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ACCESS TO SOLAR ENERGY IN COMPLEX CRISES

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COVER PHOTO

NORCAP Energy Expert Emmanuel Biririza discussing the solar installations in Ajourng Thok, with UNHCR staff.

Photos taken by Karina Fredly Sætre, Borja Gomez Rojo, Ida Sem Fossvik, Klaus Strasser, Nina Hjellegjerde and other NORCAP contributors. These photos were shot in Ajourng Thok and Jamjang (South Sudan), Nyarugusu Refugee Camp (Tanzania), Mutua resettlement site (Mozambique), and Uganda.

A warm thank you to all NORCAP and BCG colleagues who have contributed to the report.

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NORCAP Energy Programme Manager Borja Gomez Rojo inspecting solar plants. Frequent maintenance is essential for optimal solar plant operation.

2. Definitions and Abbreviations

BCG: Boston Consulting Group

Clean energy: In this report, refers to renewable energy sources (i.e., solar PV, wind, geothermal, hydro). Efficient uses of energy sometimes referred to as cleaner energy (e.g., LPG for cooking or heating) are not directly analysed in the study

Clean Energy Challenge: Joint initiative led by UNHCR with the goal to ensure that all refugee settlements and nearby host communities will have access to affordable, reliable, sustainable, and modern energy by 2030. Comprises of five main components defining the ambition for electricity, cooking fuels, public services, water supply, and host communities.

DESCO: Distributed energy solar company

Displaced persons: In this report, collectively refers to both internally displaced persons and refugees

Distributed energy (solution): In this report, refers to SHS kits for use by individual households

DRC: Democratic Republic of the Congo

GPA: Global Plan of Action for Sustainable Energy in Situations of Displacement

HDP: Humanitarian, development, and peace

Host community: In this report, refers to the original inhabitant population either directly housing displaced persons, or with their settlement adjacent to a refugee/IDP camp

IDP: Internally Displaced Person, refers to persons or groups of persons who have been forced or obliged to flee or to leave their homes or places of habitual residence, in particular as a result of or in order to avoid the effects of armed conflict, situations of generalised violence, violations of human rights, or natural or human-made disasters, and who have not crossed an internationally recognised State border (*Guiding Principles on Internal Displacement, United Nations, 1998, E/CN.4/1998/53/Add.2*)

International financial institution (IFI): A financial institution established (or chartered) by more than one country, and hence is subject to international law. Its owners or shareholders are generally national governments, although other international institutions

and other organisations occasionally figure as shareholders. IFIs include multilateral, regional, and bilateral development banks, and the International Monetary Fund (IMF)

International organisation (IO): Organisation established by a treaty or other instrument, governed by international law, and possessing its own international legal personality. International organisations generally have States as members, but often other entities can also apply for membership. Examples include the United Nations (UN) and the Organisation for Economic Co-operation and Development (OECD)

IOM: International Organization for Migration

Mini-grid: Solar solution that distributes energy to multiple end users through a local grid; not necessarily connected to the national grid

NGO: Non-governmental organisations

NRC: Norwegian Refugee Council

Off-grid: Electricity generation source not connected to national electricity grid

PAYGO: Pay-as-you-go, a business model that allows end users to pay for energy in weekly installments or whenever they are financially liquid

Peace: There are three different perspectives on peace:

- **Peace processes** and other interventions in active conflict
- **Peacekeeping** and special political missions, where risks tend to be mitigated by protocols that separate political interventions from UN/humanitarian work
- **Peacebuilding** efforts, which are a highly context-specific common form of nexus work where risks of politicisation are generally very low. This paper uses mainly this definition

Persons of Concern: Inclusive definition of refugees, asylum seekers, IDPs, returnees, stateless persons, and others to whom the UNHCR extends protection

PoC: Protection of Civilians camp



NORCAP expert Emilie Ntempera engaging with the local refugee community. Local engagement is crucial to achieving long-standing results.

Peace Renewable Energy Credit (P-REC): A traded virtual commodity representing 1 MWh of renewable energy generated in fragile and energy poor countries

PV: Photovoltaic

Refugee: Person who, owing to well-founded fear of being persecuted for reasons of race, religion, nationality, or membership of a particular social group or political opinion, is outside the country of his nationality and is unable or, owing to such fear, is unwilling to avail himself of the protection of that country; or who, not having a nationality and being outside the country of his former habitual residence, is unable or, owing to such fear, is unwilling to return to it (Art. 1(A)(2), *Convention relating to the Status of Refugees*, Art. 1A(2), 1951 as modified by the 1967 Protocol)

SDG7: Sustainable Development Goal 7 (Energy), which aims to ensure access to affordable, reliable, sustainable, and modern energy for all. Ambition is defined by three targets: 1) universal access to affordable and reliable energy, 2) increased use of renewables, and 3) increased energy efficiency

SGBV: Sexual and gender-based violence

SHS: Solar home system, a small, off-grid solar solution that only distributes energy to a single household

Sub-Saharan Africa: In this report, refers to African countries, excluding Algeria, Egypt, Libya, Mauritania, Morocco, and Tunisia

WASH: Water, sanitation, and hygiene

3. Executive Summary

There is an immediate need to address the widening energy access gap impacting vulnerable populations in Sub-Saharan Africa. A staggering 600 million persons in Africa, half the continent's population, lack access to electricity. Displaced populations are critically exposed, with over 90% lacking sufficient access to electricity. This represents a huge gap to the ambition articulated by SDG7, where all persons are to have access to affordable, reliable, sustainable, and modern energy by 2030. Sub-Saharan Africa is especially affected, with sixteen countries each hosting over 100,000 forcibly displaced persons, and providing electricity access to less than 50% of their own population. The humanitarian-development-peace nexus (Triple Nexus) approach presents an opportunity for accelerating deployment of clean energy solutions through efficient use of financial and capability resources. The Triple Nexus also enables better risk distribution across the three sectors, thereby inviting international financial institutions (IFIs) to take a more prominent role in humanitarian challenges.

It is possible to deliver clean energy to over 9 million displaced and associated host persons in Sub-Saharan Africa through an accelerated solar deployment. An estimated \$500 million to \$600 million of investment is required towards 2030 to deliver clean energy access to 4.5 million displaced and 4.5 million host persons. Both displaced and host communities must be addressed in parallel to ensure equitable energy access for all. UN agencies and NGOs should lead the change by taking immediate action to transition about 60% of camp operations within five years from diesel generators to solar technologies and setting a 90% penetration target by 2030. In turn, the transition to greened humanitarian operations could serve as a catalyst to accelerate the growth of the electrification of displaced and host communities, as initial concepts are proven and taken to scale in the latter half of the decade. High-impact, larger projects will likely emerge only from 2025, due to the increased financing complexity and longer development periods compared to smaller projects. Both distributed and larger mini-grid projects are needed to directly deliver impact into displaced and host households.

Meaningful impact of these clean energy solutions is only achievable if five long-standing challenges are addressed:

1. *Long-term, "bankable" financing models required of high-capital clean energy investments are mismatched with short-cycle budgets and siloed humanitarian funds.*

2. *Significant off-taker risks with high uncertainty of continued operations from international organisations and NGOs, and high default risks from displaced/host consumers.*
3. *Fluid political environment and demanding regulatory regimes requiring over 24 months to secure approvals and could, at worse, retroactively cancel projects.*
4. *Lack of sufficient community engagement and involvement causing local pushback against projects and risking escalated tensions between host and displaced communities.*
5. *Physical supply chain disruptions and endemic corruption in procurement channels, increasing logistics and operations costs.*

No one solution fits all; each country, context, and risk must be individually tackled. Three countries illustrate the variety of unique challenges faced in different contexts. In South Sudan, logistics security remains a key concern due to ongoing armed conflict from instability of tribal geopolitics. An immovable stance against refugee resettlement and assistance in Tanzania prohibits efforts to provide energy access. And in Burkina Faso, an exponential increase in Internally Displaced Persons (IDPs) housed within host communities has put a drastic strain on already stretched energy supplies.

To overcome these challenges, several stakeholders need to contribute in a coordinated manner.

- **International organisations (including UN agencies) and NGOs** must adopt a Triple Nexus approach to enable access to pooled finances and ensure combined expertise is used to inform decisions of clean energy solutions.
- **National and local government and regulatory bodies** should enact regulatory and refugee policy reform to attract additional investors and fuel their own national development.
- **Clean energy companies** should partner with UN agencies, other international organisations, and NGOs to identify ground-level opportunities and scale local capabilities to meet that demand.
- **IFIs, donors, and investors** should establish multi-year funds to finance higher-capital clean energy projects and support HDP actors' transition to new energy delivery models.



An internally displaced person charging her mobile phone and lamp from solar power.

4. Scope, Methodology, and Purpose

This report represents NORCAP's and BCG's assessment of clean energy's potential impact on displaced and host populations and the most prominent challenges for clean energy projects in humanitarian, development, and conflict situations. This study focused on enabling energy access for the most vulnerable people that would otherwise never receive it, yet sorely need that energy access to enable a bare minimum quality of living. Furthermore, the study evaluated the opportunity for the Triple Nexus approach to address the issue and identified how the pooled efforts, capabilities, and finances could enable this energy access.

The scope of this study includes clean energy sources that produce electricity and provide power to households, shared community services, and productive uses for livelihood opportunities of displaced and host populations. The scope also extends to production of electricity for UN and NGO camp operations.

Clean cooking options are not evaluated as part of this study, as the cooking needs of displaced persons are likely to be met through energy sources and solutions other than electricity. Electric cooking appliances require higher levels of power and solar electric cooking appliances are still nascent and being trialled, for example by the World Food Program (WFP) in Burundi. Both improved cooking stoves and LPG technologies have been proven through multiple projects and are likely to address displaced persons cooking needs before electricity-powered methods.

The report consists of four main parts: 1) an assessment of the energy access, forced displacement, and Triple Nexus opportunities in Africa; 2) a potential deployment scenario of clean energy solutions to impact displaced and host populations in Africa; 3) discussion of the challenges hindering deployment of clean energy

solutions; and finally, 4) a view of key mitigating actions and priorities for stakeholders moving forward.

For this report, we focused on the broader Sub-Saharan African context, given the continent's persistent and multiple humanitarian, development, peace, and energy concerns. Burkina Faso, Tanzania, and South Sudan were selected for deep dives, as they represent areas where both energy poverty and severe forced displacement issues create an opportunity for clean energy sources to make a significant impact. Each of the three countries illustrate unique perspectives across each of the humanitarian, development, and peace sectors, respectively.

Important sources of information for this report were over 70 in-depth interviews with topic experts and stakeholders. They represent a broad spectrum from across the humanitarian, development, peace, and energy sectors, including governmental agencies, UN agencies, international organisations, NGOs, project developers, independent power producers, investment companies, development funds, and frontline staff. (See Section 9.4.1.)

The primary purpose of the interviews was three-fold: 1) to identify and validate the major challenges for clean energy in protracted humanitarian situations, 2) to identify interlinked short- and long-term mitigating actions through a Triple Nexus approach to address those risks, and 3) to gather specific examples of lessons learnt. BCG and NORCAP additionally performed further desktop analysis, leveraging information from a broad range of sources. (See Section 9.4.4.)

This report aims to establish an initial call-to-action for key stakeholders—further assessment and detailed planning will be required for some of the initiatives.



NORCAP Energy Expert Klaus Strasser (left), together with Angelo from the implementing partner Cemdo, in front of the solar plant at a multi-purpose centre.

5. Energy Access, Displacement, and Triple Nexus Opportunities

An estimated 1.2 billion people remain without access to electricity globally, including some of the 80 million who are currently forcibly displaced. Africa is the most impacted continent, facing protracted and continually escalating humanitarian crises.

5.1 Widening Energy Gap in Africa Severely Impacting Quality of Life

A staggering half of Africa’s population, over 600 million persons, currently lack access to electricity. Despite new capacity additions, energy poverty is expected to persist beyond 2030, as rapid population growth outpaces efforts to increase access.

The energy gap between Africa and the rest of the world is widening. On current trends, it will take another 60 years, until 2080, to achieve universal access. Multiple quality-of-life issues compound with any delay in energy access, including:

- **Health and safety complications:** 600,000 Africans are killed every year from health issues due to indoor air pollution from biomass or kerosene burning. Kerosene is predominantly used for cooking, although such fuels are also used to provide light and heat. Both biomass and kerosene are highly combustible and present extreme fire hazards, exacerbated by dense accommodation

layouts in camps and settlements and inadequate fire response contingencies. A lack of refrigeration entails keeping critical medicines and vaccines many kilometres offsite.

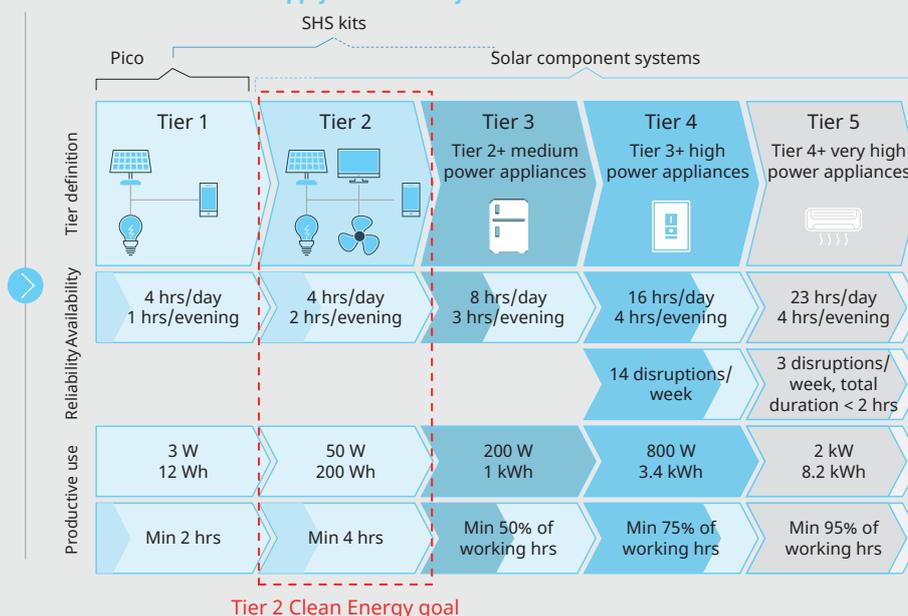
- **Educational gap:** 90% of children in Sub-Saharan Africa attend primary schools that lack electricity. This translates to a negative impact on the quality and quantity of studying, which is largely limited to daylight hours, both in schools and after-hours within households. A UNDESA study in developing countries indicated literacy rates up to 30% lower than peers in developing countries with electrification rates below 80%.
- **Social inequality:** Despite rapid developments in specific regions, 40% of Africa’s poorest households spend 10% or more of their limited income to merely power a few basic appliances. This places additional strain on allocating income to even more critical needs, such as food and medicine. A widening socioeconomic gap risks further marginalisation of impoverished persons and contributes to increased involvement with armed conflict groups.
- **Economic stagnation:** A lack of lighting forces businesses to limit operations to daylight hours. Tools and equipment are either primitive or powered by unreliable energy sources that further

Exhibit 2 | Multi-Tiered Ambition Set by UNHCR Clean Energy Challenge

UNHCR Clean Energy 2030 goals

- 1 **Refugee and host community households** have access to a minimum Tier 2 renewable electricity
- 2 **Refugee and host community households** have access to modern cooking fuel and technology
- 3 **Health and education facilities, latrines, public spaces, businesses, and street lighting** for refugee communities, and humanitarian facilities in refugee settlements, are powered by energy-efficient technologies and renewable energy
- 4 **Water supply for refugee settlements**, including boreholes, are powered by renewable energy
- 5 **Energy solutions support nearby host communities equitably**, and align with broader programmes to support host country national and local energy plans, or vice versa, so that refugee communities can be included in these plans

Different uses and supply of electricity across different tiers



Source: UNHCR; Differ (2019) Cheaper, Faster, Cleaner

limit quality and quantity of productive output in small industries (e.g., artisanal shops, local agriculture, machining/welding).

