC shelter/household size	Number
7. Average number of families per household/shelter	Household families
8. Head of household (male/female)	Head of household (gender)
9. Type of dwelling/shelter in PoC (tent, adobe hut/house, mud-brick hut/house, brick house, timber hut/house, cement house, self-built shack, transitional shelter/house, other) (%)	Dwelling/shelter type (%)
10. Average stay in the location (refugee camp, IDP camp, other) (in years)	Number
11. Number of commercial businesses and small/medium-sized enterprises	Number
12. Commercial business ownership by gender (% male and % female) in PoC	Business ownership (gender)
13. Category of business	Category (%)
14. Number of commercial businesses/small/medium-sized enterprises in host population	Number
15. Commercial business ownership by gender (% male and % female) in host population	Business ownership (gender)
16. Category of business in host population	Category (%)
17. Distance of PoC location to protected environmental areas	Distance to protected areas (km)
PoC POLICY REGIME	
18. Refugee right to work	None/Restricted (inside the camp)/Restricted (outside the camp)/Full/ Other
19. Refugee freedom of movement	Restricted/Unrestricted outside the camp
20. Refugee right to resident status (Yes/No) and/or citizen status (Yes/No)	Refugee status
ENERGY POLICY REGIME AND ENERGY MARKET	
21. Distance of the PoC camp/settlement to the national grid (km)	Grid proximity
22. Local supply chain for clean energy technologies	Mature/Nascent/Absent
23. Local supply chain for non-clean energy fuels/technologies (e.g. biomass, kerosene, paraffin, etc.)	Mature/Nascent/Absent
24. Commercial market for renewable energy products in the location	Mature/Nascent/Absent

Indicator / Data point	Metric / classification
25. Commercial market for clean cooking technologies in the location	Mature/Nascent/Absent
26. National tax exemptions on PV and other clean energy products *[list all relevant]*	Yes/No/Partial
27. National VAT exemptions on clean cooking technologies	Yes/No/Partial
28. National legal and licensing provisions for mini-grid development in place	Yes/No/Partial
29. National cost-recovery and tariff regulation for mini-grids in place (e.g. capital subsidies, performance-based subsidies and cross-subsidies)	Yes/No/Partial
30. (National or donor) financial support for mini-grids offered	Yes/No/Partial
31. Strategy for sustainable energy provision by humanitarian organisations in place (incl. joint/multi-party strategies)?	Yes/No/Partial (qualitative details)
EXISTING ENERGY INTERVENTIONS	
32. Description of existing electricity interventions in the location (active projects, programmes, pilots etc.)	Electricity interventions (qualitative description)
33. Description of existing cooking interventions in the location (active projects, programmes, pilots etc.)	Cooking interventions (qualitative description)
34. Description of waste-to-energy interventions in the location (for electricity and/or cooking)	Waste-to-energy interventions (qualitative description)
35. % of electricity access projects that use market-based approaches in the location	Projects using market-based approaches (%)
36. % of clean cooking projects that use market-based approaches in the location	Projects using market-based approaches (%)
37. % of clean cooking projects that use free distribution of energy products/services in the location	Projects using free distribution approaches (%)
38. Priorities for improvement in energy access in PoC	Energy improvement priorities (qualitative description)

3.2. Energy Access for Households

Energy uses found in households: Most common energy uses in households are basic uses of electricity and energy for cooking. In terms of electricity, these include lighting, phone charging, powering TVs and radios, fans, and other appliances such as shavers (or hair clippers), laptops and irons. Some households might need refrigerators though they tend to be too energy-demanding for small-scale solutions, such as SHS, and expensive.

Technologies used: For lighting and power: battery-powered torches, candles, kerosene lanterns, mobile phone torches, solar lanterns, solar homes systems (SHSs), mini-grids, small generators and grid power. Other applications which require electricity are frequently powered by solar lanterns, SHSs, small diesel generators and, in some instances, grid power.

For cooking: firewood, charcoal, dung, pellets, biogas or LPG. Electricity can also be used for cooking but it is extremely rare in settings of displacement. A number of different cook stoves are in use: traditional three-stone stove, brick and mortar stove, earth stoves, Improved Cook Stoves (ICS), LPG (gas) stoves, electric stoves.

Contexts: Refugee households; IDP households; host community households. Households could also be referred to as dwellings/shelters (referring to the physical structures)in some settings. We use the term ‘household’ (HH) throughout this document, referring to the people inhabiting the same dwelling/shelter but recognise that other terminology might be more suitable in some instances.

3.2.1. Household Electricity

Key Indicator (s) for Global Data Needs	Key Indicator (s) for Project Data Needs
Proportion of PoC population with access to electricity (on or off-grid) (Access %)[7]	Type of electricity in households with access (grid, mini-grid, SHS, solar lantern, standalone diesel, shared diesel, other) (Technology %)
Renewable energy share in total final PoC energy consumption	Average household monthly spend on electricity (Spend $)
	Proportion of average household monthly spend on electricity (% of total spend)

The two indicators presented above only provide information on two aspects of energy: the number of people with access to household electricity, and how much people pay for power. The Project Data Needs indicator for household access above is aligned with the SDG7 and World Bank ESMAP Multi-Tier reporting for energy.

Indicator / Data point	Metric / classification
ELECTRICITY	
1. Host population households (within **20**km) with access to electricity (on or off-grid)	Access (%)
2. Access to household electricity supply (Tier 0, 1,2 ,3 ,4 or 5)	Tier (%)
3. % of households with access to a renewable source of electricity	Renewable electricity source (%)
4. What is the capacity of primary electricity source in households with access? (maximum capacity)	Capacity (W)
5. Accidents caused by the electricity supply in the household in the last 12 months	Accidents (Yes/No and number)
6. Hours of electricity (per 24hrs) in households with access	Number (hours)
7. Hours of electricity available at night	Number (hours)
8. Average total duration of all electricity outages or blackouts (over 24hrs) *[where applicable]*	Number (hours)
9. What is the main method of households to access electricity? (distribution, buy at a market, buy from a private supplier etc.)	Access (method)
10. Availability of grid-alternative electricity solutions in the location (Yes/No and details)	Availability
11. Does the current level of electricity provision meet all the electricity-related needs? (Yes, all/Yes, most/No, only few)	Needs
12. Electricity-dependent appliances used [list all] (e.g. radio, fan, TV, computer/laptop, iron, hair clipper, fridge, etc.)	Appliances (current)
13. Power consumption of each appliance (in Watts) *[list all functioning appliances]*	Power consumption (Watt)

7 Or alternatively: % of households with access to electricity (Access %, in ranges, e.g. 10%-20%, 30%-40% etc.). This could be applicable to indicators measuring energy access following this one.

Indicator / Data point	Metric / classification
14. Electricity-dependent appliances not currently used but wanted in the future [list all] (e.g. radio, fan, TV, computer/laptop, iron, hair clipper, fridge, etc.)	Appliances (future)
15. Electricity use per capita *[in electrified population]*	kWh/capita
16. Electricity use per household *[in electrified households]*	kWh/household
17. Primary source of lighting (grid, mini-grid, SHS, solar lantern, battery torch, candle, kerosene lantern, firewood, standalone diesel, shared diesel, other)	Technology (%)
18. Number of households with access to distributed lighting-only or multi-purpose electricity products (e.g. solar lanterns, SHSs or similar)	Number (of households) Or % of households with distributed products
19. Expected lifespan of the distributed lighting-only or multi-purpose electricity product	Lifespan (years)
20. Average monthly household spend on lighting	Spend ($)
21. Proportion of average household monthly spend on lighting (% of total spend)	% of total spend (%)
22. [if purchased up front] Total cost of the primary lighting source (if a handout then 0)	Price ($)
23. [if purchased up front] Total cost of the primary electricity source (if a handout then 0)	Price ($)
24. Unit price paid for electricity ($) per kWh *[where applicable]*	Unit price ($/kWh)
25. Price paid for litre of fuel ($) (diesel, petrol, other) for electricity generation *[where applicable]*	Unit price ($)
26. Method of payment for electricity (e.g. mobile money (MoMo), vouchers, cash, do not pay, other)	Method (payment)
27. Availability of repair services for primary electricity solution, community capacity or SME businesses offering repair services?	Repair options (Qualitative answer)
28. What are the positive impacts of access to electricity?	(Positive) impact. Qualitative answer / List (e.g. less indoor smoke, less eye irritation, fewer respiratory problems, ease of doing things/chores, improved work/study environment, improved feeling of safety, etc.)
29. What are the negative impacts of lack of access to electricity?	(Negative) impact Qualitative answer / List (e.g. indoor smoke, eye irritation, respiratory problems, difficulty in performing chores, harmful work/study environment, feeling of lack of safety, etc.)
30. % of individuals of households reporting feeling safe at night as a result of lighting	Households (%)

Indicator / Data point	Metric / classification
31. Population with access to information technology (% radio, % TV, % internet)	Access (%)
32. Population with access to mobile phone	Access (%)
33. Type of mobile phone in population with access to mobile phone (cell, feature, smartphone)	Technology (%)
34. Average weekly number of mobile phone charges (per phone) in population with access	Charging (frequency)
35. Average weekly spends on mobile phone charging per person in population with access	Spend ($)
36. Average weekly spend on mobile phone credit (airtime) per person in population with access	Spend ($)
37. Population with access to mobile money (MoMo) *[where relevant]*	Access (%)
38. Population with access to other financial services (e.g. MFIs, savings groups, etc.)	Access (%)
39. What do households think about electricity access, why is it important to them?	Qualitative answer
40. What types of solutions and electricity methods do households suggest?	Qualitative answer
41. CO2 emissions per household *[in electrified and unelectrified households]*	Emissions (t/household)

Debates in Household Electricity

Within the neutral list of indicators presented above, there are several core debates present on which elements of household electricity to measure. These are outlined below to enable discussion:

- *Household lighting or electricity?* Several of the indicators above only measure lighting resources within a household. While this has been common within emergency humanitarian responses, as there is limited capacity within agencies to provide power beyond lighting, protracted situations present a different context. It is best practice to measure overall electricity access and needs, rather than just lighting, and both SDG7 and the World Bank measure electricity access. The list of indicators presented above includes both electricity-wide measurements and lighting specific indicators in case specific indicators are required for individual programmes or interventions.
- *Hours of access:* should this be measured by total access available in a 24hr period (i.e. when power is available, whether consumed or not), or distinguished by hours per day and night?. The MTF suggests measuring hours of access per day and per evening (eg. Tier 3 access states that electricity should be available for a minimum of 8 hours a day and 3 hours a night). Therefore, it is suggested that indicators differentiate on when power is available.

- *Measuring supply, access or use:* "A key difficulty in defining access to energy is whether to measure access to energy supplies (without the end-use appliance), access to energy services (including the end-use appliance), or the actual use of energy for these applications (consumption). This is further complicated by technologies such as solar lanterns in which the means of supply and the appliance are inextricably combined." (ESMAP, 2015, p. 42). The indicators in this mapping include metrics for measuring supply, access, and consumption.

- *Distribution or independent household action?* Often humanitarian surveys assume that the only or main method by which households access energy is via humanitarian provision, for example through the distribution of solar lanterns. However, in many situations it is the case that households secure and access their own forms of electricity, for example by buying solar products or torches from local markets, or in some cases by connecting to a local mini-grid supplier and paying for electricity access. As a result, indicators to measure both types of access are included above. This issue also applies to access to cooking resources in households, so similar indicators are included in the household cooking section below.

- *Specific or general measurement*: it is possible to measure access to electricity in either percentage terms (for example % of access to households with access) or by proportion of the population with access to electricity. At first glance these indicators are very similar, as they both tell us about the general electricity access situation. However, for developing projects and interventions or to be able to measure specific changes over time, it is likely that a specific percentage indicator would be more useful. However, when comparing displacement settings (for example, the level of electricity access displaced people have in Bangladesh versus Kenya), or when embedding measurement in broader humanitarian assessment processes, a proportion indicator may be more appropriate. In many cases an absolute number (number of households) would also be a useful number for project interventions.

- *Home-based businesses and the risk of double-counting:* in displacement settings, small businesses can frequently be run from within one's home (e.g. small shops, phone charging stations, pharmacies etc.) meaning that the same electricity supply might be used to satisfy the business and the household needs. In such instances, there is a risk of double counting the same unit under both household and business/ enterprise electricity access and the same expenditure for electricity under both categories as well. This can skew results either positively or negatively and should be avoided, if possible.