The current situation presents a significant gap compared to the bold ambitions of SDG7, the Global Plan of Action (GPA) for Sustainable Energy in Situations of Displacement, and UNHCR's Clean Energy Challenge. (See Section 2.) NORCAP supported development of the Clean Energy Challenge through the GPA Coordination Unit, and provided direct input through the Energy Action Group in the Global Refugee Forum. SDG7 defines the broader global energy ambition, which aims to "ensure access to affordable, reliable, sustainable, and modern energy for all" by 2030. Among other targets, the UNHCR Clean Energy Challenge further articulates this goal for refugees by mandating "refugee and host community households have access to a minimum Tier 2 renewable electricity" by 2030. (See Exhibit 2.)

5.2 Displaced Populations Critically Exposed

Africa disproportionately represents nearly one-third of the global displaced population, with over 25 million displaced persons. Five of the top ten displacement situations by country are on the continent, a legacy of multiple sustained conflicts.

"9 out of 10 of the largest neglected crises are in Africa."

– Jan Egeland, Secretary-General,
Norwegian Refugee Council (NRC)

Approximately 90% of these displaced populations lack sufficient access to energy, including the large majority lacking any access to electricity. These vulnerable persons require increased energy access for cooking, lighting, heating/cooling, education, and other basic needs.

Although half of the residents in refugee camps have some form of basic solar lighting, over one-third still rely on a combination of battery torches, firewood, and kerosene. Highly combustible firewood and kerosene fuels pose severe health and safety risks, through indoor air pollution and the risk of fire. It is estimated to take less than eight minutes for a corrugated tin shack to burn completely and fire control measures are limited (e.g., scarce availability of water for extinguishing fires).

Where other light and heat sources are not available, firewood collection has a further deforestation impact in surrounding areas and poses severe SGBV risks. For example, in Farchana refugee camp, Chad, 90% of confirmed rapes occurred when women left camps in search of firewood.

Humanitarian organisations face several challenges to provide energy to displaced persons. The displaced population is geographically dispersed. Only a minority of the total displaced population lives in camps, while the remainder resides in informal settlements, larger cities, host communities, or other isolated conditions. Not all camps are formal camps that have a permanent UN or NGO presence to assist the displaced persons. Informal camps lack a permanent UN/NGO presence and therefore have even more unaddressed needs. Delivering fuels to the camps is logistically difficult, being situated in remote locations. Other more critical needs of residents take priority (reflected in funding), such as food, shelter, and water, sanitation, and hygiene (WASH), although energy is a cross-sectional issue impacting the rest of the essential needs.

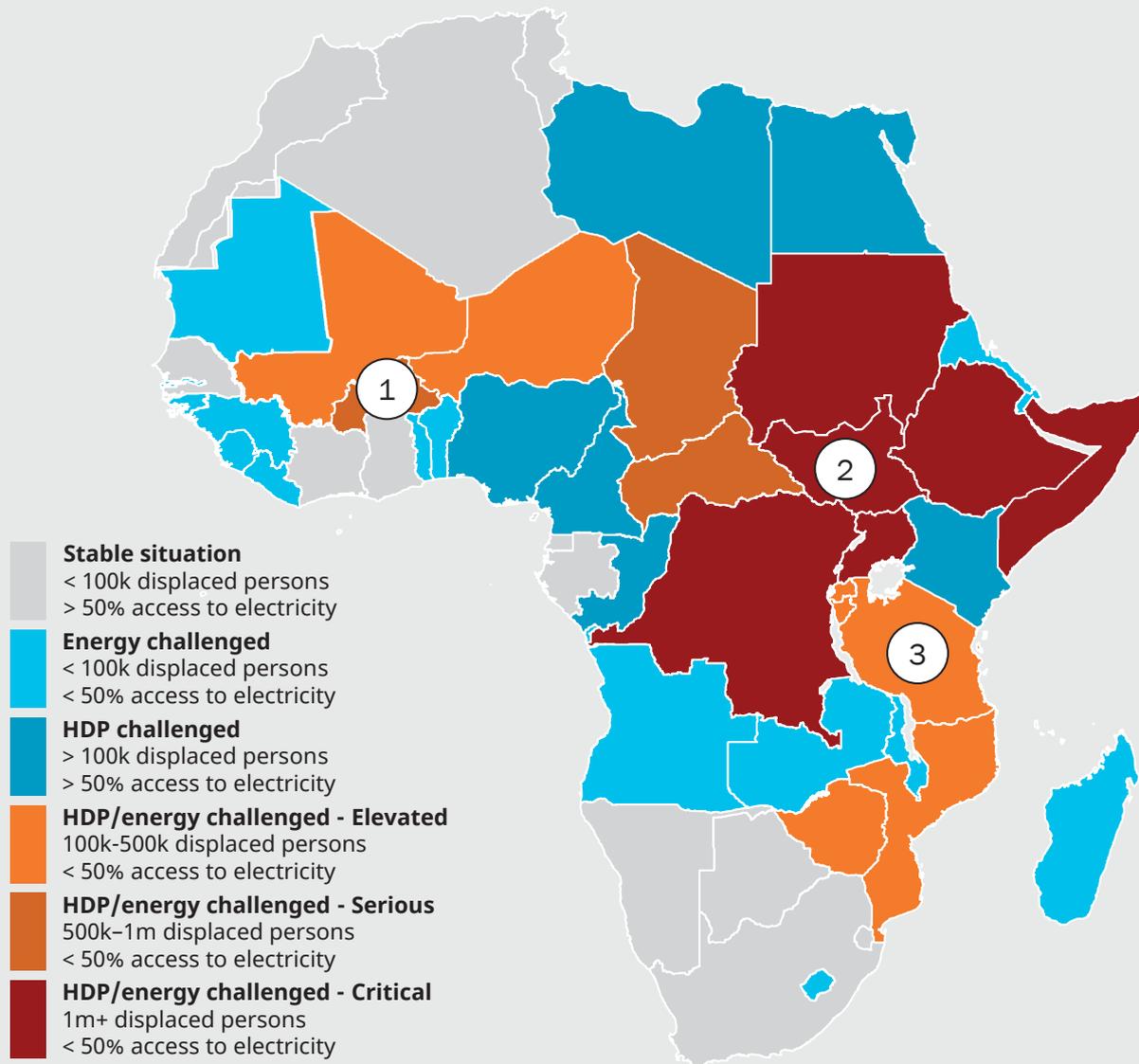
5.3 Sub-Saharan Africa is the Most Vulnerable Region

Sub-Saharan African countries face the most extreme humanitarian, development, and peace crises, as well as the most severe energy challenges. (See Exhibit 3.) Over 95% of Africa's IDPs and refugees reside in Sub-Saharan countries, of which over 22 million lack energy access. The situation is particularly amplified in Sudan, South Sudan, the Democratic Republic of the Congo, Somalia, Ethiopia, and Uganda, where each country hosts over 1 million persons of concern and less than 50% of the population has access to electricity.

In this region, three countries illustrate the variety of unique challenges faced in different contexts. More details on each country and each specific situational context for Burkina Faso, South Sudan, and Tanzania are covered in full page excerpts throughout the report.

While Sub-Saharan Africa presents the most severe case to address forced displacement crises as well as demand for energy access, the remaining majority of African countries would also benefit greatly from accelerated deployment of clean energy and are potentially good candidates for clean energy pilots. They face forced displacement challenges yet offer increased geopolitical and security stability. Even the more developed countries with better access to energy (e.g., South Africa, Egypt) host a large persons of concern population, due to refugees and asylum seekers endeavouring refuge within those countries' stable borders. However, these opportunities have not been further addressed in this report.

Exhibit 3 | Three African Countries Facing Humanitarian, Development, Peace, and Energy Challenges



1 Humanitarian
 Opportunity to assist a rapidly growing displaced population (850,000 June 2020), of which a significant proportion is housed by host communities



Burkina Faso

2 Peace
 Potential for clean energy to play a key role in peace-building and resolve continual conflict over the country's hydrocarbon resources



South Sudan

3 Development
 Potential to drive structural development for both host and displaced populations, which have been present in the country for nearly 80 years



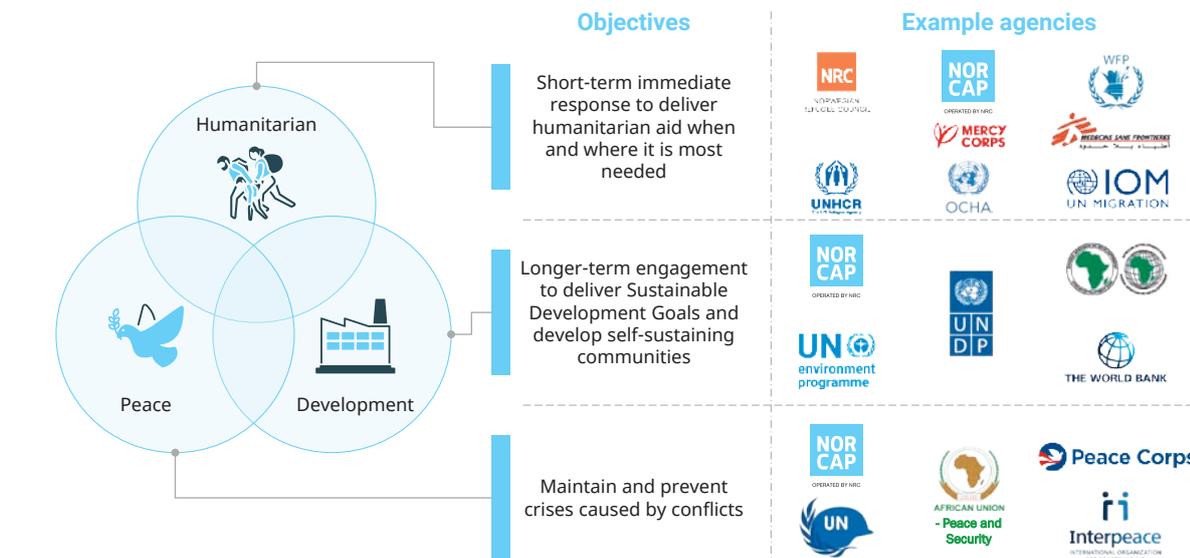
Tanzania

Note: Displaced persons include refugees under UNHCR's mandate and IDPs of concern to UNHCR

Source: UNHCR (2019), IEA (2018), European Commission, Worlddata.info, NORCAP-BCG analysis

The Humanitarian-Development-Peace Nexus

Exhibit 4 | Three Sectors of the Humanitarian-Development-Peace Nexus



Source: NORCAP-BCG analysis

The humanitarian-development-peace nexus (Triple Nexus) is a framework that envisions stronger collaboration and coordination among humanitarian, development, and peacebuilding actors towards jointly defining Collective Outcomes. (See Exhibit 4). Collective Outcomes (in contrast to output-oriented goals) are concrete and measurable results to be achieved over a period of three to five years in order to reduce people's acute and chronic needs, risks and vulnerabilities, and increase their resilience. This entails providing relief from immediate crises, addressing the underlying causes of structural poverty and inequality, as well as enhancing opportunities for peace.

Through interviews conducted with international organisations and NGOs, the following actions were identified to operationalise the humanitarian-development-peace nexus principles. (See Section 9.2).

- *Employ joint synergistic approaches across the three sectors to realise additional opportunities*

- *Deliver predictable, flexible, multi-year financing to decompartmentalise funds and ensure reallocation of finances where most needed*
- *Leverage the comparative advantage and capabilities of actors to use the most relevant expertise in specific areas*
- *Conduct local context analysis and mandate inclusive community participation to strengthen project decisions, avoid doing harm, and ensure inclusion of key stakeholders and target groups*

Section 5.4 'Triple Nexus Approach' illustrates the opportunity for the Triple Nexus to enable clean energy solutions to be deployed at scale. In turn, clean energy projects can contribute to implement the nexus framework and put theory into practice.

Section 8.2 'Call-to-Action for Stakeholder Groups' highlights actions needed for international organisations and NGOs to practically drive this forward.

5.4 Triple Nexus Has the Potential to Accelerate Clean Energy Deployment

A coordinated contribution between humanitarian, development, and peace actors is critical to enable successful deployment of clean energy solutions. At the same time, clean energy has the potential to operationalise the Triple Nexus approach.

To ensure meaningful impact, energy access solutions will need to be deployed at scale and for an extended duration of time. This requires a structural change

in the current disjointed approach to humanitarian, development, and peacebuilding interventions.

"Typically, in a country there are 200 to 300 international actors. If they invested together, everyone could save phenomenal sums."

– Jan Egeland, Secretary General, NRC

A Triple Nexus approach could unlock three key enablers:

- *Increased flexibility in fund allocation over time*

- *Improved utilisation of comparative capabilities*
- *De-risked projects through ground-level engagement*

“There is a real opportunity for clean energy to deliver HDP outcomes. From a nexus perspective, designing an intervention is not just about delivering clean energy to a hospital but about pairing up all the actors involved.”

– Katrina Pielli, Independent clean energy consultant, formerly USAID

5.4.1 INCREASED FLEXIBILITY IN FUND ALLOCATION

There is currently difficulty in shifting funds between different intervention activities, and contributions are often earmarked by donors for specific projects. Funds are often unable to be reallocated where they would best solve immediate humanitarian needs or root causes of conflict and other long-standing issues. Disconnected funds alone are not enough to tackle a larger pipeline of projects for a sustained period.

Clean energy solutions require increased flexibility in funding, as they are intrinsically long-term investments that require upfront capital. A greater pool of funds is needed to finance this initial capital, including through enabling reallocation to projects as needed. Predictability of funds over the time is also a prerequisite.

Development entities, such as multilateral development banks, could accelerate private sector contributions into the African market. Clean energy presents an appealing investment for many actors from the private sector, such as engineering firms, construction companies, and investment funds, and development actors have the professional networks and relationships to engage them.

5.4.2 IMPROVED UTILISATION OF COMPARATIVE CAPABILITIES

Professionals of international and national humanitarian, development, and peace organisations often hold an advantageous position, extensive experience, and local expertise to identify clean energy opportunities. Through collaboration between local, national, and international staff, these organisations provide a detailed understanding of the risks and advantages in each situation. (See Exhibit 5.) This entails systematically integrating local expertise and institutions (e.g., local authorities, local NGOs, and community-based organisations) both within those respective organisations and promoting capacity-building across local and national authorities.

Humanitarian actors are usually well positioned to understand local political, economic, and logistics challenges and solutions. Over time they often earn the trust of community leadership and build relationships with key local stakeholders, through

engagement and collaboration. Humanitarian organisations could accelerate implementation of projects through ground-level knowledge of individual contexts.

“You need local expertise from the three sectors working together, from the start.”

– Marc DuBois, Senior Fellow, SOAS, University of London

Development organisations provide long-term sustainability perspectives. They offer key inputs on future impact and opportunities for projects, including a view on project integration with national energy agendas, for example, national grid extensions. On the ground, they engage with national authorities following standardised approaches. In addition, development organisations share a common language with financial institutions and are best positioned to engage for financing.

“Financial institutions and humanitarian actors speak different languages. We need “translators” to advance the dialogue on financing—and development actors seem perfect for this role.”

– Eva Mach, Environmental Sustainability Programme Officer, International Organization for Migration (IOM)

Peacebuilding actors best understand national and regional conflict dynamics to shape project risk profiles. For example, conflict analysts offer their capacity towards defining contextual conflict risks of different projects.

“There is a tension between economies of scale to make a project cost-effective, and the risk of conflict it can generate in terms of its potential for being co-opted by belligerent parties.”

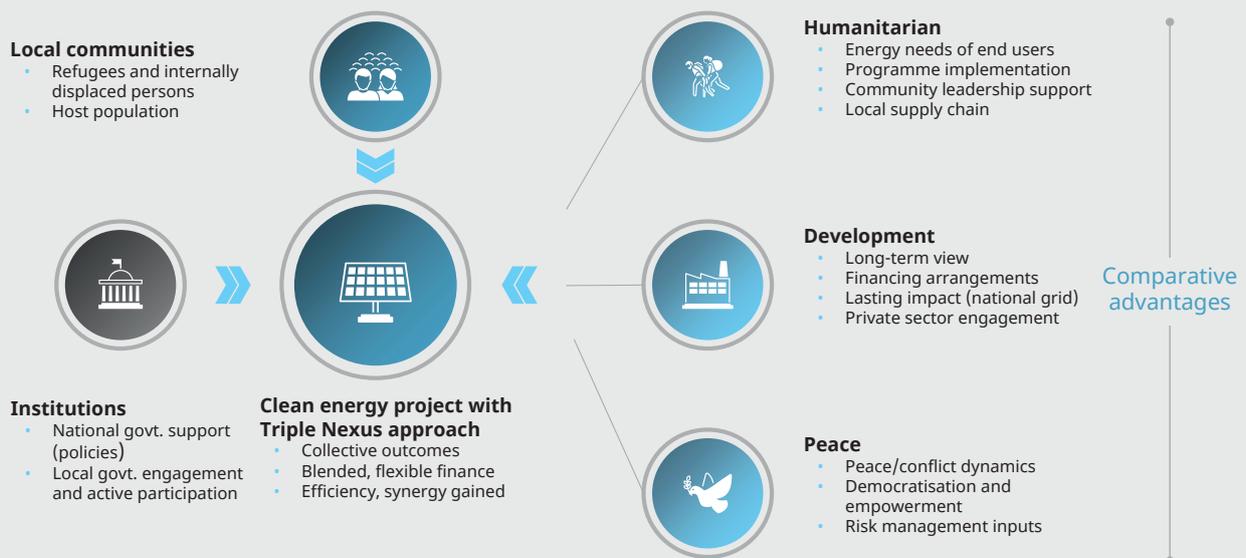
– Florence Foster, Representative for Peace and Disarmament, QUNO

5.4.3 DE-RISKED PROJECTS THROUGH GROUND-LEVEL ENGAGEMENT

Successful deployment of clean energy solutions at scale is dependent upon transparent collaboration between the different actors. Developing a fundamental understanding of each clean energy project’s risk, in every unique context, is reliant upon ground-level input from joint context analysis and local participation.

Joint context analysis. Clean energy projects can be individually de-risked through a truly in-depth understanding of each context. For example, knowing who the right stakeholders are and how to engage. Preliminary, detailed analysis from multiple HDP actors across multiple facets (e.g., power-conflict analysis, gender analysis) provides a critical assessment of the risks for each project.

Exhibit 5 | Clean Energy Projects Enabled Through HDP Comparative Advantages



Source: NORCAP-BCG analysis

PERSPECTIVES FROM THE FIELD

“The Triple Nexus is a powerful approach to articulate successful projects on the ground. A big part of my role here is to make sure that the voices from the three different elements of the nexus are well heard, as opposed to following a purely humanitarian approach or not integrating the peace component. While linking humanitarian and development seems easier, as was the case in Burkina Faso, what is sometimes missing is the complexity of the peace element. Working on peace requires addressing the longer-term perspective of identifying the root causes of conflicts and crises. Local expertise is key in identifying conflict dynamics.

I’m also proud to facilitate the understanding of the Triple Nexus approach among key stakeholders on the ground and contribute to linking the HDP sectors at project-level. There is a need to follow the bottom-up approach to adapt analysis and development tools to the given context, including the use of participatory, conflict and gender analysis.

Another important issue is around the differing working cultures and implementation cycles across the three sectors. It doesn’t require more money to get the best out of the Triple Nexus approach, we just have to change the mindset of how we work together across sectors. For instance, delivering water or energy projects creates a local mechanism of better distribution and synergies of the same existing resources.”

*Steve Ndikumwenayo, NORCAP Triple Nexus Coordination Officer
- Office of the UN Resident Coordinator in Burkina Faso*

Local participation. Clean energy projects would drive ground-level action to engage the right stakeholders and secure the buy-in of end users (including religious and civil leaders, and youth), regulators, national authorities, and other local stakeholders. For instance, Bright Products conducted product-oriented focus groups with communities to understand the impact of solar lanterns on end users.

“It is preferred to include local actors... in the [clean energy] programmes; in these countries they know which ‘keys to press’, especially when dealing with land access.”

- Pablo Izaguirre, Energy Consultant, MRC



Solar power has the potential to replace diesel generators, which could save costs and benefit the environment in many camps for refugees and internally displaced people across Africa. NORCAP expert inspecting a diesel generator.



Many schools struggle to deliver quality education due to lack of electricity access. Here is a teacher providing lessons to a pre-school class in Imvepi refugee settlement, Uganda.

6. Solution Could Be Rapid Deployment of Solar Developments

Securing energy access in Sub-Saharan Africa for the 22 million displaced persons lacking electricity, needs to be addressed through a combination of different technologies and solutions. This study primarily focused on electrification solutions to enable lighting and small devices toward improving livelihoods, and enabling access to improved, electrified services (e.g., street lighting, schools, clinics). Addressing these needs provides significant impact to both displaced and host communities.

Solar is advantaged over conventional energy sources, not only due to lower costs but also due to its flexibility to be deployed at different levels of scale. A scaled combination of different solar deployment solutions and complementary energy sources is needed to close the electricity access gap.

6.1 Solar Advantaged Over Conventional Energy Sources

Selected off-grid solar solutions provide multiple advantages over grid-based power, diesel generators, and other renewable electricity technologies to serve the displaced and host populations in Sub-Saharan Africa. The opportunity for solar growth is underlined by the region's lag in PV technology adoption. Sub-Saharan Africa (excluding South Africa) comprised less than 0.5% of total global solar capacity in 2019, despite having a near-unlimited resource of solar energy.

Solar could be up to 50% cheaper than diesel generators typically used in rural Africa. This advantage is amplified in contexts where the cost of diesel is high and the supply is unreliable (e.g., in South Sudan). Solar can also be up to four times cheaper per household than a grid-connected solution, however this is dependent upon a nation's regulations and tariff policies.

"We see an opportunity for governments to derive funds from grid extension to remote mini-grid projects."

– Luc Severi, Sustainable Energy for All (SEforALL)

New solar financing and business models enable access to areas beyond grid limits, often where displaced persons are located. Distributed Energy Solar Companies (DESCO) enable sale and distribution of portable SHS kits to remote areas. For example, SUNami services rural customers in Kenya and Uganda with solar packages on a lease-to-own model. Furthermore, in some contexts, innovative

financing takes the shape of improving the ability to pay for kilowatt-hours (kWh). Cash programming is increasingly entering in the realm of cash-for-energy, a concept aimed at reducing some of the barriers to private sector participation.

"The key action is to acknowledge beneficiaries' energy needs, which they fulfil either by purchasing energy (through cash or vouchers), or adopting negative practices which could be harmful to the environment (e.g., cutting down trees)."

– Mariano Gomez, Cash Programming Expert, NORCAP

Other renewable technologies are often more location-dependent compared to solar. Wind requires a suitable supply chain with logistics access for manufacture, transport, and installation of large equipment. Hydro and geothermal technologies require suitable in-ground formations and water sources, respectively. Displaced populations are often located in rural sites with poor logistic connections and lack the geological features required for hydro and geothermal solutions.

However, solar technologies are also not without their own unique challenges. Solar power is reliant on the availability of solar irradiation during the day. Inclement weather (e.g., heavy cloud cover) can effectively cut power generation. Battery storage or a backup source of electricity are required to enable power outside of daylight hours, for example to enable lighting or 24/7 applications like refrigerators. Battery storage is not cheap, potentially doubling total installation cost versus a PV-only system.

6.2 Ongoing Solar Initiatives

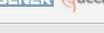
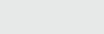
There are several solar initiatives in the humanitarian and development sectors. (See Section 9.3.) However, these initiatives remain largely dedicated to development efforts and Sub-Saharan Africa is not comprehensively covered by the limited set identified.

"Although we strive to address vulnerable people, our programme targets the overall population and does not have a dedicated focus on humanitarian efforts. We may only provide support to the humanitarian sector if member states request it."

– Program Officer, African multilateral organisation

Interviews with multiple experts have indicated that there is little focus, so far, in delivering clean electricity to displaced persons in refugee settings.

Exhibit 6 | Different Solar Deployment Solutions Characterised by Scale and Impact

	Deployment solutions	Investment	People impact	Typical solution	Example with stakeholders
1	Greened humanitarian operation Replace traditional fossil-based generators with solar mini-grids	\$1m to \$2m	10k indirect impact for displaced persons from improved NGO services	500 kW-1 MW solar mini-grid with battery storage and diesel generator backup	 Malakal PoC camp 700 kW solar mini-grid  
2	Shared service extension Build out capacity and grid to shared services (e.g., hospitals, schools, communal kitchens)	\$2m to \$10m	20k displaced and host persons with clean energy access enabled	1 MW-3 MW solar mini-grid with battery storage and selected grid extensions into camp and host central services	 Nuru mini-grid extension to street lighting 
3	Distributed energy access Provide mix of distributed solar systems for households and services	\$5m to \$20m	1k to 100k+ displaced and host persons with clean energy access enabled via scalable deployment	Mix of Tier 1 and Tier 2 distributed SHS kits for households and larger systems for central services	 Kakuma refugee camp (trial as of 2019)   moving energy initiative
4	Mini-grid energy access Scale up capacity and reach of mini-grid for households, services, and industry	\$10m to \$50m	100k displaced and host persons with clean energy access enabled	3 MW-10+ MW solar mini-grid with grid extensions into camp/town households potentially linked into national grid	 Za'atari refugee camp 13 MW solar mini-grid  
5	Large-scale energy access National energy project to increase access across larger portions of national population	\$50m+	Not in scope for this report 1,000,000+ host persons with clean energy access enabled	50 MW-200 MW solar farm tied into national grid for public access	 Kathu solar park 100 MW solar farm    

Source: NORCAP-BCG analysis

Current efforts are primarily focused on greening humanitarian operations, which present a lower risk and more attractive point of entry for the private sector.

“We have never had targeted donor resources and programmes for humanitarian interventions, except for specific projects. However, I recognise that refugees and IDPs should be acknowledged.”

– Energy Specialist, International organisation

Donors and funding partners have recently started to develop de-risking mechanisms. With a focus on greening operations, SIDA launched its SEK 40 million Green Fund supporting UNHCR’s efforts to establish agreements with third-party suppliers for their institutional electricity.

6.3 Solar Deployment Solutions

A set of different solar deployment solutions are needed to address the energy needs for the approximately 22 million displaced persons in Sub-Saharan Africa who lack electricity access. Different solutions with different capacities and technologies are crucial to cater for the diverse settings that refugees and IDPs reside in.

For instance, energy consumption in IDP and refugee camps is highly varied and somewhat dependent upon the camp size. Larger camps with tens of thousands of residents are more likely to have higher electricity needs due to more health centres and education centres than smaller settlements. Similarly, newer

settlements are less likely to have these facilities and place a higher priority on more fundamental needs (i.e., food, shelter, WASH).

Through assessment of existing and potential solar projects in humanitarian, development, and conflict contexts, four solar deployment solutions were identified. (See Exhibit 6.)

1. *Greened humanitarian operation*
2. *Shared service extension*
3. *Distributed energy access*
4. *Mini-grid energy access*

For this report, ‘greened humanitarian operation’ encompasses international organisations, including the UN and NGOs with a humanitarian mandate.

A fifth deployment solution, large-scale energy access, was identified from utility-scale solar projects. This deployment solution was not evaluated in detail for this study, due to a required grid connection often not available in rural settings, and escalated risks in humanitarian, development, and conflict contexts that negatively impact the viability of such projects.