- *Finally*, *energy for private transport* is a contentious area as in principle transport is not included in SDG7 but it requires energy and is considered an essential service. According to ESMAP "Transport is another important aspect of energy use. However, poor people typically use public transportation services (which may be run by private operators in some cases), bicycles, animal-drawn vehicles, or walk on foot. As a result, in most cases they do not directly procure or use energy for transportation. Transport services depend on the availability of vehicles, as well as roads, railway lines, and other infrastructure, and fuel needed to energize these is sold (or supplied) along these routes in almost all cases. Further, the cost of liquid and gaseous fossil fuels used for transportation is a function of macroeconomic factors such as prevailing international crude oil and gas prices, government subsidy (or cross-subsidy), and the tax regime. As a result, public transport is typically not affected by initiatives to expand access to energy. Therefore, under the proposed methodology, transportation is not being included as a dimension of energy use." (p. 50). While we do acknowledge that energy for transport can be categorised as household energy, we do not suggest measuring it. We do, however, include transport energy in the humanitarian operations category due to the UN commitments which also include targets around transport.

3.2.2. Household Cooking

Household cooking is one of the most complex topics within the space of humanitarian energy. Fuel sources include firewood, LPG, ethanol, and many others. There are also a large number of cook stoves and cooking appliances, which individual households use in different ways depending on their needs.

Key Indicator(s) for Global Data Needs	Key Indicator(s) for Project Data Needs
Proportion of PoC population with primary reliance on clean fuels and technology for cooking	Type of primary cooking fuel (%) (firewood, animal dung, charcoal, LPG, biogas, other)
Average fuel acquisition and preparation time (hrs/ week)	Average total monthly spend on cooking fuels ($) AND Cooking fuel expenditure share of household income if not freely collected (measured as a %)
Proportion of renewable cooking fuels in the total household cooking fuel mix (renewable cooking %)	Average total spend on cooking stoves ($) (either as a one-off payment or per month, *to be specified*)

Indicator / Data point	Metric / classification
COOKING	
1. Host population households (within 20km) with access to improved cooking	Access (%)
2. Cooking fuel access method (collection, purchase, distribution, vouchers, other)	Access type (collection, purchase, distribution, voucher, other)
3. Secondary cooking fuel (firewood, animal dung, charcoal, LPG, biogas, other)	Cooking fuel (%)
4. Average number of kg of firewood used for cooking per person, per day *[where applicable]*	Mass (kg)
5. Average number of litres of liquid fuels (kerosene and/or ethanol) used for cooking per day *[where applicable]*	Volume (litres)
6. Cooking location (e.g. indoor- shared room, indoor- separate room/kitchen, outdoors- covered, outdoors- uncovered, outside of household- shared and covered, outside of household- shared and uncovered etc.)	Location
7. *[If cooking indoors]* Presence of of a chimney, hood or other exhaust systems for cooking	Ventilation (Yes/No)
8. Primary cook stove used (three stone fire, clay, metal, LPG, mud, kerosene, charcoal, ICS, other)	Technology (%)
9. Way of obtaining primary cook stove (e.g. self-built, donated, purchased on installments, purchased in full/up front, other).	Means of obtaining primary cook stove
10. Total price paid for primary cook stove *[where applicable]*	Price ($)
11. Expected lifespan of the primary cook stove	Lifespan (years)
12. Primary cook stove combustion efficiency (Low, Medium, High)	Combustion efficiency (Low/Medium/High)
13. Average number of hours of use of primary cook stove per day (based on use in the last 7 days) per household	Primary stove use (hours)
14. Problems/issues encountered with primary cook stove in the last 12 months (or since purchase/start of use) (e.g. stove stolen, stove broken, stove caused unintended fire, poor combustion, etc.)	Primary stove issues

Indicator / Data point	Metric / classification
15. Burns or injuries suffered by any household member in the last 12 months caused by primary cook stove	Harm (Yes/No)
16. Number of stove burners offered by the primary cook stove	Number
17. Expected lifespan of the primary cook stove	Lifespan (years)
18. Carbon Monoxide Emissions (gram/megajoule delivered) of the primary cook stove[8]	CO emissions (g/MJd)
19. Fine Particulate Matter Emissions (milligram/megajoule delivered) of the primary cook stove	Fine particulate matter emissions (mg/MJd)
20. Secondary cook stove used in PoC household/shelter (three stone fire, clay, metal, LPG, mud, kerosene, charcoal, ICS, other)	Technology (%)
21. Way of obtaining secondary cook stove (e.g. self-built, donated, purchased on installments, purchased in full/up front, other)	Means of obtaining secondary cook stove
22. Total price paid for secondary cook stove *[where applicable]*	Price ($)
23. Expected lifespan of the secondary cook stove	Lifespan (years)
24. Combustion efficiency of the secondary cook stove (Low, Medium, High)	Combustion efficiency (Low/Medium/High)
25. Reasons for using a secondary stove *[where applicable]* (e.g. insufficient number of burners on primary stove, primary stove flame too weak, some types of cooking not feasible on primary stove, etc.)	Secondary stove use reasons
26. Average number of hours of use of secondary cook stove per day (based on use in the last 7 days) per household	Secondary stove use (hours)
27. Problems or issues encountered with secondary cook stove in the last 12 months (or since purchase/start of use) (e.g. stove stolen, stove broken, stove caused unintended fire, poor combustion, etc.)	Secondary stove issues
28. Burns or injuries suffered by any household member in the last 12 months caused by secondary cook stove	Harm (Yes/No)
29. Number of stove burners offered by the secondary cook stove	Number
30. Expected lifespan of the secondary cook stove	Lifespan (years)
31. Carbon Monoxide Emissions (gram/megajoule delivered) of the secondary cook stove	CO emissions (g/MJd)
32. Fine Particulate Matter Emissions (milligram/megajoule delivered) of the primary cook stove	Fine particulate matter emissions (mg/MJd)
33. Is any of the cook stoves used for purposes other than cooking? (Yes/No) If yes, list them all	Repurposing
34. % of distributed cash or monetary support spent on purchasing fuel or cooking technologies in the last month	% of value
35. Average number of hours spent acquiring cooking fuel per week per household *[where applicable]*	Number
36. Average number of trips to acquire cooking fuel per week per household	Number
37. Primary person responsible for cooking fuel acquisition (adult male/adult female/child male/child female/other)	Fuel acquisition responsibility (gender)
38. Incidents of experiencing physical harm or violence during cooking fuel collection (or travel to purchase) in the last 12 months	Harm/Violence (Yes/No & Number)

8 Data on most of the listed indicators could be collected from the field. However, this and the next indicator would require data from laboratory tests or product manufacturers.

Indicator / Data point	Metric / classification
39. Average number of monthly incidents/conflicts over energy resources in or around the location	Fuel-related conflict (number)
40. Average number of meals cooked per day per household	Number
41. Primary person responsible for meals preparation/cooking (adult male/ adult female/child male/child female/other)	Cooking responsibility (gender)
42. Average number of hours spent cooking per day per household	Number
43. % of HHs that agree the cooking technology meets all of their specific cooking task needs.	Needs (%)
44. Number of skipped meals last week due to lack of cooking fuel[9] per household	Number
45. Other coping strategies for lack of cooking fuel (e.g. trade of other goods/resources for extra fuel; liquidation of assets to free up funds for cooking fuel; getting meals from friends/neighbours; barter for fuel and cooking related items; other)	Coping strategy
46. What cooking issues are important to households?	Qualitative answer
47. What do households think about the available cook stove/cooking solution options?	Qualitative answer
48. What other types of solutions and cooking methods do households suggest and/or what do they look for in their cooking technologies/ solutions?	Qualitative answer
49. Evidence of excessive deforestation: no change, both loss and gain, forest loss (<50% of the area of interest), excessive forest loss (>50% of the area of interest)[10]	Deforestation
50. Number of people exposed to deforestation and associated risks[11]	Deforestation risks (number)

Debates in Energy Access for Cooking

Sufficient provision: Firewood has been the most commonly used cooking fuel in displacement settings. It has either been gathered by households or distributed by agencies to refugee households to satisfy some cooking needs. In reality, the amounts have often been insufficient, particularly for bigger households. Indeed, households often have to resort to various coping strategies, e.g. trade other resources (e.g. food) to get more firewood in order to prepare cooked meals. Not only has the issue of 'quantity' been a challenge for refugee households, but also as an unsustainable, highly polluting and dangerous fuel, firewood's adequacy for settings of displacement has been heavily questioned in recent years. This has led to much interest in moving away from firewood. However, as clean cooking solutions (such as ICSs or BLEENS[12]) are not commercially available in all refugee settlements, households tend to fall back on either charcoal (still widely accessible) or firewood collection (still the most prevalent option wherever feasible). This can be not only illegal, but time-consuming and dangerous in conflict locations, leaving women, who are mostly responsible for fuel collection and cooking, vulnerable to SGBV.

Another *safety-related issue* concerns the utilisation of the fuel and the stove present in the house. Use of firewood poses a much higher likelihood of burns and fire accidents than the use of ICSs, LPG or electricity.

Some *critical questions* to consider when assessing cooking energy include the following:

9 Alternatively: % of households reporting skipping meals last week due to lack of cooking fuel.
10 When no local data available, this can be measured from international datasets such as the Global Forest Watch [https://www.globalforestwatch.org/map] or MapX: Global Forest Loss/Extent/Gain; https://app.mapx.org?project=MX-WJO-FOV-NNB-1BN-SZN&views=MX-6HEOD-B15MA-BDQNV&viewsOpen=MX-6HEOD-B15MA-BDQNV&language=en&
11 When no local data available, this can be measured from international datasets such as MapX: Population & Global Forest Loss; https://app.mapx.org?project=MX-WJO-FOV-NNB-1BN-SZN&views=MX-5DI5D-BR0SF-JO4HT,MX-6HEOD-B15MA-BDQNV&viewsOpen=MX-5DI5D-BR0SF-JO4HT,MX-6HEOD-B15MA-BDQNV&language=en&
12 Biogas, liquefied petroleum gas, electricity, ethanol, natural gas, and solar

- What should be the minimum standard for energy for cooking needs in settings of displacement?

- Given the limited availability of alternative, clean and sustainable cooking fuels in many refugee settlements- which ones should be the recommended ones?

- Should we be making assumptions (whether based on previous data or not) regarding coping strategies for fuel insufficiency or ask questions to explore it first? 'Skipping meals' in the last week/month seems to be a common way of measuring whether or not a household has enough cooking fuel but in reality, some households might not have enough but trade other goods, effectively landing with a sufficient amount but at a trade-off and a personal cost.

- Is self-reported feeling of safety during fuel collection a sufficient metric or should there be a way of accessing data on SGBV among women at times of fuel collection, if such data exists? (and would it be too sensitive?).

- How to best measure affordability given the complex nature of the context (e.g. barter among households? Value of vouchers vs price of fuel needed for X number of people? etc).

Stove stacking: stove and fuel stacking, which is a concurrent use of multiple cooking fuels and/ or cook stoves, is a common practice in settings of displacement, as it is among the majority of households in low- and middle-income countries (Shankar et al, 2020). Households will frequently resort to the use of more than one stove or cooking fuel (or both) for reasons such as affordability, availability, accessibility or cooking practices and preferences. For example, households might prefer to cook certain foods on a specific fuel because of taste preferences or because certain foods (e.g. beans) require long periods over fire. Majority of households switch between stoves or use them in parallel, also as a result of insufficiency of some cook stoves (e.g. those with just one burner which might not be enough if more than one food needs to be cooked at the same time). This poses a challenge not only for measuring stove and fuel adoption, but also challenges in measuring health and environmental impacts as lower emissions from an improved cook stove can be compromised by traditional cook stoves and fuels.

The Tier challenge in cooking: A common misconception is that cooking stoves can be measured in Tiers. There is no such thing as a Tier 3 stove, just as appliances are not labelled Tier 4. There are three types of Tiers in cooking, which refer to either: 1) the level of indoor emissions produced by the stove (which cause health impacts), 2) the level of overall emissions produced by the stove (which cause impact on the environment), or 3) the efficiency the stove has for burning fuel. Importantly, the Tier that can be reached for clean cooking is dependent on the combination of the cook stove and the fuel used: even an efficient stove will not burn efficiently if a poor-quality fuel is used. There are also safety and ISO standards that can be applied to cooking solutions, which further complicates the issues. The Tier challenge is detailed further in the targets section below.