Deployment of solar could deliver humanitarian, development, peace, and evident environmental impacts for host and displaced communities, as well as improving quality and sustainability of UN and NGO operations. (See Exhibit 7.) Impact generally scales in parallel with the size of the solution as the electricity access is provided to a wider population for a wider set of uses.

Malakal, South Sudan Case Study: Replacing diesel generators with solar + batteries



Background

LOCATION

PoC camp in Upper Nile
30,000 IDPs
300 humanitarian workers



INVOLVED ORGANISATIONS

Customer: International Organization for Migration (IOM)
Developer/operator: Scatec Solar & Kube Energy
Financing: Scatec Solar (equipment)
UK DFID (initial hardware & installation)



ISSUES

- High diesel costs of about \$1m annually for diesel generator operation
- Unstable fuel supply due to the remoteness of the camp
- Local noise and air pollution from diesel generators running 24/7



SOLUTION

- 700 kWp solar plus 1,368 kWh battery energy storage system
- Existing diesel generators retained as backup for 10% energy supply
- UK DFID funded the initial hardware and installation cost



IMPACT

- Annual savings of \$300k from 80% to 90% reduced diesel consumption
- Yearly reduction of 800 tonnes CO₂
- Reduced noise pollution
- Increased uptime from reduced reliance upon tenuous diesel supply chain

Challenges

UNSUPPORTIVE BUDGET PRACTICE
One-year budget cycles not supporting capital investments or committing to long-term agreements

LIMITED EXPERTISE
Limited on-the-ground PV operational and maintenance expertise

LIMITED TRANSPORTATION
Significant logistical challenges including air and barge being the only means of transportation

COMMUNITY MISPERCEPTION
IDPs in camp distrustful of excavation activities during construction phase

Mitigating actions

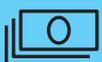
BREAK CLAUSES
Contract includes a break clause, allowing the camp operators to 'walk away' in the event of a funding shortfall, in exchange for an elevated lease fee

ENERGY-AS-A-SERVICE
Kube/Scatec Solar providing operational capabilities through energy-as-a-service agreement

DIRECT COMMUNICATION
Established direct communication with UN logistical cluster to coordinate transportation needs

LOCAL COMMUNITY ENGAGEMENT
Retroactively engaged IDP community to allay concerns

Lessons learnt



Tailor suitable financing mechanisms and business models to balance risks between different stakeholders (e.g., energy-as-a-service, break clauses, and guarantee facilities)



Leverage clean energy company and investor expertise to optimise the project delivery and the operational performance of the deployed system (e.g., maintenance capabilities, technical expertise, and financing capabilities)



Build ground-level partnerships across multiple stakeholders to facilitate logistics, and integrate and secure buy-in for the solution with the local community

Source: IOM; Press releases; Expert interviews

Exhibit 7 | HDP and Environmental Impact Across Each Deployment Solution

	 Humanitarian impact	 Development impact	 Peace impact ²	 Environmental impact
 Greened humanitarian operation	<ul style="list-style-type: none"> Improved service delivery and use of funds by HDP actors 	<ul style="list-style-type: none"> 20% to 30% reduced costs vs. conventional diesel generators Local talent and capability development 	<ul style="list-style-type: none"> Reduced flow of UN/NGO funds to lead conflict actors, through corruption channels 	<ul style="list-style-type: none"> Reduced UN/NGO CO₂ footprint through reduced use of hydrocarbon-based fuels
 Shared service extension	<ul style="list-style-type: none"> Access to electricity for central community services 	<ul style="list-style-type: none"> Improved energy access for community services (e.g., clinics and hospitals) Local talent and capability development 	<ul style="list-style-type: none"> Further reduced flow of UN/NGO funds to lead conflict actors 	<ul style="list-style-type: none"> Reduced CO₂ footprint of shared services through reduced use of hydrocarbon-based fuels
 Distributed energy access	<ul style="list-style-type: none"> Access to Tier 1 and Tier 2 clean electricity for displaced and host community households Reduction in air pollution-related incidents 	<ul style="list-style-type: none"> Improved energy access for small industry in displaced and host communities Local talent and capability development 	<ul style="list-style-type: none"> Reduced tensions where services are equally accessible to displaced and host communities 	<ul style="list-style-type: none"> Reduced CO₂ footprint from reduced use of hydrocarbon-fuelled lighting
 Mini-grid energy access	<ul style="list-style-type: none"> Access to Tier 3+ clean electricity for displaced and host community households Reduction in air pollution-related incidents Reduced exposure to SGBV¹ 	<ul style="list-style-type: none"> Sustainable economic development through improved energy access for larger local industries Local talent and capability development 	<ul style="list-style-type: none"> Reduced tensions between displaced and host persons Increased regional stability through reduced conflict over scarce hydrocarbon resources 	<ul style="list-style-type: none"> Reduced CO₂ footprint of refugees and host communities

1. Sexual and gender-based violence 2. Contextually dependent

Source: NORCAP-BCG analysis

6.3.1 GREENED HUMANITARIAN OPERATION

Improved service delivery and use of funds by humanitarian actors. Transitioning diesel generators to solar would indirectly enable improved delivery of humanitarian services to the displaced populations in camps (e.g., consistent delivery of humanitarian aid through increased reliability of power supply). Reduced operating costs would also enable further funding to be diverted where most needed for the camp population.

20% to 30% reduced operating costs versus conventional diesel generators. Nearly \$200 million could be saved annually for humanitarian organisations alone by reducing the costs of fuel and maintenance (estimated \$620 million spent globally on polluting fuel in 2017). This is especially applicable in South Sudan, where the cost of black-market diesel is exorbitantly high and subject to hyperinflation.

“At times humanitarian actors have been inadvertently funding the war economy through purchases of black-market diesel.”

– David Mozersky, President, Energy Peace Partners

Local talent and capability management. A ‘greened humanitarian operation’ enables education and upskilling of both host and displaced community individuals to maintain and operate the solar asset. In Azraq, Jordan, a joint effort between NRC and iPlatform offers courses in solar panel installation to Syrian refugees.

Reduced flow of UN/NGO funds to lead conflict

actors through corrupt procurement channels.

In South Sudan, the diesel supply chain is largely controlled by conflict actors, yet the only option for humanitarians is to purchase from the black market.

Reduced UN/NGO CO₂ footprint through reduced use of hydrocarbon-based fuels. The average carbon intensity of generator-produced electricity in UN compounds is over 1.6 times China’s and over 1.4 times India’s national carbon intensities of the power sector (1,040g CO₂ per kWh vs. 613g CO₂ per kWh and 709g CO₂ per kWh, respectively as reported by IEA in 2018).

6.3.2 SHARED SERVICE EXTENSION

Access to electricity for central community services in both host and displaced communities.

Larger shared services such as education, community cooking facilities, and lighting provide increased quality-of-life benefits for residents. For example, in Goma, Democratic Republic of the Congo (DRC), the sale of Peace Renewable Energy Credits (P-RECs) from Nuru’s 1.3 MW solar hybrid mini-grid will fund the purchase and installation of public street lighting, as well as improve safety and security and provide extended business hours in the Ndosho neighbourhood. In the Nyagurusu camp, Tanzania, a solar mini-grid is in planning to provide electricity to the camp schools and hospitals, in addition to powering the UN and NGO operations.

Local talent and capability development. Like the development impact for a ‘greened humanitarian operation’ solution, but on an increased scale as skills and capabilities will also be needed to maintain a wider grid connecting shared services.

PERSPECTIVES FROM THE FIELD

"I was deployed to NRC South Sudan with the goal to help them transition to greener operations. A first phase of solarising it, and a second phase aimed at the electrification on the pool of vehicles. After some months of work, we managed to identify and design nearly 300 kW to be sourced from PV Panels in the facilities.

A regular tendering process followed, and we received eight bids. None of them were price competitive enough, and the process is in a halt. The difficulties of the supply chain to the country are key in understanding the somehow high cost bidders are consistently offering.

Many solar companies are interested primarily in larger PV system installations (i.e., above 100 kW). In the case of NRC, six of eight of the systems were stand-alone systems below 100 kW. Smaller systems are more expensive on a kWh basis because of higher unit costs, remote site logistics, and specialised installation requirements. For this reason, a different business case is required for systems below 100 kW."

Mark Hankins, NORCAP Energy Expert deployed to NRC South Sudan

Reduced CO₂ footprint of shared services through reduced use of hydrocarbon-based fuels. Most of the CO₂ emissions from lighting and running diesel generators currently used to operate shared services (e.g., in hospitals and clinics) could be reduced through solar.

6.3.3 DISTRIBUTED ENERGY ACCESS

Access to Tier 1 and Tier 2 clean electricity for displaced and host community households.

Such access enables improved quality of life within households, including lighting and the ability to charge and power small devices (e.g., mobile phones), radios/TVs, and fans. It also enables improved safety by avoiding the use of highly-combustible hydrocarbon fuels (e.g., in kerosene lamps).

Reduction in air pollution-related incidents.

Household air pollution is estimated to cause over 600,000 premature deaths per year in Africa. In Ghana and Kenya, studies found an estimated 50% reduction in indoor smoke by switching to solar PV lighting.

Improved energy access for small industry in displaced and host communities.

GOGLA research indicated a high revenue increase and new business opportunities for host community adopters of distributed energy. Within the first three months of solar ownership, more than one-third of customers increased their monthly income by more than half the average monthly GDP per capita average for Kenya, Mozambique, Rwanda, Tanzania, and Uganda.

Local talent and capability development. Training of additional field agents fluent in end user languages is required for sale and distribution of the solar home kits. A distributed SHS project in Rwanda employed nearly 50 locals as sales agents. Further development and training would be required for maintenance of equipment both in the field and in maintenance hubs.

"If communities adopt a new solution and it fails, they will not come back to it. Therefore, designing a community-based maintenance network is imperative."

– Philippe Georges Jacques, Directorate-General for International Cooperation and Development

There are potentially broader educational-related benefits for host and displaced communities. For example, increased lighting in homes via SHS kits enables longer study hours without daylight.

Reduced tensions, where services are equally accessible to displaced and host communities.

Distributed solar solutions would reduce the dependence on shared biomass resources for both displaced and host persons for lighting.

Reduced CO₂ footprint from reduced use of hydrocarbon-fuelled lighting.

If every electricity-deprived, displaced household in Sub-Saharan Africa switched out just one kerosene light for a solar light, nearly 4 million metric tons of CO₂ equivalent would be avoided. This is equivalent to the carbon sequestered by planting over 60 million trees and allowing them to grow for 10 years.¹

6.3.4 MINI-GRID ENERGY ACCESS

Access to Tier 3+ clean electricity for displaced and host community households.

One of the advantages mini-grids have over distributed solutions is the ability to power larger appliances. In addition to the Tier 1 and 2 quality-of-life benefits for 'distributed energy access', households can power larger appliances. For example, in Za'atari camp, Jordan, 35% of households use their electricity for refrigerators, enabling storage of medication, and specifically insulin.

Reduction in air pollution-caused health incidents.

Similar effects realised as in 'distributed energy access', yet on an even greater scale. In a 'mini-grid

energy access' deployment solution, all displaced households would have access to lighting, whereas in the 'distributed energy access' model only those who have the SHS kit have access.

"It's very important that medicines are preserved safely as you can only get them for chronic illnesses once per month, and we have to keep it the whole time in a cool place—like the fridge."

– Qaseem, Syrian refugee, Za'atari camp, Jordan²

Reduced exposure to SGBV. Adopting solar solutions would reduce the need for firewood collection over long distances, multiple times per month. There are high risks of SGBV for women and children who make the journey to collect firewood over long distances and multiple trips per month. A study found that 30% to 40% of households reported incidents of violence, rape, or attempted rape during firewood collection across refugee camps in Uganda, Ethiopia, and Chad.

Sustainable economic development through improved energy access for larger local industries.

For example, the local economy is thriving in the Azraq refugee camp in Jordan, stimulated through two supermarket chains and four community markets. The solar mini-grid powers the community markets, each consisting of about 100 individual stores operated by camp residents.

"These longer-lasting, clean energy assets could support future reconstruction and health, education, and social service delivery, and would carry the additional benefit of being in place and, likely, of having been paid for."

– David Mozersky, President, Energy Peace Partners

Local talent and capability development. Greater scale of impacts as seen in 'greened humanitarian operation' and 'shared service extension' deployment solutions. Capabilities must be developed to maintain a much larger solar plant and the larger mini-grid extending throughout the camp.

"We create employment for the refugees in the camps to operate and maintain tasks in the solar plants."

– Yazan Abdullah, Electrical Engineer, UNHCR Jordan

A larger mini-grid would also ensure much-needed electricity access in education. For example, the mini-grid powering the Za'atari camp in Jordan provides power to over 30 schools supporting 21,000 children.

Reduced tensions between host and displaced communities. Solar-powered sources have the potential to reduce conflict between host and displaced populations by eliminating or reducing the need for burning scarce biomass resources. In Tanzania, there are frequently high tensions over

refugees walking through host community farms, leading to stolen crops and damaged land. There were direct clashes between locals and DRC and South Sudanese refugees in the north and west of Uganda over millions of trees cut down for firewood and construction.

Increased regional stability through reduced conflict over scarce hydrocarbon resources.

Solar solutions could enable longer-term regional development after a refugee camp has been decommissioned. It could also reduce local conflicts as hydrocarbon resources are a central conflict driver and source of power across the region. In South Sudan, reduced use of and payment for diesel directly reduces the funds that inevitably flow to conflict actors.

However, it remains important to consider the context of conflict risks. There remains an underlying risk that new energy sources could act as conflict drivers, especially where there is no "rule of law" to maintain peace.

"Although the availability of renewable energy can be a driver of conflict in the short-term, it has a critical role to play as a peace builder in the long run."

– Miklos Gosztonyi, Conflict Analyst, NRC

Reduced CO₂ footprint of refugees and host communities.

Similar effects as in shared service extension, but with a much broader scale of impact. For example, the Za'atari and Azraq camps in Jordan are estimated to have reduced CO₂ emissions by 20,000 metric ton/year combined, equivalent to over 40,000 barrels of oil.