Renewable fuels for cooking and the question of efficiency: there are existing debates as to whether fuels such as LPG should be considered clean. LPG's footprint is negligible when compared to biomass fuels and a global surplus exists (van Leeuwen et al., 2017). LPG's combustion efficiency is also very high as compared to other fuels. The development of various subsidy schemes have made LPG more affordable. While improved biomass cook stoves with a higher level of combustion efficiency would also be better than current, often inefficient cooking methods, the scale of the clean cooking challenge is too big to be tackled by improved cook stoves only (ibid.). Decisions on the most appropriate solutions will have to be made according to the context, the available fuel supplies and support mechanisms such as national subsidies.

3.2.3. Household Heating and Cooling

Heating and cooling solutions make up what is collectively called thermal comfort solutions. Thermal comfort means that a person feels neither too warm, nor too cold. It is important for health and well-being, as well as one's productivity. Of course, in warmer countries cooling may be more important, whereas in colder countries heating and warming technologies are needed.

Key Indicator(s) for Global Data Needs	Key Indicator(s) for Project Data Needs
% of households with access to heating and/or cooling solutions (i.e. thermal comfort solutions)	Average monthly spend on heating and cooling solutions (Spend $)
% of households with access to energy efficient heating and/or cooling solutions	Primary thermal comfort solution - cooling (fan, air conditioning, other) and heating (electric heater, gas heater, fire stove, other)
Number of solar water heaters or other renewable energy heating solutions per capita (#/1000 inhabitants)	

Indicator / Data point	Metric / classification
HEATING AND COOLING	
1. Households with access to a sufficient, safe[13] and affordable energy supply to maintain thermal comfort	Access (%)
2. Primary thermal comfort solution - cooling (fan, AC, other)	Technology (%)
3. Power consumption of the primary cooling solution (in Watts)	Consumption (Watt)
4. Average monthly spend on cooling solutions *(if separate from other energy expenditure, i.e electricity and cooking fuels)*	Spend ($)
5. Primary thermal comfort solution - heating (electric heater, gas heater, fire stove, other)	Technology (%)
6. Power/energy consumption of the primary heating solution (in Watts or GJ) *[depending on type of solution used]*	Consumption (Watt/GJ)
7. Average monthly spend on heating solutions *(if separate from other energy expenditure, i.e electricity and cooking fuels)*	Spend ($)
8. Frequency of indoor temperature being uncomfortably cold in the coldest month of the year	Thermal discomfort frequency (cold)
9. Frequency of indoor temperature being uncomfortably hot in the hottest month of the year	Thermal discomfort (hot)
10. Impact of thermal discomfort	Thermal discomfort (impact) (qualitative)
11. Ability to cool the home in the last 12 months (Yes/No) *[Where applicable]*	Cooling ability (Yes/No)
12. Ability to heat the home in the last 12 months (Yes/No) *[Where applicable]*	Heating ability (Yes/No)
13. Other coping strategies for lack of cooling/heating solutions (e.g. indoor cooking or group sleeping arrangements to maintain heat etc.) *[list all relevant]*	Coping strategy

Debates in Access to Heating and Cooling Solutions

Heating and cooling solutions are critical for households to ensure thermal comfort and alleviate risks of dehydration and heat strokes or hypothermia, particularly in regions with extreme temperatures. Heating solutions often overlap with cooking solutions, e.g. firewood is used both for cooking and for heating up spaces, as well as heating water (for bathing or consumption). This can make it difficult to differentiate between cooking and heating solutions and decouple average spend on both. The most common cooling solutions include fans and air conditioners, although the latter tend to be prohibitively expensive and few households of displaced populations can afford them. The former are more common and can be powered by off-grid

13 Similarly to the dimensions of energy access under SDG7 (affordable, reliable, sustainable and modern), sufficiency and safety can have different definitions, which depend on the context in which they are used.

energy solutions, such as SHSs. Air coolers are an intermediate cooling solution. In addition to these active cooling solutions (which rely on power supply), there exist passive (non-mechanical) ones, e.g. light-coloured roofing, ventilation, and more. However, these usually provide either cooling or heating (rather than both, if needed) unless they are incorporated into the build of a house/shelter (if structures are semi-permanent or permanent) which can be costly, for example insulation.

Some of the critical questions to consider when assessment heating and cooling solutions include:

- What should be the minimum heating and cooling requirements in settings of displacement, especially given the often-temporary nature of the shelters/houses?
- How can we best decouple what households spend on cooking vs heating, if the same fuel serves both purposes?
- Can natural (passive) thermal designs be incorporated into the build of the refugee houses/ shelters? And if so, what are the key barriers to such solutions being implemented?
- How can space heating be achieved with an average minimum requirement of 1500W (Tier 4), according to ESMAP, if the minimum electricity access Tier set for settings of displacement is Tier 2 or Tier 3?

3.3. Energy Access for Productive Uses and Enterprise Access

Productive use energy types: There are numerous different productive uses of energy (PUE). The most common ones found in refugee and IDP camps are agri- and food-processing (e.g. which use energy for milling), small shops such as grocers or pharmacies (lighting, refrigeration), mobile phone charging stations (phone charging), restaurants/canteens (refrigeration, cooking), barber shops (shaving), metalworks (welding) or artisans (pottery wheel). Simple applications like lights to extend hours of business operations can also be considered as PUE. Beyond this, energy for micro-enterprises is also an important use. For example, energy needed by businesses such as tailors, hairdressers, ICT and mobile phone charging shops in camps.

Technologies used: Diesel generators, SHS, solar mini-grids, solar lanterns, portable lights/torches, grid, where available, and firewood or charcoal (for cooking).

Contexts: Businesses and enterprises within refugee and IDP camps and in host communities. In the former, grid connections are rare whereas in the latter they might be more accessible if the national network reaches the place (village/town/ city). Often these businesses are referred to as small and medium sized enterprises (SMEs) and in many humanitarian locations are the main suppliers of electricity and cooking products and services to households and enterprises. These businesses are often run and owned by refugees or internally displaced people, with the support of suppliers in the local host community.

3.3.1. Energy for Micro-Entrepreneurs and Productive Uses

Energy in the context of enterprise use covers the use of light in working spaces to enable workers/ employees to perform various tasks with ease and to ensure comfort of customers (e.g. in retail and hospitality facilities) (ESMAP, 2015). While ESMAP separates out lighting from other uses of electricity, such as for motive power or ICT needs, businesses often need electricity for many uses. Therefore, the sections below consider energy as a whole and also includes some specific lighting and electricity indicators.

Key Indicator(s) for Global Data Needs	Key Indicator(s) for Project Data Needs
% of businesses and enterprises with access to electricity (on or off-grid)	Type of energy in enterprises with access (covering both electricity and cooking sources) (Technology %)
% of businesses and enterprises with access to electricity through renewable sources	Average businesses/enterprises monthly spend on electricity ($)
	Primary source of electricity in businesses/ enterprises (grid, mini-grid, SHS, solar lantern, battery torch, candle, kerosene lantern, firewood, standalone diesel, shared diesel, other)

Key Indicator(s) for Global Data Needs	Key Indicator(s) for Project Data Needs
	Electricity-dependent appliances used in businesses/enterprises (multiple selection)
	Average monthly electricity use per business (kWh/ business)
	Average businesses/enterprises monthly spend on cooking fuels ($) *[where applicable]*
	Type of primary cooking fuel (%) (firewood, animal dung, charcoal, LPG, biogas, other) in businesses/ enterprises *[where applicable]*

Indicator / Data point	Metric / classification
ELECTRICITY USES	
1. Host population businesses or enterprises (within **20**km) with access to electricity (on or off-grid)	Access (%)
2. Access to business or enterprise electricity supply (Tier 0, 1, 2, 3, 4 or 5)	Tier level
3. What is the capacity of the primary electricity source in businesses or enterprises with access? (maximum capacity)	Capacity (Watt)
4. Hours of electricity (per 24hrs) in businesses or enterprises with access	Availability (hours)
5. Average businesses/entreprises monthly spend on electricity (total spend)	Spend ($)
6. Average % of business/enterprise monthly turnover spent on electricity	Spend (%)
7. [if purchased up front] Total cost of the primary electricity source in the business or enterprise (if a handout then 0)	Price ($)
8. Unit price paid for electricity ($) per kWh *[where applicable]*	Unit price ($)
9. Price paid per litre of fuel (diesel, petrol, other) ($) for electricity generation *[where applicable]*	Unit price ($)
10. Method of payment for electricity (e.g. mobile money (MoMo), vouchers, cash, do not pay, other)	Method (payment)
11. Primary source of lighting in businesses/entreprises (grid, mini-grid, SHS, solar lantern, battery torch, candle, kerosene lantern, firewood, standalone diesel, shared diesel, other)	Technology (%)
12. Hours of lighting in businesses or entreprises (per 24hrs)	Availability (hours)
13. Average businesses/entreprises monthly spend on lighting *[if separate from the overall spend on electricity]*	Spend ($)
14. Number of enterprises or shops in the location selling energy products or services	Number
15. Average total duration of all electricity outages or blackouts (over 24hrs) in a business or enterprise *[where applicable]*	Number (hours)
16. What is the main method of businesses or enterprises to access electricity?	Distribution, buy-in market, private supplier, etc.

Indicator / Data point	Metric / classification
17. Electricity-dependent appliances used [list all] (e.g. radio, fan, TV, computer/laptop, iron, hair clipper, fridge, etc.) in the business or enterprise	Appliances (current)
18. Power consumption of electricity-dependent appliances used (in Watts) (list all)	Consumption (Watt)
19. Electricity-dependent appliances not currently used but wanted in the future [list all] (e.g. radio, fan, TV, computer/laptop, iron, hair clipper, fridge, etc.) in the business or enterprise	Appliances (future)
20. Number of businesses or enterprises offering repair services for electricity solutions or community capacity building in repair services	Number
21. Number of businesses/enterprises/organisations offering community capacity building in electricity solutions repair services	Number
22. Number of people serviced by businesses or enterprises offering repair services for electricity solutions per month	Number
23. What are the positive impacts of access to electricity?	(Positive) impact Qualitative answer / List (e.g. less indoor smoke, less eye irritation, fewer respiratory problems, ease of operating the business, improved work environment, improved feeling of safety, etc.)
24. What are the negative impacts of lack of access to electricity?	(Negative) impact Qualitative answer / List (e.g. indoor smoke, eye irritation, respiratory problems, difficulty in operating the business, harmful work environment, feeling of lack of safety, etc.)
25. What do businesses or enterprises think about electricity access, why is it important to them?	Qualitative answer
26. What types of solutions and electricity methods do businesses or enterprises suggest?	Qualitative answer

3.3.2. Information and Communication Technology for Enterprise Uses

Access to ICT in the context of productive uses refers to the use of energy for appliances such as computers/ laptops, electronics, communication devices and other audiovisual purposes (ESMAP, 2015).

Key Indicator(s) for Global Data Needs	Key Indicator(s) for Project Data Needs
% of population with access to information technology (radio, TV, internet)	% of population with access to mobile phone
Number of businesses or enterprises supplying energy or ICT services *[list all relevant]*	Average weekly spend on mobile phone charging per person in population with access ($)

Indicator / Data point	Metric / classification
INFORMATION AND COMMUNICATION	
1. Average size of businesses or enterprises supplying ICT services (number of employees)	Business size (number)
2. Businesses or enterprises with access to information technology (radio, TV, internet)	Access (%)
3. Businesses or enterprises with access to a computer or laptop	Access (%)
4. Businesses or enterprises with access to mobile phone	Access (%)
5. Type of mobile phone in Businesses/enterprises with access to mobile phone (cell, feature, smartphone)	Technology (%)
6. Average weekly number of mobile phone charges (per phone) in businesses/enterprises with access	Charging (frequency)
7. Average weekly spend on mobile phone charging per person in businesses/enterprises with access	Spend ($)
8. Average weekly spend on mobile phone credit (airtime) per person in businesses/enterprises with access	Spend ($)
9. Businesses/enterprises with access to mobile money (MoMo)	Access (%)
10. Businesses/enterprises with access to other financial services (e.g. MFIs, savings groups etc.)	Access (%)
11. Businesses/enterprises with access to audiovisual equipment (projectors, recorders, cameras, etc.)	Access (%)

3.3.3. Motive Power for Productive Uses

Motive power is large-scale electricity required for powering machinery or big appliances. It is described as "[a]n application of energy that pertains to delivery of linear or rotatory motion as the output. Motive power typically requires electrical motors or engines as the appliances for converting electricity or fuels, respectively, into motion." (ESMAP, 2015). Motive power is required to power off machinery, such as milling or grinding machines, and is a necessary provision for some types of productive uses of energy (PUE).

Key Indicator(s) for Global Data Needs	Key Indicator(s) for Project Data Needs
% of businesses/enterprises (food processing, distribution, etc.) with access to motive power	Primary source of motive power in businesses/ enterprises (grid electricity, diesel, solar, manual, other)
% of businesses/enterprises (food processing, distribution, etc.) with access to motive power through renewable sources	Main applications of motive power used in businesses/enterprises (e.g. milling machine, oven, welding machine, etc.)
	Average monthly spend on motive power in businesses/enterprises ($)

Indicator / Data point	Metric / classification
MOTIVE POWER	
1. % of total businesses/enterprises requiring motive power	Number (%)
2. Businesses/entreprises (food processing, distribution, etc.) with access to motive power (non-manual)	Access (%)

Indicator / Data point	Metric / classification
3. Primary source of motive power (grid electricity, diesel, solar, other)	Technology (%)
4. Average monthly spend on motive power (total spend)	Spend ($)
5. Average % of business/enterprise monthly turnover spent on motive power	Spend (%)
6. Price per unit of motive power (kWh) *[where applicable]*	Price ($)
7. Main applications of motive power used (e.g. milling machine, oven, welding machine, etc.)	Productive applications used
8. Main foodstuffs/products requiring mechanical processing (e.g. washing, milling, separating, baking, etc.)	Foods/products requiring mechanical processing

3.3.4. Refrigeration for Enterprise Uses

Refrigeration for productive uses refers to the use of fridges/coolers/freezers in shops (e.g. coolers/fridges for drinks, dairy, etc.), restaurants or other businesses/enterprises which require cooling services for their operations.

Key Indicator(s) for Global Data Needs	Key Indicator(s) for Project Data Needs
% of total businesses/enterprises with access to power supply for refrigeration	% of total businesses/enterprises requiring refrigeration
% of total businesses/enterprises with access to energy efficient refrigeration solutions	Primary source of power to support refrigeration in businesses/enterprises (grid electricity, diesel, solar, other)
	Average monthly spend on refrigeration in PoC businesses/enterprises ($)

Indicator / Data point	Metric / classification
REFRIGERATION	
1. % of total businesses/enterprises requiring refrigeration	Number (%)
2. % of businesses/enterprises with access to a power supply for refrigeration	Access (%)
3. Power consumption of refrigeration appliances used (list all) (in Watts)	Consumption (Watt)
4. Primary source of power to support refrigeration in businesses/ enterprises (grid electricity, diesel, solar, other)	Technology (%)
5. Secondary [back up] source of power to support refrigeration in businesses/enterprises (grid electricity, diesel, solar, other) *[where applicable]*	Technology (%)
6. Weekly frequency of unscheduled interruptions of (primary) electricity supply or breakdowns of (primary) electricity supply equipment in businesses/enterprises with refrigeration	Number (frequency)
7. Average monthly spend on refrigeration in businesses/enterprises	Spend ($)
8. Main foodstuffs or products requiring refrigeration in businesses/ enterprises	Foods/products requiring refrigeration

3.3.5. Heating for Enterprise Uses (Space, Product, Water, Process)

Heating of space refers to the heating of the interior work spaces in order to ensure comfort of workers/ employees and/or customers. Heating of products or water "refers to uses of energy for heating as a direct part of the production process, including water heating as a means of achieving product heating" (ESMAP, 2015: 138-139). Heating spaces can be supported by electricity or other (non-electric) means, such as LPG (gas) or firewood.

Key Indicator(s) for Global Data Needs	Key Indicator(s) for Project Data Needs
% of businesses and enterprises with access to a fuel supply for heating	% of total businesses/enterprises (refugee camp, IDP camp/area, other) requiring heating
	Primary source of power to support heating in businesses/enterprises (grid electricity, diesel, solar, other)
	Average monthly spend on heating in businesses/ enterprises ($)

Indicator / Data point	Metric / classification
HEATING (SPACE, PRODUCT, WATER, PROCESS)	
1. % of total businesses/enterprises requiring heating	Number (%)
2. Type of heating (space, product, water, process) required in the business/enterprise	Heating category
3. % of businesses/enterprises with access to a power supply for heating	Access (%)
4. Primary source of power or fuel to support heating businesses/ enterprises (grid electricity, diesel, solar, LPG (gas), other)	Technology (%)
5. Secondary [back up] source of power or fuel to support heating in businesses/enterprises (grid electricity, diesel, solar, other) *[where applicable]*	Technology (%)
6. Weekly frequency of unscheduled interruptions of (primary) electricity supply or breakdowns of (primary) electricity supply equipment in businesses/enterprises with heating *[where electric heating]*	Number (frequency)
7. Average monthly spend on heating in businesses/enterprises	Spend ($)

3.3.6. Water Pumping for Enterprise Uses

Water pumping for productive uses refers primarily to the use of energy for water pumping for agricultural purposes. However, it mostly applies to settings where distributed water pumping technologies, such as solar water pumps, are used (rather than communal boreholes or pumping).

Key Indicator(s) for Global Data Needs	Key Indicator(s) for Project Data Needs
% of businesses/enterprises with access to a power supply for pumping	% of total businesses/enterprises requiring pumping
Number of formal (with permit) and informal (without permit) water pumping points serving PoC businesses/enterprises *[if/where need for permits applicable]*	Primary source of power to support pumping in businesses/enterprises (grid electricity, diesel, solar, other)
Number of water pumping points/stations serving PoC businesses/enterprise (number)	Average monthly spend on pumping in businesses/ enterprises ($)

Indicator / Data point	Metric / classification
PUMPING	
1. Average capacity of water pumping points/stations serving PoC businesses/enterprises	Capacity (litres/second (lps))
2. % of total businesses/enterprises requiring water pumping	Number (%)
3. % of businesses/enterprises with access to a power supply for water pumping	Access (%)
4. Average distance of businesses/enterprises requiring/with access to water pumping to water pumping points/stations	Distance (m)
5. Primary source of power to support pumping in businesses/ enterprises (grid electricity, diesel, solar, other)	Technology (%)
6. Secondary [back up] source of power to support pumping in businesses/enterprises (grid electricity, diesel, solar, other) *[where applicable]*	Technology (%)
7. Weekly frequency of unscheduled interruptions of (primary) electricity supply or breakdowns of (primary) electricity supply equipment in businesses/enterprises with pumping	Number (frequency)
8. Average monthly spend on pumping in businesses/enterprises	Spend ($)
9. % of average monthly business/enterprise turnover spend on water pumping	Spend (%)

Debates on Energy Access for Enterprise Uses

Given the range and diversity of productive uses, it is difficult to set one common metric or a minimum standard. A welding machine might consume as much as 3-4 kW while being used for one hour, whereas a shaver might only need 10-20W. That is also why there are several categories under PUE.

Some of the challenges with PUE concern questions around the location of productive uses, for example, some businesses, such as phone charging points, barber services or pharmacies, can be run from one's home, while others might require separate spaces, e.g. metalworks or a restaurant. In the case of the former, it might be hard to distinguish how much energy is used for household needs vs productive uses. Another important question revolves around the ability of small, off-grid solutions, such as solar lanterns or small SHSs, to support PUE and therefore income generation. Few appliances can run on less than 100W, and even fewer on 50W or less. If the minimum standard for access to electricity is set at Tier 2, that limits the ability of end-users to engage in productive, income-generating activities. This can be a considerable barrier, particularly in refugee/IDP camps where PoC often cannot get employment outside of the camps. Issues of affordability of PUE appliances are also important to consider as cost is often prohibitively high, even if the energy solution has a sufficient capacity to support the appliance. There is also a limited number of PUE appliances which run on DC power, which is what SHSs and smaller solar products offer.

Businesses/enterprises (together with educational and health facilities) are also among the ones most affected by blackouts or power cuts, e.g. a fridge should have a constant power supply to ensure safety of refrigerated goods (food or drugs, and so should a business relying on access to wi-fi for their activities which might be compromised if power, and therefore wi-fi, goes off). Reliability of power supply is therefore an important prerequisite.

Some of the critical questions to consider when assessing PUE and enterprises include the following:

- What does a minimum standard for electricity access at Tier 2 (as the level defined by UNHCR's Global Strategy for Sustainable Energy (2019)) mean for PUE and enterprises, given that relatively few appliances which can be used productively or for income generation can run on 50W (daily supply capacity of 200Wh) or less ?

- Should water pumping be included under the PUE category for energy access in settings of displacement? Water pumping in refugee camps is generally associated with humanitarian operations, particularly boreholes which are operated by humanitarian organisations. However, pumping can also refer to water pumping for agricultural activity which some PoC do engage in.

- Should there be different minimum standards set for each sub-category under PUE?

- How should reliability be reflected in the indicators? And how would it be measured (self-reported? Remote monitoring? Another way?). This question is also pertinent for other categories of energy access , including household and community energy access.

- What should be the minimum standards for cooking fuels and cook stoves for productive uses? How do we ensure we do not double-count or under-count cooking fuels used if the same are used for household and business purposes?

3.4. Energy Access for Community Facilities

Energy types found in community facilities: Community facilities include public lighting (street lighting and lighting around public spaces, such as ablution blocks, community centres, clinics/hospitals, schools etc.), energy for educational and health facilities with applications such as medical/surgical/diagnostic appliances, fridges for refrigeration of medicines, vaccines etc., lighting and power for administrative appliances such as computers/laptops, and power to support communication. Hospitals/clinics, schools and other community facilities (such as public offices) might also require printing and scanning, as well as water pumping, water and space heating and/or cooling. Other appliances might also be needed, depending on the function performed by the community facility and the services it offers. Energy for cooking is needed in many community facilities, including schools, health centres, community centres.

Technologies used: For electricity: solar solutions (mini-grids, SHSs, solar street lights), solar lanterns, diesel generators, grid. For cooking: firewood, charcoal, biogas, LPG.

Contexts: Refugee camps; IDP camps; host communities. Refugee and IDP camps very rarely have access to the grid to satisfy communal energy needs, such as street lighting, electricity for hospitals, schools, etc., and have to rely on alternative access options (e.g. solar street lights). Host communities, on the other hand, are often more likely to be covered by the grid but many still lack connections.

In some exceptional circumstances spaces/facilities will be shared by PoC population and host communities (e.g. Northern Jordan where Syrian refugees and Jordanians attend the same schools).

Some organisations collect metrics on community facilities collectively, combining metrics for health facilities, educational facilities and community spaces (e.g. churches, community centres, etc.). However, in our framework we separate out health facilities and educational facilities (with each category having its own set of proposed metrics), and refer to spaces such as community centres, places of worship, refugee public/administration offices, youth centres, and other indoor facilities shared by the community as community spaces.

3.4.1. Community Facilities

“Community facilities” is sometimes a contested term in humanitarian settings and can be used for multiple types of places. This mapping suggests that the term “community facilities” is used as an umbrella term to understand the whole range of energy needs in humanitarian settings (including energy needed for street lighting, health, education facilities, and community spaces such as places of worship and community halls, etc). The key indicators below cover the total amount of energy needed to power all of these places. Community spaces are distinguished from community facilities (i.e. schools, health centres, clinics, reception centres, etc.), as community spaces are a more specific subset of locations including spaces of religious practice, playgrounds, community halls, etc. The further sections below then outline specific indicators needed on public space lighting, energy for health, education, and community spaces.

Key Indicator(s) for Global Data Needs	Key Indicator(s) for Project Data Needs
% of community facilities with access to electricity (Access %)	Primary (most commonly used) source of electricity in community facilities (grid, mini-grid, SHS, solar lantern, standalone diesel, shared diesel, other) (Technology %)
% of community facilities with access to electricity through renewable sources (Access %)	Average monthly spend on electricity in community facilities (Spend $)
% of community facilities with access to clean cooking solutions	Price per unit of electricity (kWh) in community facilities [where applicable] (Price $/kWh)
	Electricity-dependent appliances used in community facilities (multiple selection)
	Annualised load profile of community facilities (Consumption kWh)

3.4.2. Public Space Lighting (incl. Street Lighting)

Public spaces include streets, pathways, thoroughfares, sports and playgrounds, outdoor gathering spaces and other shared (outdoor) spaces.