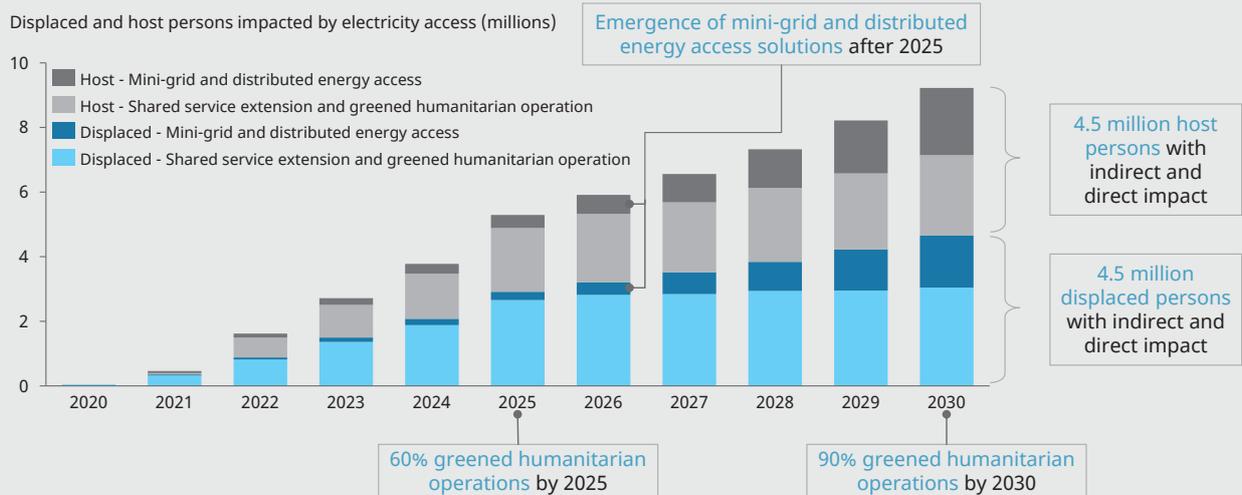
6.4 Solar Deployment Scenario Towards 2030

As part of this study, a deployment scenario was developed to estimate the potential impact. Out of the 22 million displaced persons lacking electricity, the deployment scenario focuses on delivering energy access for approximately 8 million living in camps or camp-like settings, as they offer the best opportunities for a limited set of clean energy solutions to have the greatest impact.

Camps have larger populations and higher population densities than informal settlements and other out-of-camp accommodations. Even distributed SHS kits require some population density to be feasible. Additionally, displaced populations outside of camps are more transient and inherently difficult to address with relatively immobile solar solutions.

There is also further opportunity to impact up to another 16 million host persons living within 20km of

Exhibit 8 | Nine Million Displaced and Host Persons Could Benefit from Solar Solutions in 2030



Note: Impact defined as both direct (having energy access) and indirect (e.g., access through shared services or better service provision from other electrified parties)
Source: UNHCR; IEA; Zero; Ovum; Interviews; BCG-NORCAP analysis

these camps based on geospatial data, of which less than 40% have access to electricity.

Out of these 24 million displaced and host persons, an accelerated solar deployment could directly and indirectly impact over 9 million in 2030. (See Exhibit 8.) The electricity access benefits are equally split between displaced and host populations. The majority from each of the displaced and host populations would receive indirect benefits, from access to improved shared facilities (e.g., powered lighting, schools, and hospitals), as well as improved services from UN and NGO humanitarian operations.

Approximately \$500 million to \$600 million in capital investments is required across the next decade to realise the deployment scenario, roughly \$50 million to \$60 million per year. This annual sum represents less than 1% of the total reported \$8.7 billion in humanitarian funding for Sub-Saharan Africa in 2019. The deployment scenario accounts for further solar cost reductions, due to the current immaturity of the PV supply chain in Africa and likely global cost reduction trends in key PV components, such as panels, inverters, and batteries.

The deployment scenario is but one of several possible outcomes and is dependent upon several factors, including deployment rates, population per camp, and number/types of camps. Furthermore, the addressable population of displaced persons in Sub-Saharan Africa could grow towards 2030, requiring further acceleration of solution deployment to minimise the total number of displaced persons without electricity access.

Greened humanitarian operation. ‘Greened humanitarian operation’ offers the lowest barriers to start deploying solar solutions on the ground. Off-take is more secure through anchor UN and/or NGO clients, the operating costs are lower with payback within four to five years, and there is reduced dependence on unreliable diesel supply chains.

“The “Greening the Orange” initiative (in reference to NRC corporate colour) is an ambitious project aiming at making NRC, the communities we serve, and the wider humanitarian sector, carbon neutral. Energy and emissions will be an important component of it.”

– Torill Sæterøy, Project Manager, Greening the Orange, NRC

The deployment scenario assumes transitioning approximately 60% of energy supply in UN/NGO camp operations from diesel generators to solar within five years (including 100% of new builds) and reaching 90% penetration by 2030. Greening multiple humanitarian operations could enable proof of initial concepts, financing mechanisms, and business models to take to scale in other deployment solutions.

Shared service extension. Extending ‘greened humanitarian operations’ to ‘shared service extension’ models could be the next logical step. This extension could reach into nearby communities (e.g., powering the town hospital, electrifying schools) and thereby enable electrified shared services for host populations. A ‘shared service extension’ would be more efficient to deploy in a single effort, if the additional demand from powering new services is small in comparison to a ‘greened humanitarian operation’ solution.

Distributed energy access. Distributed solutions of SHS kits could incrementally scale unit-by-unit within camps, and geographically across different regions. Within specific camps, initial pilots for host and displaced populations have been highly successful. For example, there was a household penetration of 20% to 25% within seven months across three camps for a pilot in Rwanda.

Geographical scaling is reliant upon continually expanding sales campaigns to new camps. It is expected that 'distributed energy access' projects are slightly advantaged to be implemented in formal camps due to greater UN and NGO support, and easier access for logistics.

The impacts for the host community are wider than the three other deployment solutions, given that the flexible distribution model is neither tied to any grid, nor to any centralised, shared services. The deployment scenario assumes distribution access to the wider host population within 20km, that is, roughly double that of the camp's displaced population.

Mini-grid energy access. In the deployment scenario, higher-impact, larger mini-grid projects will only emerge after three years in 2023, due to an increased complexity of financing and longer development periods than smaller deployment solutions. For reference, the 12.9 MW Za'atari solar mini-grid in Jordan took approximately four years from planning to delivering electricity. Host population impact is only expected for immediately adjacent host communities

(i.e., within 5km), under the assumption that further grid extensions across longer distances would be uneconomical.

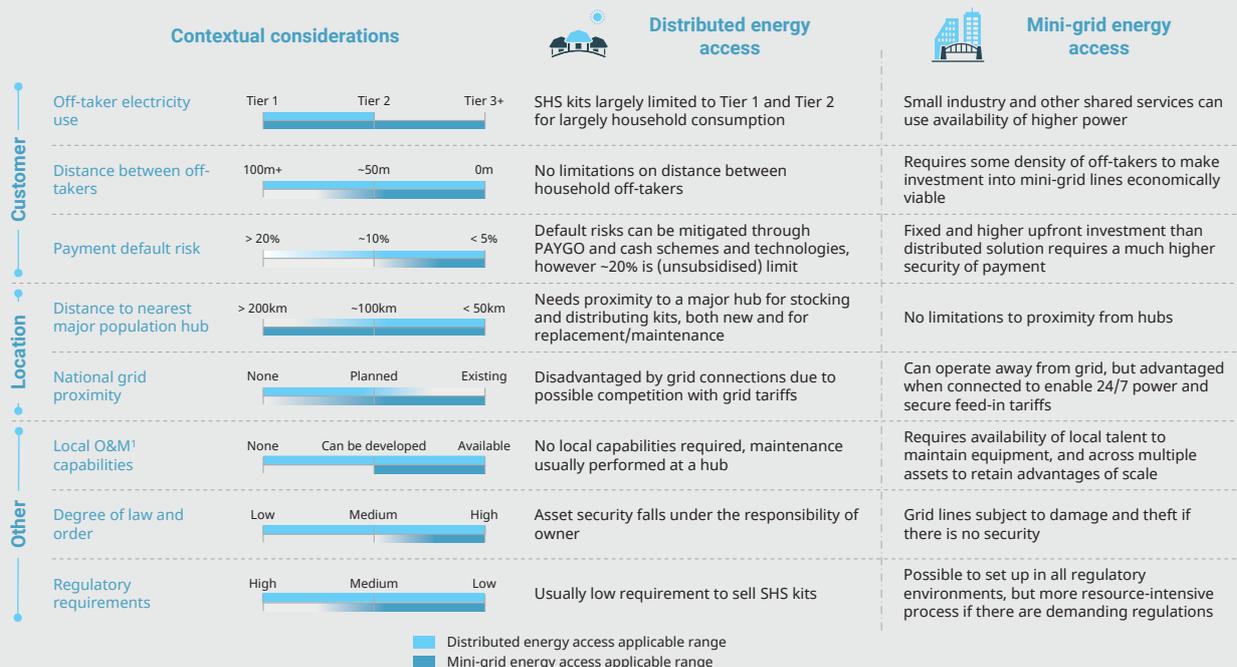
'Mini-grid energy access' solutions may organically evolve from existing 'shared service extension' or 'greened humanitarian operation' deployment solutions, due to the scalability and modularisation of solar mini-grids. (See 'shared service extension' above.) The deployment scenario reflects this pivot from 2026 onwards where the growth of 'shared service extension' and 'greened humanitarian operations' stagnates as 'mini-grid energy access' solutions grow.

6.5 Local Context Determines Relevant Deployment Solution

Achieving direct impact for the nearly 4 million displaced and host populations in the deployment scenario largely relies upon a mix of both distributed and mini-grid energy access solutions. 'Distributed energy access' solutions are suited for a broader range of contexts. (See Exhibit 9.) The low density of off-takers, and lack of a grid infrastructure for vandals to target, make it ideally suited for rural, unstable areas. Required proximity to a centralised hub remains crucial for quick and cost-effective turnaround of distribution and maintenance.

'Mini-grid energy access' solutions are required where there are higher-power needs of end users. For

Exhibit 9 | Distributed Solution Suited for Wider Range of Contexts Than Mini-Grid



1. Operations and maintenance
Note: Contextual considerations in no order of importance
Source: GSMA; Interviews; NORCAP-BCG analysis

example, refugee households in Azraq and Za'atari use the elevated power for refrigerators, otherwise unable to be supplied by smaller SHS kits.

"I think the number one challenge for us as agents is the availability of equipment in the camp. Once a customer needs a replacement piece, it can take weeks or months to bring from the HQ to Kakuma."

– PAYGO solar agent, Somali refugee working since 2016 in Kakuma refugee camp³

A national grid connection can be both advantageous and disadvantageous for 'mini-grid energy access' solutions. Grid connections eliminate the cost and need of batteries and dependence upon daylight hours. The connection also provides the ability to take advantage of feed-in tariffs when mini-grid output is higher than needed, by selling electricity to the national utility. However, low feed-in tariffs and low compensation for any planned grid arrival may also make the business case for a 'mini-grid energy access' solution uneconomical.

Notes

1. Calculation is an estimate and based on GOGLA Impact Metrics
2. UNHCR. (2018). Jordan – Impacts Of Electricity: Participatory impact assessment of electricity access in Za'atari and Azraq camps
3. GSMA. (2019). Mobile-enabled energy for humanitarian contexts

NORCAP expert Isaac Mwathi, deployed to IOM, discussing how solar power could offer a source of income for vulnerable people.



Solar-diesel hybrid system in Nyarugusu refugee camp, where NORCAP is working together with UNHCR.



 **Nyarugusu Refugee Camp**
Safe drinking water supply 

In partnership with the United Nations High Commissioner for Refugees and the Government of Tanzania

**BOREHOLE 2
NYARUGUSU
SAFE WATER
PROJECT
POWER SYSTEM**

Funded by
Paul Due Jensen foundation
(Grundfos Foundation)

Implemented by
Water Mission Tanzania

 Paul Due Jensen Foundation

 watermission TANZANIA

Solar / diesel hybrid
Commissioned
October 2019

7. Long-Standing Challenges Must Be Mitigated

7.1 Five Long-Standing Challenges for Solar Energy Deployment

To accelerate the deployment of solar energy and provide direct or indirect access to displaced and host persons, five long-standing challenges for solar deployment solutions must be mitigated and addressed. (See Exhibit 10.) These were the most frequently identified risks in humanitarian, development and conflict contexts, identified by the study's interviewees. Each challenge is nuanced between the different deployment solutions, however the five main challenges remain commonly shared.

"If only they [UN agencies/institutional donors] would have accepted that there will be an upfront cost, that they will be earning back, and had provided the funding mechanisms, we could all be shifting [to solar energy sources] within a year."

– Alexander Davey, South Sudan Country Director, NRC

7.1.1 HIGH CAPITAL AND MULTI-YEAR PAYBACK PERIOD OF SOLAR ENERGY INVESTMENTS

High upfront capital required for solar energy investments is significantly greater than conventional energy sources. The additional upfront investment required for solar energy compared to conventional sources is hindering the deployment, despite the long-term savings the projects provide. For example, purchasing a mini-

grid and battery storage in a greened humanitarian operation requires an investment potentially four to five times greater than an equivalent diesel generator solution.

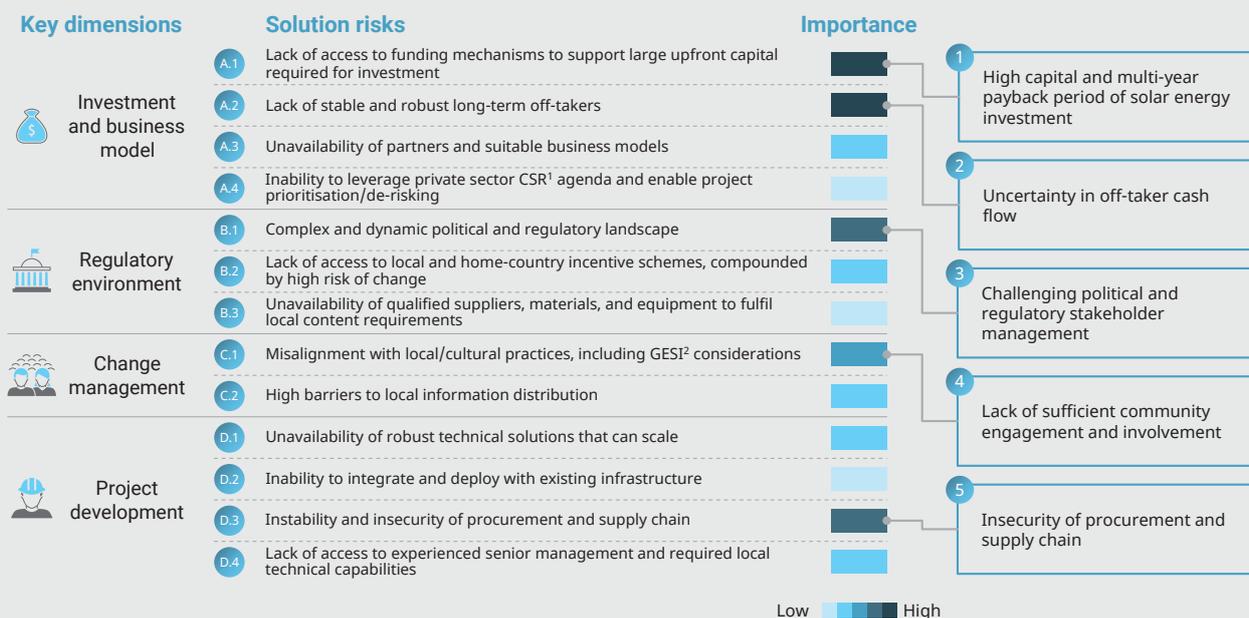
Difficulty in securing multi-year commitment towards solar energy investments due to short-cycle budgets. UN agencies and NGOs lack the internal financing mechanisms, policies, and procurement practices to acquire or commit to solar energy solutions across multiple years. Examples of limiting factors include one-year budgets, lack of predictability of long-term funding, and limited capital investment budgets. Furthermore, it is difficult to reallocate funding from different activities and projects. Funds are often restricted to specific projects and plans over fixed periods. (See Section 5.4.1.)