Key Indicator(s) for Global Data Needs	Key Indicator(s) for Project Data Needs
% of (total location) area with street or public lights (Coverage %)	Street/public lighting technology used (Technology %)
	Average monthly spend on street/public lighting (Spend $)
	Annualised load profiles of public lighting (incl. street lighting) (Consumption kWh)

Indicator / Data point	Metric / classification
PUBLIC/STREET LIGHTING	
1. Price per unit of electricity (kWh) *[where applicable]*	Price ($)
2. Hours of light from street/public lights (per 24hrs)	Availability (hours)
3. Perception of safety at night due to street lights	Self-reported feeling of safety (%)
4. Public spaces with missing public lighting (list all that apply)	Missing public lighting
5. Average number of monthly incidents of experiencing physical harm or violence resulting from missing street lighting in PoC	Harm/violence incidents (number)
6. % female victims of total average monthly incidents of physical harm or violence resulting from missing street lighting in PoC	Harm/violence incidents affecting women (%)
7. % other vulnerable group victims of total average monthly incidents of physical harm or violence resulting from missing street lighting in PoC	Harm/violence incidents affecting other vulnerable groups (other than women) (%)

3.4.3. Water Pumping for Community Facilities

Key Indicator(s) for Global Data Needs	Key Indicator(s) for Project Data Needs
% of water pumping solutions (incl. boreholes) using renewable energy sources for functionality	Average monthly spend on water boreholes operational fuel [where applicable, i.e. where diesel, PV, grid other non-manual as source of power] (Spend $)
	Existing water programmes in the location (number and qualitative detail)

Indicator / Data point	Metric / classification
WATER PUMPING	
1. Number of water pumping points (incl. boreholes) in PoC settlement (refugee camp/IDP camp or area/other)	Number
2. Functional water pumping points (incl. boreholes) in PoC settlement (manual, diesel powered, PV powered, national grid powered, other)	Technology (%)

Indicator / Data point	Metric / classification
3. Average monthly volume of water used in humanitarian operations (in litres)	Volume (litres)
4. Distance between area assessed (i.e. the displacement location) and stationary water bodies	Distance (km)
5. Most common form of household water management in the PoC area assessed	Water management method

3.4.4. Health Facilities

Health facilities include hospitals, clinics, nutrition centres, medical surgeries, dispensaries, and any other facilities offering health/medical services.

Key Indicator(s) for Global Data Needs	Key Indicator(s) for Project Data Needs
% of health facilities with access to electricity	Primary (most commonly used) source of electricity in health facilities (grid, mini-grid, SHS, solar lantern, standalone diesel, shared diesel, other)
% of health facilities with access to electricity through renewable sources	Average monthly spend on electricity in health facilities (Spend $)
	Price per unit of electricity (kWh) in health facilities [where applicable] ($/kWh)
	Annualised load profiles of health facilities (Consumption kWh)
	Electricity-dependent appliances used in health facilities (multiple selection)

Indicator / Data point	Metric / classification
HEALTH FACILITIES	
1. Number of health facilities (hospitals, clinics, nutrition centres, etc.)	Number
2. % of WASH facilities and community WASH spaces with access to electricity	Access (%)
3. Number of employees in health facility	Employees (number)
4. Average number of weekly users (patients) the facility serves	Users (number)
5. Number of rooms the facility occupies	Rooms (number)
6. Number of days (per week) the facility operates for	Operations (number)
7. Primary (most commonly used) source of electricity in health facilities (grid, mini-grid, SHS, solar lantern, standalone diesel, shared diesel, other)	Technology (%)
8. Secondary/backup source of electricity in health facilities (grid, mini-grid, SHS, solar lantern, standalone diesel, shared diesel, other) *[where applicable]*	Technology (%)
9. [where generator primary or secondary] Is the generator owned or leased?	Business model
10. Primary (most commonly used) cooking fuel in use in health facilities (charcoal, animal dung, woodfire, LPG, biogas, other)	Cooking fuel (%)
11. Secondary source of cooking fuel in use in health facilities (charcoal, animal dung, woodfire, LPG, biogas, other) *[where applicable]*	Cooking fuel (%)

12. Average monthly spend on cooking fuels in health facilities	Spend ($)
13. Average monthly spend on electricity in health facilities	Spend ($)
14. Type of payment for electricity in health facilities (flat or metered or none)	Payment
15. Price per litre of fuel for electricity in health facilities (diesel/kerosene/ other)	Price ($/L)
16. Power consumption of electricity-dependent appliances used (list all) (in Watts)	Consumption (Watt)
17. Primary source of lighting in health facilities (e.g. electricity, solar lanterns, SHS lights, dry cell batteries, other)	Technology (%)
18. Rooms (out of the total) in health facilities with reliable lighting	Lighting (proportion of rooms)
19. Average number of power outages/blackouts per week in health facilities	Power reliability (outages/ week)
20. Average duration of each power outage/blackout in health facilities	Time (minutes/hours)
21. Impact of power outages/blackouts on the operations of health facilities	Impact (qualitative)
22. Frequency of power surges/voltage fluctuations in health facilities	Voltage fluctuation (frequency/day)
23. Impact of power surges/voltage fluctuations in health facilities on the appliances used	Voltage fluctuation impact (qualitative)
24. Ease of getting maintenance/repairs done on the energy system(s) in health facilities	Maintenance/repairs
25. Accidents caused by the electricity supply in health facilities in the last 12 months	Accidents (Yes/No) and number
26. Accidents caused by the cooking fuel/method in health facilities in the last 12 months	Accidents (Yes/No) and number

3.4.5. Educational Facilities

Educational facilities include kindergartens, schools (primary/secondary/tertiary), universities, technical and vocational education and training (TVET) centres and any other facilities providing educational services.

Key Indicator(s) for Global Data Needs	Key Indicator(s) for Project Data Needs
% of educational facilities with access to electricity (Access %)	Primary (most commonly used) source of electricity in educational facilities (grid, mini-grid, SHS, solar lantern, standalone diesel, shared diesel, other) (Technology %)
% of educational facilities with access to electricity through renewable sources (Access %)	Average monthly spend on electricity in educational facilities (Spend $)
	Price per unit of electricity (kWh) in educational facilities [where applicable] (Price $/kWh)
	Annualised load profiles of educational facilities (Consumption kWh)
	Electricity-dependent appliances used (multiple selection)

Indicator / Data point	Metric / classification
EDUCATIONAL FACILITIES	
1. Number of educational facilities (schools, TVETs, etc.)	Number
2. % of educational facilities with access to electricity	Access (%)
3. Power consumption of electricity-dependent appliances used (list all) (in Watts)	Consumption (Watt)
4. Secondary/backup source of electricity in educational facilities (grid, mini-grid, SHS, solar lantern, standalone diesel, shared diesel, other) *[where applicable]*	Technology (%)
5. Primary (most commonly used) cooking fuel in use in educational facilities (charcoal, animal dung, woodfire, LPG, biogas, other)	Cooking fuel (%)
6. Secondary (most commonly used) cooking fuel in use in educational facilities (charcoal, animal dung, woodfire, LPG, biogas, other) *[where applicable]*	Cooking fuel (%)
7. Average monthly spend on electricity in educational facilities	Spend ($)
8. Average monthly spend on cooking fuels in educational facilities	Spend ($)
9. Number of employees in educational facilities	Employees (number)
10. Average number of weekly users (pupils/students) educational facilities serve	Users (number)
11. Number of rooms educational facilities occupy	Rooms (number)
12. Number of days (per week) educational facilities operate for	Operations (number)
13. Type of payment for electricity in educational facilities (flat or metered or none)	Payment
14. Price per unit of electricity (kWh) in educational facilities *[where applicable]*	Price ($/kWh)
15. Price per litre of fuel for electricity in educational facilities (diesel/kerosene/other)	Price ($/L)
16. Primary (most commonly used) source of lighting in educational facilities (e.g. electricity, solar lanterns, SHS lights, dry cell batteries, other)	Technology (%)
17. Rooms (out of the total) in educational facility with reliable lighting	Lighting (proportion of rooms)
18. Average number of power outages/blackouts per week in educational facility	Power reliability (outages/week)
19. Average duration of each power outage/blackout in educational facility	Time (minutes/hours)
20. Impact of power outages/blackouts on the operations of the educational facilities	Impact (qualitative)
21. Frequency of power surges/voltage fluctuations in educational facilities per day	Voltage fluctuation (frequency/day)
22. Impact of power surges/voltage fluctuations in educational facility on the appliances used	Voltage fluctuation impact (qualitative)
23. Ease of getting maintenance/repairs done on the energy system(s) in educational facilities	Maintenance/repairs
24. Accidents caused by the electricity supply in educational facility in the last 12 months	Accidents (Yes/No) and number
25. Accidents caused by the cooking fuel/method in educational facility in the last 12 months	Accidents (Yes/No) and number

3.4.6. Community and Public Spaces

Community spaces include community centres, churches, mosques, spaces of religious practice, displaced people public or administration offices, youth centres, and other facilities shared by the community. Public spaces include streets, parks, market squares and other open spaces accessible to the public.

Key Indicator(s) for Global Data Needs	Key Indicator(s) for Project Data Needs
% of community and public spaces with access to electricity (Access %)	Primary (most commonly used) source of electricity in community spaces (grid, mini-grid, SHS, solar lantern, standalone diesel, shared diesel, other) (Technology %)
% of community and public spaces with access to electricity through renewable and clean sources (Access %)	Average monthly spend on electricity in community spaces (Spend $)
	Price per unit of electricity (kWh) in community and public spaces [where applicable] (Price $/kWh)
	Annualised load profiles of community and public spaces (Consumption kWh)
	Electricity-dependent appliances used in a community space (multiple selection)

Indicator / Data point	Metric / classification
COMMUNITY AND PUBLIC SPACES	
1. Number of community spaces (community centres, churches, refugee public offices, etc.)	Number
2. Secondary/backup source of electricity in community spaces (grid, mini-grid, SHS, solar lantern, standalone diesel, shared diesel, other) *[where applicable]*	Technology (%)
3. Power consumption of electricity-dependent appliances used (list all) (in Watts)	Consumption (Watt)
4. Primary (most commonly used) cooking fuel in use in community spaces (charcoal, animal dung, woodfire, LPG, biogas, other)	Cooking fuel (%)
5. Secondary source of cooking fuel in use in community spaces (charcoal, animal dung, woodfire, LPG, biogas, other) *[where applicable]*	Cooking fuel (%)
6. Average monthly spend on cooking fuels in community spaces	Spend ($)
7. Number of employees in a community space	Employees (number)
8. Average number of weekly users community space serves	Users (number)
9. Number of rooms community space occupies	Rooms (number)
10. Number of days (per week) community space operates for	Operations (number)
11. Type of payment for electricity in community spaces (flat or metered or none)	Payment
12. Price per unit of electricity (kWh) in community spaces *[where applicable]*	Price ($/kWh)
13. Price per litre of fuel for electricity in community spaces (diesel/ kerosene/other)	Price ($/L)

14. Primary (most commonly used) source of lighting in community spaces (e.g. electricity, solar lanterns, SHS lights, dry cell batteries, other)	Technology (%)
15. Rooms (out of the total) in a community space with reliable lighting	Lighting (proportion of rooms)
16. Average number of power outages/blackouts per week in a community space	Power reliability (outages/ week)
17. Average duration of each power outage/blackout in a community space	Time (minutes/hours)
18. Impact of power outages/blackouts on the operations of the community space	Impact (qualitative)
19. Frequency of power surges/voltage fluctuations in community spaces	Voltage fluctuation (frequency/day)
20. Impact of power surges/voltage fluctuations in a community space on the appliances used	Voltage fluctuation impact (qualitative)
21. Ease of getting maintenance/repairs done on the energy system(s) in community spaces	Maintenance/repairs
22. Accidents caused by the electricity supply in a community space in the last 12 months	Accidents (Yes/No) and number
23. Accidents caused by the cooking fuel/method in a community space in the last 12 months	Accidents (Yes/No) and number

Debates in energy access for community facilities

Energy access in community facilities is of particular importance given the critical functions it supports, especially in health centres (hospitals, clinics, etc.). Unreliable energy supply can cause vaccine spoilage, interruption in facilities' operations with implications on patients, students and others benefitting from community services. Lack of public lighting can pose serious safety hazards, especially for women and children, e.g. when using public toilets or moving around at night. No or unreliable power supply in schools can compromise teaching provision and negatively impact on students' educational achievement. In all community facilities, poor energy access can impede on staff retention and leave community members with limited services, including medical and educational.

Inefficient energy solutions can contribute to fuel and cost waste, which can compromise space operations in resource-constrained settings, such as refugee or IDP camps. However, fossil-fuel (mostly diesel) generators are the main energy solution in community facilities because of their low up front investment costs, even though other solutions, such as solar installations, offer more reliable and more affordable energy in the long run.

Solar solutions have been slowly gaining traction as either primary energy sources or backup solutions in community facilities, including in settings of displacement. However, appropriate sizing is necessary to ensure that all needs are supported, and financial commitment is needed to choose renewable options over the more easily available generators. Similarly, in the case of public lighting, solar installations have been used in a number of refugee camps (including under RE4R in Rwanda) with varied levels of success. Issues such as theft (of panels or batteries) and lack of maintenance have undermined their feasibility. Therefore, questions of affordability, sufficiency, reliability and sustainability, both from the technical and financial standpoints, are critical.

Some of the critical questions to consider when assessing community facilities are:

- What data can (realistically) be obtained for measuring/estimating energy efficiency and reliability, beyond self-reported data from community facility staff?
- Should we also include the same indicators for host community facilities? Or focus exclusively on the ones within IDP/refugee camps?
- What should be the minimum targets for each sub-category of community facilities?
- Should we further incorporate questions around safety of energy access, for example under public lighting? (currently only personal feeling of safety is included)

- How do we measure coverage, especially in the case of public lighting? Should we measure it in % of public spaces with lights? And if so, should that be collectively for all public spaces or should it be divided into different categories, e.g. streets/pathways, public toilets/ablution blocks, communal areas such as playgrounds, etc.?

3.5. Energy Access for Humanitarian Operations

Energy types found in humanitarian operations: Energy in humanitarian operations is used in a variety of ways. Electricity is needed to power off laptops and computers, printers and other equipment needed for the running of daily activities, as well as basic applications such as lighting. Energy is also needed for cooling and heating purposes, e.g. of offices or staff quarters. Energy for cooking is required for meal preparation for locally-based staff. Energy for transport relies on fuel supply (petrol, diesel) and is included among the proposed indicators.

Technologies used: For electricity: diesel generators, solar installations (mini-grids, higher capacity standalone systems, SHSs), grid (where available). For cooking: charcoal, firewood, biogas, LPG, other.

Contexts: Humanitarian public and administration offices, accommodation buildings for humanitarian staff/compounds, warehouses, offices, Cluster Coordination Reference Module (CCRM) facilities.

3.5.1. Institutional and Operational Electricity

Key Indicator(s) for Global Data Needs	Key Indicator(s) for Project Data Needs
Annualised electricity use related CO2 emissions (absolute) AND Annualised electricity use related CO2 emissions (per capita)	Primary source of electricity in HO facilities (grid, mini-grid, solar (AC), solar (DC), diesel/petrol, other) (Technology %)
% of humanitarian operational facilities with access to electricity through renewable sources	Average monthly spend on electricity (total) in HO facilities (excluding community facilities, such as boreholes) (Spend $)
Energy efficiency policies for Humanitarian Operations in the location (Yes/No/Partial and details)	Cost per kWh of electricity used (Cost $)
% of CCRM facilities, logistics and operations with reliable energy access	Annualised load profiles for HO country operations (site-specific) (Consumption kWh)
100% of unavoidable carbon emissions offset via certified carbon credits (Yes/No)	Average amount of fuel used for ground transport per month (Litres/month)

Indicator / Data point	Metric / classification
ELECTRICITY	
1. Secondary/backup source of electricity in HO facilities (grid, mini-grid, solar (AC), solar (DC), diesel/petrol, other)	Technology (%)
2. Financial mechanism for supply of primary electricity (qualitative)	Type of contract or payment mechanism (direct supply by national or private sector company, type of contract, billed per use or amount of diesel, etc).
3. Average monthly variable cost of electricity (fuel cost, operation and maintenance expenses and carbon dioxide emission charges, if applicable) *[where grid connection]*	Variable cost ($)
4. [if generator] Cost of purchase and installation of diesel/petrol generator	Price ($)

Indicator / Data point	Metric / classification
5. Average monthly total volume of electricity used by the organisation in the location (in kWh)	Volume (kWh)
6. Average monthly fuel consumption for electricity generation *[where diesel/petrol]*	Consumption (Litres/month)
7. Amount of diesel for power generation *[where diesel/petrol]*	Litres of diesel per kWh generated
8. Cost of diesel/petrol (price paid by UNHCR/other humanitarian organisation) *[where diesel/petrol]*	Spend ($ per litre)
9. Monthly cost of diesel/petrol generators maintenance *[where applicable]*	Maintenance cost ($)
10. Has an energy audit of HO facilities been conducted?	Yes/No
11. % of HO facilities supplied by renewable energy	Technology (%)
12. [If RE sources deployed] Solar (or other) capacity installed (kWp)	Capacity (kWp)
13. [If RE sources deployed] how was this financed? (HQ grant/field office capital/external grant/ other)	Financing method
14. [If RE sources deployed] What was the capital cost for installing?	Cost ($)
15. [if RE sources in use] Average monthly cost savings as a result of a renewable source of electricity in use (as compared to diesel/ petrol)	Saving/month ($)
16. [if RE sources in use] What is the estimated payback period on capital investment?	Payback period (months/ years)
17. Average number of power outages/blackouts per week	Power reliability
18. Average duration of each power outage/blackout	Time (minutes/hours)
19. Impact of power outages/blackouts on HO facilities (qualitatively detailed)	Impact (qualitative)
20. Frequency of power surges/voltage fluctuations	Voltage fluctuation (frequency)
21. Impact of power surges/voltage fluctuations in HO facilities on the appliances used	Voltage fluctuation (impact)

3.5.2. Institutional and Operational Cooking

Key Indicator(s) for Global Data Needs	Key Indicator(s) for Project Data Needs
% of HO facilities with access to clean cooking fuels	Primary cooking fuel in HO facilities (firewood, animal dung, charcoal, kerosene, LPG, electricity, biogas, other) (Cooking fuel %)
	Average monthly spend on cooking fuels in HO facilities (Spend $)

Indicator / Data point	Metric / classification
COOKING	
1. Secondary cooking fuel in HO facilities (firewood, animal dung, charcoal, kerosene, LPG, electricity, biogas, other)	Cooking fuel (%)
2. Primary cook stove used in HO facilities (three stone fire, clay, metal, LPG, electric, mud, kerosene, charcoal, ICS, other)	Technology (%)

Indicator / Data point	Metric / classification
3. Secondary cook stove used in HO facilities (three stone fire, clay, metal, LPG, electric, mud, kerosene, charcoal, ICS, other)	Technology (%)
4. LPG for cooking (in kilograms) per month *[where applicable]*	Fuel amount (kg)
5. Price paid for 1kg of LPG *[where applicable]*	Price ($ per kg)
6. Average monthly cost of transporting cooking fuel (e.g. LPG) for HO	Cost ($)

3.5.3. Heating and Cooling for Humanitarian Operations

Key Indicator(s) for Global Data Needs	Key Indicator(s) for Project Data Needs
% of HO facilities with access to heating and/or cooling	Average monthly amount of electricity used for heating and/or cooling in HO (in kWh) (Consumption kWh)
% of HO facilities with access to energy efficient heating and/or cooling	Average monthly spend on heating and/or cooling in HO (if separate from other energy expenditure, i.e electricity and cooking fuels) (Spend $)

Indicator / Data point	Metric / classification
HEATING AND COOLING	
1. Presence of heating/cooling appliances	Yes/No
2. Primary thermal comfort solution in HO - cooling (fan, AC, other)	Technology (%)
3. Power consumption of the primary cooling solution (in Watts)	Consumption (Watt)
4. Primary thermal comfort solution in HO - heating (electric heater, gas heater, fire stove, other)	Technology (%)
5. Power or energy consumption of primary heating solution (in Watts or GJ)	Consumption (Watt or GJ)
6. Frequency of indoor temperature in the HO buildings being uncomfortably cold in the coldest month of the year	Thermal discomfort frequency (cold)
7. Frequency of indoor temperature in the HO buildings being uncomfortably hot in the hottest month of the year	Thermal discomfort (hot)
8. Impact of thermal discomfort in HO	Thermal discomfort (impact)
9. Other coping strategies for lack of cooling/heating solutions in HO *[where applicable]*	Coping strategy

3.5.4. Water Pumping for Humanitarian Operations

Key Indicator(s) for Global Data Needs	Key Indicator(s) for Project Data Needs
% of water pumping solutions (incl. boreholes) using renewable energy sources for functionality	Average monthly spend on water boreholes operational fuel [where applicable, i.e. where diesel, PV, grid other non-manual as source of power] (Spend $)
	Existing water programmes in the location (number and qualitative detail)

Indicator / Data point	Metric / classification
WATER PUMPING	
1. Number of water pumping points (incl. boreholes) in PoC settlement (refugee camp/IDP camp or area/other)	Number
2. Functional water pumping points (incl. boreholes) in PoC settlement (manual, diesel powered, PV powered, national grid powered, other)	Technology (%)
3. Average monthly volume of water used in HO (in litres)	Volume (litres)
4. Distance between area assessed and stationary water bodies	Distance (km)
5. Main water source of the local population pre-crisis (e.g. shallow well, spring, deep well, internal source (within PoC location), external source (outside of PoC location), etc.)	Source type
6. Most common form of household water management in the PoC area assessed	

3.5.5 Transport for Humanitarian Operations

Key Indicator(s) for Global Data Needs	Key Indicator(s) for Project Data Needs
Transport-related CO2 emissions (Volume)	Average monthly spend on transport fuel (Spend $)
	Fuel efficiency of ground transportation (l/100km)

Indicator / Data point	Metric / classification
TRANSPORT	
1. Energy efficiency policies for HO in the location in place	Yes/No/Partial
2. Number of vehicles (cars, motorcycles, trucks etc.) used for HO in the location	Number
3. % of electric or biofuel vehicles (cars, motorcycles, trucks etc.) used for HO in the location	Electric/biofuel vehicle (%)
4. Average monthly amount of diesel used for vehicles/transportation *[where applicable]*	Litres of diesel
5. Average monthly amount of petrol used for vehicles/transportation *[where applicable]*	Litres of petrol
6. Average monthly cost of transporting fuel (diesel) for HO *[where applicable]*	Cost ($)
7. Average monthly cost of transporting fuel (petrol) for HO *[where applicable]*	Cost ($)
8. Average monthly cost of transporting general aid provided to the camp	Cost ($)
9. Average CO2 contributions through flights per month (total)	Total flight-related CO2 emissions per month
10. Average CO2 contributions through flights per month (per capita)	Per capita flight-related CO2 emissions per month

Debates on Energy access in Humanitarian Operations

Despite the important role energy plays in humanitarian operations, there remain a number of challenges for creating a sustainable humanitarian system. A Moving Energy Initiative report (2018) outlines the following issues based on research conducted with humanitarian agencies and implementing partners:

- Agencies largely rely on fossil fuels (mainly diesel) for electricity generation and poor energy efficiency standards exist for buildings, the use of gen-sets and fleet management. As a result, agencies are estimated to have spent around $1.2 billion on polluting fuel in 2017, and paying more for energy than they could under cleaner and more efficient solutions scenarios;

- There are very few motivations to improve on the overall energy performance in humanitarian operations: there are no incentives to conserve fuel and fuel use is generally poorly monitored; spending on energy often lacks transparency;

- There are huge savings to be made if agencies were to move away from status quo solutions and switch to existing cleaner energy access options, such as solar PV.

Furthermore, the UNHCR's Global Strategy for Sustainable Energy states that "The energy needs of communities and support facilities are often addressed by means of oversized, costly, polluting diesel generators. This, compounded by the use of inefficient appliances, poor monitoring of energy consumption and no incentives for energy efficiency or shifting to renewable energy, leads to high financial and environmental costs." (UNHCR, 2019: 21).

In the case of HO in particular the lack of data is striking and the lack of proper monitoring frameworks for energy use and spend reporting has been seen as a significant shortfall on the humanitarian agencies' end. An example of initiatives to address this is the UN Greening the Blue Initiative, which relies on data produced by UN agencies through their own reporting systems to understand the contribution that the UN is making to reducing emissions.

Some of the critical questions to consider when assessing humanitarian operations are more definition-focused rather than trying to answer the current status of data collection by humanitarian agencies, and should help design frameworks for better energy related data collection, monitoring and reporting.

- Should HO include projects/programmes or only the operations of humanitarian facilities? What about boreholes?

- If humanitarian organisations are responsible for powering the community centres, clinics, schools etc. (incl. water pumping) then should the community facilities category be under the HO one? This comes back to the question on whether the HO category should only cover operational costs of UNHCR's or other agencies' facilities rather than the project/programme related access as well;

- How to include energy for vehicles/transport under HO? Energy for transport is generally a contentious issue as it is not included in the SDG7 targets explicitly and hence is mostly excluded from energy access analyses. There is a need for more research on transport for not only HO, but also for households and businesses/enterprises to better understand its impact on the overall energy access needs and the environment.