"The internal policies and rules have not allowed them to acquire clean energy assets because diesel generators can be purchased in a one-year cycle and they have recurring costs that can be budgeted annually, while a mini-grid replacement would be a long-time asset that they simply cannot purchase."

– Aaron Leopold, CEO, Africa Minigrad Developers Association

Financing not available at the required scale and through suitable mechanisms. There is not enough financing available to support investments in solar energy, and the facilities through which funds are

Exhibit 10 | Five Long-Standing Challenges Hindering Solar Solution Deployment



1. Corporate Social Responsibility 2. Gender Equality and Social Inclusion
Source: Interviews; NORCAP-BCG analysis

available, such as guarantees, are often limited to larger-scale projects or not available through the appropriate mechanisms. For example, access to credit facilities does not necessarily provide the de-risking needed to make a project commercially viable.

“The issue of the lack of guarantees and suitable financing mechanisms is well known. It has been requested over several years, across both the humanitarian sector and the private sector involved in developing renewable energy.”

– Endre Ottesen, Senior Adviser, NORAD

Even local DESCOs struggle to raise enough finances to enable deployment of ‘Distributed energy access solutions’, due to their lack of credit-worthiness. Western companies are not willing to invest, therefore DESCO solutions remain reliant upon local distributors.

“Small companies do not have financing and no-one is willing to offer them access to financing.”

– Pablo Izaguirre, Energy consultant, MRC

7.1.2 UNCERTAINTY IN OFF-TAKER CASH FLOW
Uncertainty around IO/NGO off-takers and their ability to commit to long-term contracts. NGOs are either not able to, or not willing to, commit to multi-year contracts or provide central guarantees due to internal rules, unpredictable funding, and the uncertainty in the longevity of the humanitarian operations. Although these operations can be expected to be long-lived, there is never a specific timeline set in stone due to the instability of the situations and changes in the government policies. Consequently, break clauses were included in contracts to offload the risk to third party suppliers and investors, creating uncertainty around the off-take of the energy production. This risk is most applicable for the greened humanitarian operation and shared service extension deployment solutions, where the IO/NGO is expected to remain as the primary off-taker.

“We had to include a break clause in the contract so it could work for the UN. It gives IOM the option to pull out of the contract if they can document a funding shortfall that forces them to scale down local operations.”

– Mads Hansen, CEO, Kube Energy

High risk of payment default from end user off-takers. Several DESCOs have struggled with low payment rates of only 65% to 80% for individual off-takers, due to a combination of a lack of cultural understanding of ‘on-time payments’ and unpredictable events reducing or eliminating the income of local communities. In the three identified pilot schemes so far, distributed energy access solutions rely upon displaced and host household

payments and struggle to remain economically viable with default rates above 20%. COVID-19 factors potentially increases the unwillingness to pay and also drives up customer default risks.

“Any sort of shock that reduces the customers’ ability to pay is a massive risk to the companies and forces them to refinance, as their cash flow needs are enormous. This happened to several companies last year [2019] and forced them into insolvency.”

– Luc Severi, Senior Energy Access Specialist, Sustainable Energy for All

Difficulty in estimating off-take potential due to lack of market data. Lack of quality data available on potential end customers, such as precise data on settlements, purchasing power, and energy demand, is not supporting precise assessments of the market potential, the design of suitable deployment models, and the necessary supporting mechanisms. Innovations within advanced analytics, such as geospatial analysis combined with mobile phone data, have closed some of the data gaps. However, the lack of market transparency continues to be a source of uncertainty.

“A lack of evidence on the energy consumption levels within vulnerable households prevents policymakers from determining appropriate thresholds for subsidies. Additional data collection on the specific energy needs of the poor, building on examples such as the Multi-Tier Framework surveys, would enhance programme design and allow policies to be more efficient.”

– Sustainable Energy for All⁴

7.1.3 CHALLENGING POLITICAL AND REGULATORY STAKEHOLDER MANAGEMENT

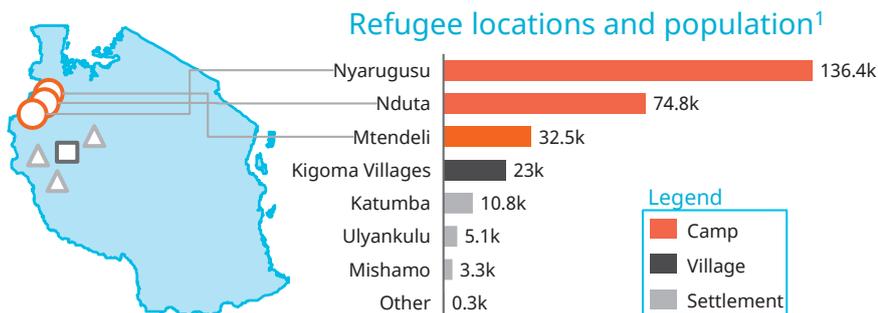
Senior government buy-in and approval required for project permits. Active support and involvement from senior government is pivotal to obtain the necessary permits for larger projects, such as scaled-up mini-grid solutions. This creates room for discretionary decisions in cases where there is a lack of clear national regulations and policies. The result is uncertainty around the outcome of the project and the time and resources required to start developing a project. Uncertainty and delays are compounded through prolonged permit application processes, that may take several months or even multiple years.

“Little development happens around energy within the continent without it having been a result of the buy-in of government.”

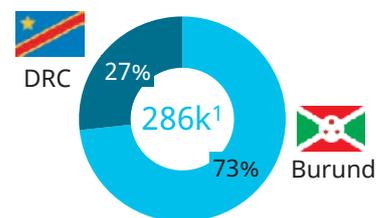
– Patson Malisa, Head of Strategic Planning & Partnerships, ECOSOCC - African Union

Mini-grid energy access solutions require support from a multitude of national stakeholders, including the national utility, national government. For example, the Za’atari project in Jordan was only possible

Tanzania: Limited refugee rights and demanding regulatory environment



Origin of refugees



Three key challenges



Strong government stance against permanent refugee settlement

- Risk of repatriation of refugees creating uncertainty in long-term demand
- Infrastructure supporting refugees not permitted (e.g., mini-grids), due to government interests to avoid permanent resettlement
- Refugees not permitted to engage in economic activities within the camp, nor allowed to leave the camps, reducing their income generation potential

“The government of Tanzania has become more strict about commercial activities. No commercial activities are any longer allowed within the camp – Country representative, International development organisation



Cumbersome and protectionist regulatory process

- Several permits required to develop a project, requiring 12 to 24+ months of processing time, multiple stakeholders, and significant application fees
- Large portion of service contracts classified as onshore by the Tanzanian Tax Authorities to maximise national tax revenues

“We had to abandon Tanzania as a market due to the protectionist Tanzanian policies – COO, International energy company



Feed-in tariffs making projects unprofitable in the event of national grid arrival

- Solar charges tariffs 5x to 10x the tariff charged by the national utility company, making it impossible to compete against the national grid
- Feed-in tariffs and approved solar tariffs not reflecting the true costs to develop and operate clean energy assets, e.g., lifeline tariffs set to about \$0.043 per kWh
- No protection or compensation offered in case of arrival of the national grid

“Solar photovoltaic mini-grid is facing one big challenge; tariffs are very high – Senior representative, Industry association

Potential path forward



Advance electrification

- Collaborate with government and regulatory bodies to shape their national electrification strategy
- Identify off-grid opportunities for host communities adjacent to displaced populations



Develop local industry

- Work with regulatory bodies and associations to identify capability gaps
- Build required competence and establish supply chain to support solar industry growth



Regulatory reforms

- Change regulations and policies to facilitate the involvement of private companies, e.g., reduce permit requirements, and introduce tariffs reflecting the true project costs



Strengthen refugee rights

- Ease restrictions limiting (semi-) permanent infrastructure for refugee camps and economic activities to enable solar projects benefiting both host and refugee communities

¹. As of March 2020
Source: UNHCR; Expert interviews

through active involvement and steering from the Jordanian government and Jordanian National Electric Power Company (NEPCO).

Host country resistance towards any encouragement of permanence for refugee and IDP camps. Host country governments are not necessarily supportive of building out access to energy for the refugee population. In several cases, there is a push to return the refugees to their home countries, and a political fear of creating incentives for refugees to stay in the camp long-term. Consequently, legal or regulatory barriers have been implemented to disallow or discourage anything perceived to be permanent infrastructure, such as mini-grids. Furthermore, refugees are in some countries not allowed to engage in economic activities within or outside the camp, nor leave the camp at all, reducing their income generation potential.

“The regulatory environment for energy is secondary to the regulatory environment for how camps are managed politically. Oftentimes they are not legally allowed to be permanent settlements. As soon as you put up an electricity pole and install wires, it appears to be permanent, which none of the host countries will either want or, in many cases, legally allow.”

– CEO, Industry association

Demanding protectionist regulatory requirements.

National governments and regulators may require a minimum level of local suppliers and/or labour. Often where local solar suppliers were procured, poor qualities of maintenance services and equipment contributed to a series of solar instalments prematurely breaking. These risks have driven several

companies to disregard certain countries or cancel initially planned projects.

“The problem started when undertaking the regulatory and legal due diligence when it became clear that foreign contractors are not allowed to work in Tanzania without permits, and that is where the problems started.”

– COO, International energy company

7.1.4 LACK OF SUFFICIENT COMMUNITY ENGAGEMENT AND INVOLVEMENT

Insufficient local stakeholder management resulting in local pushback against the projects.

Participation and ownership from local stakeholders are pivotal to get access to the necessary local resource, such as access to land, and to garner the required political approvals and access to local off-takers.

The Poverty and Environment Initiative, implemented by WFP in Rwanda, demonstrated that successfully implementing projects requires engaging the local authorities by aligning the former with existing development plans. In addition, local authorities, by working regularly with community districts, are usually the gateway for reaching out to people. Failing to adopt participatory processes and capacity-building efforts at a community level risks jeopardising project outcomes and project sustainability.

“Meaningful participation in decision-making helps to build human and institutional capacity for reaching sustainable clean energy solutions, and identifies potential hurdles toward resolving conflicts peacefully.”

– Florence Foster, Representative for Peace and Disarmament, QUNO

PERSPECTIVES FROM THE FIELD

“The government of Tanzania promotes rural electrification by providing financing through the Rural Energy Agency as well as encouraging private sector investments in this space. For quite some time, looking at the country’s priorities, the bigger portion of the rural energy funds has been spent for grid extension rather [than] to small-scale off-grid projects. These small projects do face some challenges, which include solicitation of necessary funds to implement them, the lack of anchor businesses for their sustainability, and weak championship.

On humanitarian settings, for almost two years now, we have been advocating the use of renewables through solar-based mini-grids for both the refugee and host communities. However, the intervention has been facing some challenges from the encampment policies, which has affected crowding-in private sector investment; the necessary financing for implementation of these projects is also uncertain.

To navigate through the encampment policies, we are now pursuing decentralised solarisation solution for the camp support facilities. To be able to make the renewable investment a reality and green the humanitarian operations, the funds have to come from humanitarian support partners. Nevertheless, we are hopeful and thrilled that the possibilities of securing financing for greening of the humanitarian operations are higher this time than any other time I have known.”

Emmanuel Michael Biririza, NORCAP Energy Expert deployed to UNHCR Tanzania

‘Unfair’ access to services and support for displaced persons creating tensions with host communities. Host communities are often lacking access to the same services as the displaced population. However, their needs are oftentimes overlooked and not included in programmes run by on-site NGOs. Unequitable access to services provided to displaced persons can cause resentment towards the displaced population and contribute to local conflicts, as well as create pushback against the project.

“There is sometimes jealousy that the camps are getting more attention, while there are many villages that don’t have access to services as well.”

– Martin van Dam, Country Sector Leader Renewable Energy
– Burkina Faso, SNV

Marginalised groups not getting access due to involved parties’ lack of understanding of the local context. Local cultural factors and societal structures are influencing who gets access to clean energy and what it is used for. Failure to properly include Gender Equality Programming as a key component in all stages of a project creates at minimum the risk of not reaching the desired target population or intended usage, up to even causing harm to vulnerable groups by unintendedly reinforcing structural discrimination.

“If you [a household] get access to electrical lamps, you risk that the husband takes it with him and leaves the house to go and have tea with his friends, while heavier and less mobile equipment is kept in the house and helps to boost the household productivity.”

– Tommy Engvik, Director Sales, Bright Products

7.1.5 INSECURITY OF PROCUREMENT AND SUPPLY CHAIN

Corruption hindering project development through poor quality and availability of materials and equipment. Corruption is a key challenge across the region for companies involved in developing projects, jeopardising the timeliness and quality of the projects. Public servants and other local stakeholders with the power to cause disturbances are prone to ask for personal compensation incentives to provide the necessary support. Rogue employees complying risk both the outcome of the project and reputation of the company.

“The incentives are hard to align in these places where \$50-\$200 makes a huge difference to the public servants.”

– Adviser, UN humanitarian agency

Difficult physical access to remote locations for transportation of material and equipment. Remote locations, coupled with poor infrastructure, results in additional transportation costs, delays, and challenges to both develop and operate solar energy

projects. Even with lead-time and significant planning of transporting equipment and staff, there are often unexpected delays.

“There are no roads to Malakal, so UN have armed convoys for barge movements. We needed to get all the material within a specific date, but some components didn’t make it in time for the barge. So, the equipment had to be flown in, amounting to several hundred thousand USD in extra cost.”

– Mads Hansen, CEO, Kube Energy

Distributed energy access solutions are particularly challenged with remote access, as any delays in delivery or replacing faulty parts immediately reduce the product’s reputation and negatively affect future subscriptions.

“One of the problems was getting the stuff there, it was a really long journey.”

– Owen Grafham, Dept. Manager: Energy, Environment & Resources, Chatham House

Severe conflict-driven security risk to potentially disrupt the logistics. The severity of the local security situations, for example, ongoing armed conflicts and terrorist attacks, are putting the operations, safety of the involved staff, and the equipment at risk. Significant additional costs for security and logistics measures are incurred, especially in the most affected regions, making it near-impossible to operate outside protected compounds.

“There is no transport, no food supplies, no possibility of entering or leaving the town. There is a shortage of water, vehicle fuel, and food, frequent electricity cuts, and so forth.”

– Representative, Aid to the Church in Need, Djibo - Burkina Faso⁵

7.2 Unique Challenges and Opportunities in Three Different Case Studies

Each country and context face unique and different challenges for solar deployment. This study has focused on understanding the risks in Burkina Faso, Tanzania, and South Sudan. For further information on each, refer to country exhibits on pages 21, 31, and 34.

Notes

4. Sustainable Energy for All. (2020). Energy Safety Nets: Using Social Assistance Mechanisms to Close Affordability Gaps for the Poor
5. https://acn-canada.org/burkinafaso_terrorism_pandemic_2020/

Kaya, Burkina Faso: 'Extended town' approach to housing displaced persons



Background



Rapid growth in displaced persons, many of whom are settling in an 'extended town'

- Drastically increased IDP population from 50,000 in January 2019 to 850,000 by June 2020, driven by the ongoing conflicts across the Sahel region
- 80,000 displaced persons living in Kaya hosted by the local community of 170,000, co-living and sharing local resources in an 'extended town' approach

Current demand limited to water pumps and the wealthier population

- Town electricity largely used to power a few shared and limited communal water pumps, which are prone to frequent breakdowns and dependent on the intermittent electricity supply
- IDPs have access to some additional manual pumps, which is causing tension with the host community due to the scarcity of water and permits required to drill new wells
- The wealthier households have access to electricity to store and handle food (e.g., refrigerators), while only 5% of the displaced community have access to lighting

“ Every time there is a problem of supply, it has impact on availability of water
- Anonymous, UNHCR

Limited and intermittent supply of energy through the grid

- Electricity supplied through the town grid highly unreliable and only available for 6 to 10 hours per day
- Electricity primarily supplied from Wagadugu and the Ivory Coast, mostly from hydropower
- NGOs rely on diesel generators for their energy supply

Two key challenges



Security challenges

- Challenging security in the Sahel region and uprising of terrorists attacks are putting personnel and local operations at risk
- Terrorists have attacked water pumps and other public infrastructure
- Public opinion that terrorists are hiding within camps, creating tension between the host communities and the displaced population

“ More than 100 violent incidents recorded in February [2020] alone¹
- The Guardian



Weak potential for off-taker demand

- Evolving migratory impact due to the ongoing conflict creating uncertainty
- Little to no power-heavy industries or anchor off-takers near host communities
- Weak existing demand with only 8.3% in the region with electricity subscription, and firewood being the main source of energy

“ The main industries in the region are small processing units (e.g., bakeries and dairies) and Kaya refrigerated slaughterhouse, which is being finished
- Steve Ndikumwenayo, NORCAP
Nexus Coordinator - UN RCO² Burkina Faso

Potential path forward



Modular solar capacity

- Build solar capacity in discrete blocks to enable flexibility for scaling operations up or down according to fluctuations in needs and in response to unstable security situations



Grant financing

- Leverage grant funding from donors to finance a large share of the projects to offset the highly limited commercial off-take potential and high risk environment



Local stakeholder involvement

- Engage local stakeholders in the planning and decision-making processes to ensure fair and equitable access to a suitable solution for both the host and displaced community

1. "Mamen, murder and mass displacement: how terror came to Burkina Faso"; 2. United Nation Resident Coordinator
Source: UNHCR; Expert sked interviews; The Guardian



NORCAP expert inspecting solar batteries at a health centre. It is important that batteries have proper ventilation and cooling, which can be a challenge in hot areas.



Solar installation on the health centre, powering electrified health services.

8. The Journey Ahead

For solar solutions to have a real impact on displaced persons and host communities, multiple stakeholders are required to act to mitigate the long-standing challenges. Clean energy companies, IFIs, donors, investors, governments, international organisations, and NGOs all have a role to play.

An industry which has successfully overcome many of the same challenges and achieved growth on the African continent is the mobile industry. Important learnings could be extracted from this industry, and it also demonstrates that a rapid penetration rate could be achieved if the right conditions are in place. (See Exhibit 11.)

8.1 Mitigating Actions to Address the Five Long-Standing Challenges

There is no silver bullet to overcome the long-standing challenges; a combination of actions is needed for each. These actions were developed based on feedback from the interviews, on the key risks.

High capital and multi-year payback periods of clean energy solutions could be addressed through pooled multi-year funds. There are already efforts by the UNDP to create an interagency “project

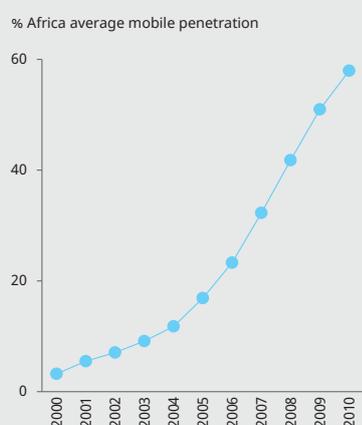
pipeline fund” that would finance the energy audits, monitoring, and business case development of potential projects in displacement settings. Similarly, NOK 300 million was pledged from the Norwegian government towards a fund for guarantees aimed at mitigating investments on renewable energy. Risk could be further reduced through transparent and forward-looking project pipelines, thereby enabling larger players to commit and build scale. Energy could be provided as a service through alternative delivery models, for example, through Power Purchase Agreements (PPAs) and leasing agreements, to fit the needs of the HDP operators.

Uncertainty of off-taker cash flow should be managed at both the organisational and end user levels. Anchoring organisational clients to long-term contracts would provide durable sources of revenue. End user payments can be secured on time through new business models (e.g., lease-to-own) and new payment schemes (e.g., prepaid, PAYGO) and initially supported by cash-based programming. A distributed energy access pilot for refugees in Rwanda experienced more than 90% of on-time payments through new technologies.

Challenging political and regulatory stakeholder alignment requires not only lobbying and stakeholder

Exhibit 11 | Case Example: Learnings From the Mobile Phone Industry

Mobile penetration in Africa grew at 34% per year from 2000 to 2010



Key learnings from the mobile industry

- Secured sources of finance** through governments or large European telcos with excess cash flows
 - Large European telecommunication companies seeking to expand in new growth markets, given European market saturation early 2000s
 - E.g., Orange (market cap of EUR ~20b, EBITDA EUR ~8b, FCF EUR ~5b): needed to invest high cash flow into new markets
- Business case largely proven** by early 2000s through learnings in Europe
 - Secured knowledge that scale would come and last for about 20 years
 - Reassured growth in penetration rates, given 10 year consistent lag in Africa vs. European markets
- Capex deployed and distributed over time**, initially financed by cash flows from high-tier segments
 - Telecommunication companies deployed network towers to ensure coverage and least-possible capacity to cover higher-tier customers
 - Revenue gradually unlocked from higher-tier segments and iteratively reinvested to increase capacity for lower-tier customers
- Negligible risk of off-taker payment default**: about 98% of subscriptions are prepaid
 - Risk of payment default minimised through prepaid SIMs
 - Prepaid highly profitable vs. post-paid; marginal price is higher and cash flow is immediate
 - However, comes with trade-off against cash flow certainty

1. African average 2000 - 2010

Note: Penetration defined as # active SIM cards / population.

Source: Expert interviews; Ovum; NORCAP-BCG analysis

PERSPECTIVES FROM THE FIELD

“In displacement settings the role of ‘coordinator’ is usually assigned to the lead agency: UNHCR, IOM, etc. Given that energy is a cross cutting issue, the coordination mechanism would need to ensure all relevant sectors / clusters / partners (WASH, shelter, education, health, livelihoods, environment, etc) participate so that energy is mainstreamed throughout the operation and its response. Limited coordination can result in the misalignment of efforts and the failure of an entire project.

Equally important is the inclusion of the local and national authorities, ideally co-chairing the coordination, for instance, through regular meetings. It is the national and local authorities who can ensure all energy projects meet appropriate policy and regulatory requirements and provide insight to what may or may not work well on the ground. It is also important to ensure inputs from the displaced and local host communities are taken into consideration, as the energy interventions need to be fit for purpose, culturally appropriate and maintain or improve the harmony between the two communities.

We will be developing a set of tools to facilitate coordination efforts, which will lead to the creation of strong partnerships in the field, which in turn will result in the development of successful and sustainable energy projects that meet the needs of the end user.”

Mark Gibson, NORCAP Senior Desk Officer – GPA

engagement at all levels, but more importantly establishing a clear path towards developmental impact for host countries and host communities. Utility and regulatory bodies should create the right incentives for clean energy projects to enable additional investments where it is potentially most difficult, and thereby advance their national electrification strategy. Additional investments and support should be devoted towards developing host countries’ solar industries and related capabilities to realise national socioeconomic benefits.

“There is a clear potential for humanitarian solutions to transition to development impact. In other words, the investment in humanitarian energy is also a long-term investment in permanent infrastructure.”

– Javier Mazorra, Alianza Shire,
Polytechnic University of Madrid

Lack of sufficient community engagement and involvement requires joint multi-stakeholder analyses to comprehensively address the risks, needs, vulnerabilities, and conflict drivers for each context. Local participation in decision-making, where target groups can provide input towards project outcomes, ensures solutions are fit for community use and secures the active involvement of local communities.

Insecurity of procurement and supply chain should be addressed through strengthening procurement capabilities and processes, thereby ensuring the right solar suppliers are ready to take on projects and at scale. Local security risks could be reduced through leveraging frontline peace actors to gain a ground-level understanding, and translating that to practical mitigating actions when evaluating, implementing, and operating solar solutions.

8.2 Call-to-Action for Stakeholder Groups

Immediate action is needed from multiple stakeholders to address the challenges and accelerate the solar development. (See Exhibit 12.)

Adopting the above recommendations offers distinct benefits for each stakeholder group.

- **International organisations and NGOs.** Increased, longer-term impact for a wider range of displaced and host persons through the pooled capabilities and funding in a Triple Nexus approach.
- **Governments and regulators.** Stimulated socioeconomic growth and advancement of the national electrification strategy in remote areas through increased productivity of local businesses and attracting increased foreign investment with more favourable business conditions.
- **IFIs, donors, and investors.** A long-term pipeline of impactful and profitable opportunities at scale, enabling financing across multiple projects.
- **Clean energy companies.** Increased projects’ return-on-investment (ROI) and expanded range of project opportunities to create and drive new markets, through ground-level de-risking and new financing mechanisms.

Exhibit 12 | Key Priorities over the Next Years to Deliver Impact By Stakeholder Group

Stakeholder group

Immediate priorities (0-12 months)

IOs/NGOs: Set a **clear strategy to green operations**, and change the internal policies and procurement processes accordingly with clear responsibilities assigned to support the transformation

IOs/NGOs: Approach clean energy companies and funding partners to **secure interest in and support** for the greenifying initiatives

IOs: Developed a **joint approach with clear responsibilities** together with similar organisations operating in the same regional areas and contexts to coordinate efforts, and create an attractive development pipeline

IOs/NGOs: **Secure engagement from local stakeholders** in the decision-making and planning processes to ensure locally anchored fit-for-purpose projects, and to build local capacity and technical skills for the long-term

IOs/NGOs: **Coordinate efforts** across the HDP sectors to develop robust programmes addressing the lack of access to clean energy

IOs: Research and **share market opportunities** with investors and clean energy companies and data on local environment to attract interest in projects

Develop a long-term **national electrification strategy**, including planned grid extensions and opportunities for off-grid solutions, to accelerate electrification efforts and create transparency on the opportunities

Initiate **regulatory and policy reforms** to create a supportive environment for clean energy projects related to displaced persons

Commit to **multi-year, adaptive, and outcome-oriented funding** to match the complexity and uncertainty of HDP projects

Provide **risk-reducing financing facilities** to clean energy companies, such as guarantees, insurances, and currency hedging facilities to make projects commercially viable

Establish partnerships with international organisations, NGOs, and local developers to secure ground-level access to local communities and stakeholders, and nuanced understanding of local contexts

Conduct **project due diligence** to identify, screen, and execute on attractive pilot projects

Develop financial and non-financial **mechanisms to secure local buy-in** and engage local stakeholders



IOs/NGOs



Local government and regulators



IFIs, donors, and investors



Clean energy companies

Medium-term priorities (6-30 months)

IOs: Elevate **prioritisation of energy for displaced persons** on par with other needs to attract the attention needed to accelerate the development

IOs/NGOs: Engage donors to **advocate the need for shared pool of funds** to facilitate projects with Triple Nexus approach

IOs/NGOs: Define and develop selected **greening humanitarian operation pilots**, based on risk minimisation

IOs/NGOs: Partner with DESCOs to **market and distribute SHS kits** to camps and locations that offer greatest impact vs. investment

IOs/NGOs: Derive **roll-out plan** of further projects, based on lessons learnt

Reshape tariff structure, to ensure economic viability for developers, especially for locations with planned grid arrival

Increase **transparency in tendering process** to attract larger investors and clean energy companies

Adopt **conditional clauses in agreements** that mandate commitment for IOs/NGOs to "go green"

Provide mechanisms such as microfinance or cash programming to **strengthen the purchasing power of local individual end users**

Provide **funding for initial set of projects** identified by clean energy companies and IOs/NGOs

Define a clear strategic ambition for how to build business across the African continent and the HDP context

Identify and qualify opportunities into a roadmap and pipeline of projects

Identify gaps in existing capabilities throughout the existing organisation, supply chain, and partnerships to execute on the roadmap

Engage **new suppliers and build local operations/partnership networks** with local companies and NGOs to close identified gaps

Begin **project development and execution** of pilot projects identified by IOs/NGOs

Long-term priorities (24+ months)

IOs: Continually develop a **systematic view of new opportunities** through a shared platform, continuously updated and discussed across stakeholders in periodical forums

IOs/NGOs: Continuously **assess new technologies for greenifying operations**, to identify new opportunities for clean energy projects

IOs/NGOs: Expand **implementation of new solar projects** to 'Shared service extension' and 'Mini-grid energy access' opportunities identified

IOs/NGOs: **Share lessons learnt** from ongoing and completed projects to drive continuous improvement

Periodically **re-evaluate regulations, policies, and tariffs** to ensure solar projects are economically viable

Industrialise due diligence capabilities to accelerate expansion of new opportunities

Commercialise and market financing mechanisms to attract and partner with clean energy companies

Redesign **equipment and capabilities in supply chain** to ensure scale-up of supply

Industrialise project development and execution processes to implement further opportunities, including 'shared service extension' and 'mini-grid energy access' solutions

8.3 Concluding Words

An urgent response from all stakeholder groups is needed to enable electricity access for the world's most vulnerable persons. This is only possible through a joint, collaborative effort across multiple organisations and sectors/industries.