- The Greening the Blue platform reports on GHG emissions across the UN system. In 2018, 67 UN entities participated in the annual greenhouse gas emissions inventory. Within this system climate neutrality is largely built on carbon offsetting and data behind the platform is difficult to interrogate. What steps are needed to facilitate better reporting, understanding, and genuine change in practices?

4. Targets for Energy Access in Displacement Settings

This report has highlighted the types of indicators and data possible to collect in humanitarian settings. Many of these indicators are target-neutral, meaning that they do not set or recommend a specific level of energy access, or percentage of energy from renewable sources. However, in this section we consider the types of targets that are commonly used within the wider energy access and humanitarian settings. We recommend that where possible, organisations and institutions strive to act progressively and in a climate-neutral manner: aiming for higher levels of access across all spaces and supporting renewable technologies. The views on targets and Tier levels in the sections below reflect the views of the authors, rather than agreed formal views from the GPA partners or wider sector collaborators. The following sections outline potential targets that could be used by organisations in supporting access to sustainable energy for households, businesses, community facilities and for operational energy.

4.1 Targets for Household Electricity Access

Setting targets for minimum levels of electricity access in households can be controversial. In displacement contexts it is common for humanitarian organisations to aim for Tier 1 or 2 level access for households. However, targets and ambitions vary considerably between countries and displacement contexts. The MTF outlines clearly-presented Tiers for household electricity. The diagram below presents these Tiers and visualizes how they compare to different types of household electricity appliances.

This document recommends that where possible a minimum of Tier 3 access for household electricity is adopted for displaced households. Below this level it is challenging for families to access basic services, study or conduct productive activities at night, or live safely and securely in their homes. Raising the minimum standard for access to Tier 3 or above would also allow for potential implementation of electric pressure cookers or other electric cooking appliances in settings of displacement where the price and externalities of biomass cooking are extreme. Reaching Tier 3 or higher comes with the need to overcome several existing barriers, among them the willingness and/or ability to pay among the displaced populations and therefore the broader economic developments, which would ideally include refugees so that they could benefit from them. Another is an increased availability of energy solutions which either offer Tier 3 and above right away or solutions which can be easily expanded from lower to higher Tiers, for example by adding on appliances offering higher Tier services (such as ironing, fans, PUE appliances, etc). Therefore the recommended target for household electricity is:

- *Tier 3 or above access for electricity should be provided for displaced households and such access should be powered by renewable technologies.*

4.2 Targets for Household Cooking Energy

The MTF proposes 7 attributes for measuring access to energy for cooking, including: “health (based on indoor air pollution), convenience (based on fuel collection time and stove preparation time), safety, affordability (including expenditure on cook stove and fuel), efficiency, quality, and availability” (ESMAP, 2015, p.9). For each one of the attributes, there are a number of Tiers (or standards) and the critical question regarding access to cooking in settings of displacement is a) whether a minimum Tier/ standard should be determined for each one of them and b) what minimum Tier or standard it should be. The MTF also includes the 2012 ISO International Workshop Agreement (IWA) Tiers (1-4) which propose 5 performance targets: thermal emissions, carbon monoxide emissions, fine particulate matter emissions, safety and durability (now superseded by the ISO/TR 19867-3:2018).

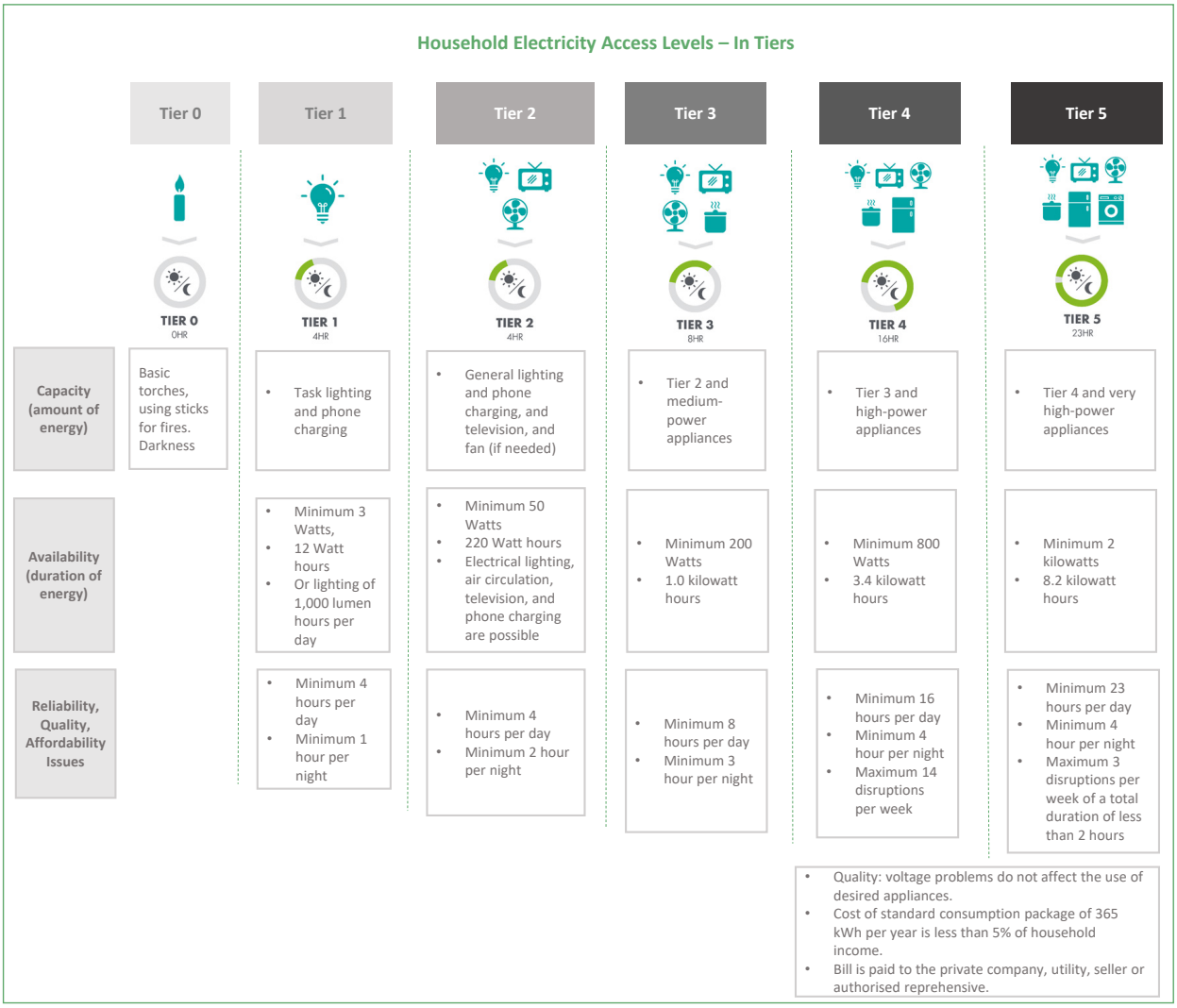

Figure 9: Tiers for household electricity (Adapted from The World Bank MTF and Mercy Corps, 2019).

The WHO describes household air pollution as one of the greatest environmental health risks in the world today, affecting almost 3 billion people in low and middle-income countries. Approx. 3.8 million children and adults died prematurely from illnesses caused by such household air pollution, due to the inefficient combustion of solid fuels. A study by the Moving Energy Initiative (2015) estimates that poor quality biomass fuels account for 20,000 premature deaths per year, among displaced persons, as well as respiratory and heart conditions affecting children and the elderly.

We recommend that Tier 4 (or level 4) for indoor pollution for cooking (as per ESMAP, 2015) is targeted as a universal standard for refugees and displaced people, with a neutral approach towards both clean technologies and delivery models. The best or most-appropriate solution (meaning combination of technology and delivery model) will inevitably vary between locations due to a number of factors, not least of all a ready supply of different technologies in the local market, as well as household preferences and ability to pay, which in turn are linked to national refugee and energy policies.

Therefore the recommended target for household cooking is:

- *Tier 4 (or level 4) for indoor pollution for cooking and such access should be provided using clean technologies and fuels.*

4.3 Targets for Heating and Cooling

WHO (2007) recommends that rooms used by children should have a temperature of 19 degrees Celsius, which can be challenging to achieve in both extremely hot and extremely cold climates. According to ESMAP (2015), a minimum proposed requirement for fans is 20W (Tier 1) with a higher average requirement of 40W (Tier 1). AC solutions require a minimum of 2000W (Tier 5), currently hardly achievable through off-grid solutions. Portable room heaters can run on as little as 750W (Tier 3/

Tier 4) though usually power requirements are much higher. The framework proposes 1500W (Tier 4) as a minimum requirement. Therefore the recommended target for heating and cooking is:

- *Tier 4 for heating and cooling access and such access should be supplied using renewable technologies.*

4.4 Targets for Productive Uses of Energy

Realistically, in order to support productive energy uses a minimum of Tier 3 of energy access is needed. While some activities will be made possible with Tier 2 level of access (e.g. lighting or phone charging), others will require higher Tiers of access (e.g. refrigeration or milling). Tier 3 will be able to facilitate selected productive uses requiring applications with higher power consumption. Insufficient access can potentially significantly limit income generating opportunities for PoC. In an ideal scenario, productive applications of energy, or PUE, should be supported by considerable electricity and cooking access. Therefore the recommended target for energy for enterprises is:

- *Tier 3 or above access for electricity should be provided for displaced businesses and such access should be powered by renewable technologies.*

4.5 Targets for Community Energy Needs

Tier 2 under street lighting indicates 4 hours of lighting provided at night which can be argued to be insufficient to ensure safety and security of PoC HHs, particularly in equatorial regions where hours of darkness change little throughout the year and the night falls early (between 6-8pm). Allowing for only 4 hours means that movement beyond 10pm/midnight is limited and potentially dangerous. Beyond street lighting, power for other community facility uses are also needed. Only Tier 4 and Tier 5 stipulate reliability, quality and safety of the actual solutions (i.e. the solution does not pose risk to the users/beneficiaries). Therefore, a minimum of Tier 4 access should be pursued for community energy access. Given the critical nature of functions community facilities fulfil and the need for safe community spaces, the minimum standard for energy access should also be set at Tier 4 and in the long term the ambition should be to have Tier 5 level of access across all community spaces and institutions. Therefore the recommended target for energy provision in community facilities is:

- *Tier 4 or above access for electricity should be provided for community facilities in displacement settings and such access should be powered by renewable technologies.*

4.6 Targets for Humanitarian Operations

As per UNHCR's Global Strategy for Sustainable Energy (2019), one of the expected outcomes is the following: "energy-efficient technologies and renewable energy are used to meet the electricity needs of communities: centralized water supplies, street lighting, educational and health facilities and humanitarian support facilities such as offices and staff accommodation" (p. 21). It is further stated that energy provision in settings of displacement and also specifically in HO should:

- Advocate for the promotion of renewable energy as primary sources and when selecting backup solutions- choose renewable energy options, such as solar PV (with storage)
- Give preference to hybrid or fully renewable mini-grids where grids do not exist
- Where other options are unavailable, use renewable standalone decentralised electricity generation (e.g. solar PV instead of diesel generators)
- Install energy metering systems to monitor consumption
- Create a culture of energy efficiency by choosing energy efficient appliances, creating appropriate incentives and providing training.

These goals, however, do not set any specific, measurable targets and are very high level, which can be seen as a shortfall of the strategy. It is therefore recommended that:

- Humanitarian organisations should set targets for phasing out diesel for electricity generation across operations.
- Humanitarian organisations should set a target and a timeline for improving the efficiency of agency fleet vehicles, and for investigating how plane, car and truck journeys can be reduced.

In many cases humanitarian operations already have substantive access to electricity (often Tier 4 or above) and therefore this target focuses more on the switch to renewable and sustainable sources of energy, including the tier at which energy can be measured. Beyond these aims and recommendations, the recommended target for energy provision in operational facilities is:

- Tier 5 or above access for electricity powered by renewable technologies and clean cooking solutions for humanitarian operational needs.

5. Limitations and Caution on Energy Data

This report comes with a number of limitations which have to be acknowledged. The list of indicators is extensive but not fully comprehensive. There are more indicators which could be considered energy access related. Not every indicator used by humanitarian organisations, or other organisations working in humanitarian contexts, for energy access has been included here due to the need for selectiveness and strategic choice making. The aim of this exercise is to propose indicators which are important in tracking in humanitarian energy access. While the initial choice of indicators by the core team who undertook this challenge was subjective (although informed by their experience and expertise in the field), the final list of indicators has been informed by one-on-one consultations with a number of experts working on energy access in settings of displacement and energy access data experts who have been able to offer their own expertise and guidance in making the selection of indicators as relevant as possible. Similarly, not all the listed indicators are applicable across all contexts/situations and when using this guide, the most suitable indicators should be strategically selected.

Other key limitations include lack of explicit focus on issues around energy efficiency and reduction of emissions alongside increased energy access. Both have been gaining importance as energy efficiency will have to be built into both existing and future energy systems to curb emissions if low-carbon energy transition pathways are to be realised and the goal of limiting the temperature increase to no more than 1.5°C, as stipulated by the Paris Agreement, is to be met. Yet energy efficiency is often hard to measure and data on the efficiency of electrical applications is not always available. While this poses a limitation in organisations' ability to collect such data, it is recommended that measures to address energy efficiency and the reduction in emissions (across all components of energy access in settings of displacement) are taken as soon as possible.

Moreover, in this indicator mapping we have only looked at energy social practices to a limited extent. Social practices of energy are driven by various cultural, economic, political and technological systems (or norms), and offer insights into what energy is for and how it is used, and the behaviours associated with energy procurement and use. Exploring and understanding social practices of energy is mostly done through qualitative methods (e.g. in-depth interviews, observation) resulting in more qualitative data which is less (or not at all) quantifiable than data gathered through quantitative methods (e.g. surveys or questionnaires). However, we fully acknowledge the value of such data as it provides a rich insight into the daily realities of energy access (or lack thereof) among the end-users.

Finally, even though some of the indicators included in this mapping can be used specifically for monitoring and evaluation (M&E) purposes, the list presented in this document does not focus on key metrics and indicators for M&E but those for global data and project and programme design. Other frameworks specifically for M&E of energy access in settings of displacement have been proposed, such as the UNHCR Energy Monitoring Framework. In theory many of the indicators can be used for M&E and learning processes, as well as for global data and project design work.

While there are limitations with understanding the types of indicators used within humanitarian settings, a larger challenge perhaps lies within the issue of data collection and analysis of data. Data on energy access is complex and contextual, and therefore requires careful data collection tool design and planning. Collecting primary data on energy access, particularly in challenging settings such as displacement can be highly time- and resource-demanding. In refugee camps, it often requires special permits, usually granted by UNHCR and/or other humanitarian organisations. Realistic timelines and expectations should therefore be set for any data collection effort in displacement settings, not least because not all data is always available. When comprehensive data collection is not feasible, focusing only on the key indicators might be the best available option.

Data is most useful when collected systematically and regularly as it then provides the useful insights into the current situation (a snapshot), as well as the trends over time. Ideally, data collection should be inclusive of host communities. Humanitarian and development organisations working on energy access in displacement settings can greatly benefit from well-designed and regular data collection to assess progress and inform future strategies for the delivery of energy products and services to the displaced and host communities.

6. Summary of Indicator Recommendations

This report has outlined the types of energy indicators required to establish a global state of play on humanitarian energy and measure progress on implementing sustainable energy programmes in displacement contexts. It is hoped that alignment of institutions around these central indicators may lay the foundation for harmonised data collection and analysis in forced displacement settings. Measuring what matters is critical to establish both a global baseline to demonstrate progress towards sustainable development and climate goals, and support positive learning within the humanitarian sector on where energy needs are most severe. To support change and data collection across the humanitarian energy sector, the UN-led Global Platform for Action on Sustainable Energy in Displacement Settings (the GPA) has produced this resource on indicators for practitioners and donors in understanding humanitarian energy needs.

The report outlines three types of indicators:

- A common set of **global level indicators to measure progress on energy access** and use in situations of displacement (i.e. include displaced populations into the SDG 7 tracking), which could be used to deliver a baseline of global energy access rates in displacement settings.
- Key **indicators needed for project interventions** in order to support the design of programmes and projects that increase the access to clean energy for displaced people and host communities and the use of cleaner energy for humanitarian agencies.
- Essential **indicators on energy costs and carbon emissions** in order to understand payments for energy and track progress on addressing the climate emergency.

We have identified 16 core Indicators for Humanitarian Energy which cover access at the household, enterprise, community facility, and institutional levels for both electricity and cooking needs in these spaces. These are outlined in the table below. We urge all institutions and projects working within the humanitarian energy sector to collect these indicators, and to share the results across the GPA community, in order to enable a global baseline on energy access needs to be produced. Such data will also make it possible to measure progress on climate emissions and reaching Sustainable Development Goal (SDG 7) on clean energy access for all displaced people by 2030.

Energy Needs Location	Key Indicator for Access to Energy (Global Baseline)	Key Indicator for Intervention Assessment (Project Development)	Key Indicator for Reducing Inequality and Emissions (Leave No-One Behind)
Household Electricity	Proportion of Persons of Concern (PoC) population with access to electricity (on or off-grid) (Access %)	Type of electricity in households with access (grid, mini-grid, SHS, solar lantern, standalone diesel, shared diesel, other) (Technology %)	Average household monthly spend on electricity (Spend $)

Energy Needs Location	Key Indicator for Access to Energy (Global Baseline)	Key Indicator for Intervention Assessment (Project Development)	Key Indicator for Reducing Inequality and Emissions (Leave No-One Behind)
Household Cooking	Proportion of PoC population with primary reliance on clean fuels and technology for cooking (Access %)	Type of primary cooking fuel (firewood, animal dung, charcoal, LPG, biogas, other) (Technology %)	Average monthly spend on cooking fuels and cooking technologies (Spend $)
Energy for Displaced Enterprises	% of businesses and enterprises with access to electricity (Access %)	Type of energy in enterprises with access (covering both electricity and cooking sources) (Technology %)	Average businesses/ enterprises monthly spend on electricity (Spend $)
Energy for Community Facilities	% of community facilities with access to electricity (Access %)	Primary (most commonly used) source of electricity in community facilities (grid, mini-grid, SHS, solar lantern, standalone diesel, shared diesel, other) (Technology %)	Average monthly spend on electricity in community facilities (Spend $)
Energy for Operations	% of humanitarian operational facilities with access to electricity through renewable sources (Access %)	Primary source of electricity in HO facilities (grid, mini-grid, solar (AC), solar (DC), diesel/petrol, other) (Technology %)	Average monthly spend on electricity (total) in HO facilities (excluding community facilities) (Spend $). Annualised electricity use related CO_2 emissions (absolute)

Annexes

Appendix 1: Terminology and Abbreviations

Many definitions for the humanitarian energy sector have been developed and published online in the paper 'Definitions and Differences: The Evolving Space of Energy Access in Humanitarian Energy' by Al-Kaddo and Rosenberg-Jansen (2021). The section below provides a short overview of some of the key terms used within the humanitarian and energy sectors specifically.

Access to electricity - access to affordable, reliable, sustainable and modern electric power to support electricity services, such as lighting, phone charging, etc. ESMAP at the World Bank distinguishes 6 Tiers of electricity access, Tier 0 being no access and Tier 5 being full access to a range of services requiring power supply. This offers a move away from a binary (access/no access) way of measuring access to electricity and highlights different levels of access along the wide spectrum of services (ESMAP, 2015).

Access to clean cooking - access to non-traditional cooking fuels, such as LPG, ethanol, biogas, natural gas or technologies using solar power or other sources of electricity to support cooking appliances.

Energy - power derived from the utilisation of physical or chemical resources, especially to provide light and heat or to work machines.

Host population/community - a host community refers to the country of asylum and the local, regional and national governmental, social and economic structures within which refugees live.

Humanitarian operations - operations conducted to relieve human suffering, especially in circumstances where responsible authorities in the area are unable or unwilling to provide adequate service support to civilian populations (WHO/ReliefWeb, 2008). In this document, energy for HO refers to the energy used for powering/running humanitarian facilities rather than projects/programmes (even if there might be some overlap between the two).

Indicator - something that shows what a situation is like or how it is changing.

Metric (classification) - a system of measurement; the division of things into groups [here: indicators].

Person(s) of Concern - a person of concern is any person whom the United Nations High Commissioner on Refugees (UNHCR), the UN Refugee Agency, considers a refugee, internally displaced person (IDP), asylum- seeker, or stateless person, with some additional persons not fitting these criteria.

Productive use [of energy] - "productive uses of energy are defined as those that increase income or productivity, referred to as value-adding activities." (ESMAP, 2015)

Renewable Energy - refers to energy options that are naturally replenished over time e.g. solar and wind energy and biofuels. (UNHCR, 2019)

Settings of displacement - places where refugees, Internally Displaced Persons (IDP) or asylum seekers live, whether temporarily or for a prolonged period; they include refugee camps, IDP camps or regions/ areas in the country where internal displacement occurred, and asylum seekers' shelters.

Sustainable energy - energy solutions that meet current energy needs without jeopardizing the ability of future generations to meet their own energy needs. (UNHCR, 2019)

Traditional use of biomass - refers to the energy use of local solid biomass resources by low-income households that do not have access to modern cooking and heating fuels or technologies. Solid biomass, such as wood, charcoal, agricultural residues and animal dung, is converted into energy through basic techniques, such as a three-stone fire, for heating and cooking in the residential sector, which is often inefficient and associated with negative impacts on human health and the environment (ESMAP, 2018).

Appendix 2: Data websites and platforms

Chatham House (Moving Energy Initiative):

- Moving Energy Initiative: https://mei.chathamhouse.org/
- Toolkits: https://mei.chathamhouse.org/resources/toolkits
- Energy use in humanitarian operations survey: https://www.surveymonkey.com/r/4MEIenergyusesurvey

Clean Cooking Alliance:

- Standards: https://www.cleancookingalliance.org/technology-and-fuels/standards/
- Voluntary Performance Targets: https://www.cleancookingalliance.org/technology-and-fuels/standards/voluntary-performance-targets.html

EnergyCoP (A space to foster knowledge sharing and collaboration on energy access in humanitarian settings):

- Home page: http://energycop.safefuelandenergy.org/web/energycop

Energypedia:

- Home page: https://energypedia.info/wiki/Main_Page
- Energy Access for Refugees: https://energypedia.info/wiki/Energy_Access_for_Refugees

Environmental Emergencies Centre:

- Home page: https://www.eecentre.org/
- The Nexus Environmental Assessment Tool (NEAT+): https://www.eecentre.org/resources/neat/

Environment in Humanitarian Action (EHA) Connect:

- Energy: https://ehaconnect.org/themes/energy/

Food and Agriculture Organization (FAO):

- Sustainable Development Goals: Indicators http://www.fao.org/sustainable-development-goals/indicators/en/
- Progress report: http://www.fao.org/sdg-progress-report/en/

HEED (Humanitarian Engineering and Energy for Displacement):

- Home page: http://heed-refugee.coventry.ac.uk/
- Data Portal: http://data-portal-heed.s3-website.eu-west-2.amazonaws.com/home

OCHA The Humanitarian Data Exchange:

- Home page: https://data.humdata.org/

Practical Action:

- Energy for Refugees: https://practicalaction.org/our-work/projects/energy-for-refugees/

UNHCR:

- Clean Energy Challenge: https://www.unhcr.org/uk/clean-energy-challenge.html
- Clean Energy Challenge Baseline: initial data visualization
- Integrated Refugee and Forcibly Displaced Energy Information System - EIS: https://eis.unhcr.org/home
- UNHCR Energy Data Mapping: https://docs.google.com/spreadsheets/d/169HpsbIc2My1UY-SbfUqdsP0csX5a4d-K7sOBWjAYcY/edit#gid=0
- UNHCR Microdata Library: https://microdata.unhcr.org/index.php/home
- Energy Monitoring Template V5: https://enketo.unhcr.org/x/#MgTaCjKD?p=0&_ga=2.44580322.791614998.1583396697-1428707290.1583396697
- Energy Partner Survey: https://d9udoyz3nlfj8.cloudfront.net/energy/media/English_PDF_MASTER_-_Energy_Partner_Survey.pdf
- Comprehensive Refugee Response Framework: https://www.unhcr.org/comprehensive-refugee-response-framework-crrf.html
- Global Strategy for Safe Access to Fuel and Energy (SAFE): https://www.unhcr.org/530f11ee6.html

UNITAR (United Nations Institute for Training and Research) as the host of the - Global Platform for Action on Sustainable Energy in Displacement Settings (GPA):

- GPA home page: https://www.humanitarianenergy.org/

World Food Programme (WFP):

- Green Kit: https://innovation.wfp.org/project/green-kit

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