Private sector companies expressed a clear willingness and interest to partake in developing and implementing solar technologies, especially for underdeveloped and challenged communities. Interviewees from oil and gas corporate social responsibility (CSR) units indicated pivoting away from donations towards co-creation of sustainable, market-based models with non-profit organisations, to ensure long-term lasting impact. There are also further synergies to leverage the existing capabilities and skillsets of oil and gas companies, for example in project development.

A Triple Nexus approach across humanitarian, development, and peace actors is key to successfully driving solar deployment at scale, and fast. Closer collaboration between the three sectors enables making the best use of shared financial and capability resources to identify, de-risk, fund, implement, and operate these assets. NORCAP is uniquely positioned to facilitate this coordination, having a wealth of experience across each sector.

Opportunities that will prove solar solution concepts in humanitarian, development, and conflict situations must be identified. Only through establishing a substantiated understanding of projects, with a tested

business case, will larger investors and clean energy companies begin working in these settings at scale. NORCAP, international organisations (including UN agencies), and NGOs can play their part through identifying and de-risking these opportunities, by leveraging their ground-level knowledge and expertise.

A common language must be established between IFIs, donors, investors, and IOs/NGOs to finance new clean energy projects. Financial mechanisms, such as guarantees, must be employed to overcome the short-cycle budget restraints and enable multi-year financing. IFIs and donors can kick-start this change through setting demands on the use of clean energy by humanitarian, development, and peace actors, and moving towards unrestricted funding models.

Active participation in solar development processes presents significant opportunities for local governments, national governments, and regulators to accelerate their country's development. Advancing electrification where most needed would stimulate local economies, through both electrifying local industries and developing solar industry capabilities. Increased foreign investment into solar projects would encourage further investment into other industries, thereby bringing broader socioeconomic benefits for host countries. Investors, clean energy companies, and IOs/NGOs should invest in developing the capacity of governmental bodies to empower them to own initiatives and enable policy and regulatory changes.

9. Appendix

9.1 Key Dimensions and Risks

To come up with the key risks for clean energy solutions in an HDP context, a long list of factors was identified prior to interviews. The risks were derived by the project team and adjusted based on feedback in the interviews to arrive at the 12 main risks across four key dimensions (in random order). (See Exhibit 13.)

9.2 Triple Nexus

The volume, cost, and length of humanitarian assistance has grown dramatically in recent years, mainly due to the protracted nature of crises and the limited coordinated humanitarian and development efforts in many vulnerable contexts. This trend elevated the dialogue for improving connectivity between humanitarian and development efforts to best assist countries towards the Sustainable Development Goals by 2030.

9.2.1 BACKGROUND AND RATIONALE

The point of departure of the Triple Nexus approach was the World Humanitarian Summit (WHS) and the Grand Bargain (2016), where most stakeholders,

including donors, NGOs, and crisis-affected states, pledged their commitment to this framework.

Following the summit, there was a push for policies that would enhance synergies between the three sectors, by bridging the gap between emergency and longer-term relief efforts. This recognises the need to work in a coordinated way across humanitarian, development, and peacebuilding sectors. The Triple Nexus continues efforts in the humanitarian and development sectors to develop joint approaches, including Disaster Risk Reduction, Linking Relief, Rehabilitation and Development, the resilience agenda, and the integration of conflict sensitivity in responses.

9.2.2 NEXUS OPERATIONALISATION AND KEY PRINCIPLES

The New Way of Working (NWOW) represents an approach to put the Triple Nexus into practice. It calls on humanitarian, development, and peacebuilding actors to work collaboratively together, based on their comparative advantages, towards collective outcomes. Building on the literature review and interviews with practitioners, the following key actions are proposed to implement a Nexus approach.

Exhibit 13 | Four Key Dimensions and 13 Solution Risks

Key dimensions

Solution risks



Investment and business model

- A.1 Lack of access to funding mechanisms to support large upfront capital required for investment
- A.2 Lack of stable and robust long-term off-takers
- A.3 Unavailability of partners and suitable business models
- A.4 Inability to leverage private sector CSR¹ agenda and enable project prioritisation/de-risking



Regulatory environment

- B.1 Complex and dynamic political and regulatory landscape
- B.2 Lack of access to local and home-country incentive schemes, compounded by high risk of change
- B.3 Unavailability of qualified suppliers, materials, and equipment to fulfil local content requirements



Change management

- C.1 Misalignment with local/cultural practices, including GESI² considerations
- C.2 High barriers to local information distribution



Project development

- D.1 Unavailability of robust technical solutions that can scale
- D.2 Inability to integrate and deploy with existing infrastructure
- D.3 Instability and insecurity of procurement and supply chain
- D.4 Lack of access to experienced senior management and required local technical capabilities

1. Corporate Social Responsibility 2. Gender Equality and Social Inclusion
Source: Interviews; NORCAP-BCG analysis

Deliver predictable, flexible, multi-year financing aligned with agreed collective outcomes. This requires identifying financing mechanisms that bring together humanitarian, development, and peace stakeholders where possible, and promoting opportunities for private sector engagement. This step is crucial to resolve the inability of funds to be re-deployed where most needed, due to compartmentalised allocation between the humanitarian, development, and peace sectors.

Strengthen national and local capacities. Advocates of the nexus approach recognise that government leadership is a key factor in the success of preventing, responding to, and recovering from crises. This may be achieved by fostering self-reliance and resilience, and prioritising funding to local organisations who have specialised knowledge and skills and who are present when crises occur. It could also be achieved by incentivising international actors with capabilities across humanitarian, development, and peace actions to invest in local capacities, and getting governments to commit to building national and local capacity.

Conduct joint multi-stakeholder analysis and establish mechanisms of participation and ownership. Structural causes and drivers of conflict must be understood to identify the immediate needs, risks, and vulnerabilities of aid beneficiaries, including those of excluded or marginalised community members. Such approaches better inform and strengthen project decisions and avoid doing harm.

Conduct joint monitoring and collect disaggregated data to enable programmes that are adaptive and responsive, and to promote iteration and learning. The success of joint humanitarian, development, and peacebuilding approaches requires strong program quality and accountability at both project and organisational levels to capture progress on cross-cutting issues, such as gender, SGBV, and advocacy.

Programmes should combine anticipatory and adaptive approaches in order to address both immediate needs, while also better anticipating and facilitating the prevention of crises. This principle

involves planning ahead of the next crisis and enabling those programmes with the capacity to adapt to the context and stay risk-focused.

9.2.3 CHALLENGES

The protection of humanitarian space. A major challenge surrounds the alleged compromise of the humanitarian principles in the transition towards Triple Nexus programming. The principles of independence and impartiality are established to prevent humanitarian organisations from working with political and armed actors to avoid a perceived loss of neutrality. Conversely, development efforts, by seeking to strengthen state institutions, have a certain degree of political vestment. Similarly, by engaging in peacebuilding processes, humanitarian organisations may appear to align with a particular party or solution to the conflict, thereby compromising their principles.

Missing consensus on definition and systematic implementation. The nexus approach remains largely theoretical to date, with no consensus or clarity on key definitions, terms, and challenges. Implementation of the New Way of Working is missing a systematic approach and there are no clear views as to what collective outcomes look like in different contexts.

Lack of consensus on the operational definition of peacebuilding. There is no clear definition on what integrating this component into programmes entails. This differing interpretation by implementing actors, seemingly according to their respective agendas, has led to inconsistent interactions with respect to peacebuilding activities. Furthermore, this may have implications for human security and safety, and for contributing further to insecurity, particularly in cases where state security and stability is prioritised.

9.3 Selected Clean Energy Initiatives and Funds in Africa

The following list (in random order) offers a non-exhaustive compilation of past and ongoing humanitarian and development solar energy initiatives in Africa. (See Exhibit 14.)

Exhibit 14 | Selected Clean Energy Initiatives and Funds in Africa

	Organisation	Initiatives
Humanitarian	AECID and EU	<ul style="list-style-type: none"> • Alianza Shire. Partnered with private sector, i.e., Acciona, Iberdrola, Philips, with NRC as main implementer
	DFID	<ul style="list-style-type: none"> • Project providing electricity to refugee camps and host communities in the North of Ethiopia • Moving Energy Initiative. Developed by Chatham House and Global Village Energy Partnership • Seeks to provide clean energy among the displaced through policy, market-based solutions, field research, and local cooperation • E.g., the ICT Nuru Access Centre in Kenya, funded under this initiative, was set up to facilitate energy access and learning opportunities
	German Federal Foreign Office	<ul style="list-style-type: none"> • Sustainable Energy for Humanitarian Settings in Djibouti. Received \$233k (€208k) • Driven by GPA, with support from UNHCR and WFP • Aimed at evaluating the energy needs of refugees and humanitarian agencies
	IKEA Foundation	<ul style="list-style-type: none"> • UNHCR Corporate Partnerships Programme. Over \$198m in contributions to UNHCR's operations • Includes areas such as Education, Shelter, Protection, Camp Management, Health & Nutrition, Livelihoods, and Renewable Energy
	Mastercard & USAID	<ul style="list-style-type: none"> • Smart Communities Coalition (SCC). Public-private effort co-chaired by Mastercard and USAID. • Aimed at changing the humanitarian operating model with sustainable approaches through energy, connectivity and digital tools
	NORAD	<ul style="list-style-type: none"> • Plan to provide \$20m. Support the GPA, NORCAP's Clean Energy Programme, and UNHCR's Clean Energy Challenge
	NORAD	<ul style="list-style-type: none"> • As of 2020, NORAD has a \$10m fund dedicated to solar projects, providing guarantees to facilitate private sector involvement
	NMFA	<ul style="list-style-type: none"> • Supported UNHCR's Clean Energy Challenge, which seeks to provide energy access to refugees and host communities by 2030
	NMFA	<ul style="list-style-type: none"> • Provided a yearly grant to the Norwegian Humanitarian Innovation Programme in 2018 (\$3.4m (NOK 30m)), 2019 (\$4.34m (NOK 38,2m)) and 2020 (\$4.8m (NOK 42m))
	NMFA	<ul style="list-style-type: none"> • Norway supports the GPA secretariat with \$682k (NOK 6m) per year
	SIDA	<ul style="list-style-type: none"> • Phasing out fossil fuels/Green Fund. Launched through a \$4.2m (SEK 40m) revolving fund mechanism • Supports UNHCR's programme for greening UNHCR operations through agreements with third-party suppliers
	USAID	<ul style="list-style-type: none"> • De-risking PAYGO SHS in Ugandan refugee settlements. Received three grants worth \$145-\$175k each • Seeks to showcase Power Africa's contribution to the SCC, along with Mastercard and SCC members
	Various	<ul style="list-style-type: none"> • Grand Bargain. A commitment between large donors and humanitarian agencies to improve the efficiency of the humanitarian action
	Various	<ul style="list-style-type: none"> • Safe Access to Fuel and Energy (SAFE) Working Group. Consortium of humanitarian NGOs, with grants from Shell and NORAD. • Seeks to offer a coordinated response to the energy needs of crisis-affected populations
	Development	DFID
GIZ		<ul style="list-style-type: none"> • West Africa Clean Energy Corridors Initiative. Launched by ECOWAS in collaboration with IRENA and the West African Power Pool • Aims at supporting the development of utility scale renewable energy
NMFA		<ul style="list-style-type: none"> • Energising Development. Contribution of \$1.6m (NOK 14m) in 2019, with partnership continuing through 2020 • Although the funding allocation is not established yet, humanitarian efforts will be included
United Nations		<ul style="list-style-type: none"> • SDG fund. A \$300m annual international multi-donor development mechanism to support sustainable development activities
World Bank		<ul style="list-style-type: none"> • Programme to offer energy access modelled on partnering with host governments, with support to refugees and host communities

Note: AECID: Spanish Agency for International Development Cooperation; EU: European Union; GIZ: German Corporation for International Cooperation

Source: NORCAP-BCG analysis

9.4 Sources

This report would not have been possible without the participation of the following organisations and experts.

9.4.1 ORGANISATIONS INTERVIEWED (IN ALPHABETICAL ORDER)

Africa Mini-Grid Developers Association (AMDA)
African Solar Design
Boston Consulting Group (BCG)
Bright Products
Burkina Faso – Ministry of Energy
Chatham House
Clean Cooking Stoves, UN Foundation
Cooperazione Internazionale (COOPI)
CrossBoundary Energy
Department for International Development - United Kingdom (DFID)
Directorate-General for European Civil Protection and Humanitarian Aid Operations – European Commission
Economic, Social & Cultural Council, African Union
Empower New Energy
Energy Peace Partners (EPP)
Enertrag
European Union Capacity Building Mission in Mali (EUCAP Sahel Mali)
Futureproof-Ideas
German Federal Foreign Office
Global Plan of Action (GPA)
International Organization for Migration (IOM)
Joint SDG Fund
Kube Energy
MRC Group
Norwegian Agency for Development Cooperation (NORAD)
Norwegian Ministry of Foreign Affairs
Norwegian Refugee Council (NRC)
Powercorner
Practical Action
Project Gaia
Quaker United Nations Office (QUNO)
Scatec Solar

School of Oriental and African Studies, University of London (SOAS)

SMA Sunbelt Energy GmbH,

SNV

South Sudan - Ministry of Environment and Forestry-GOSS

Stockholm International Peace Research Institute (SIPRI)

SunPoynt

Sustainable Energy For All (SEforALL)

Swedish International Development Cooperation Agency (SIDA)

Tanzania Renewable Energy Association (TAREA)

The Commission's Directorate-General for International Cooperation and Development (DG DEVCO)

United Nations Development Coordination Office

United Nations Development Programme (UNDP)

United Nations Environment Programme (UNEP) / United Nations Office for the Coordination of Humanitarian Affairs (OCHA) Joint Environment Unit (JEU)

United Nations High Commissioner for Refugees (UNHCR)

United Nations Institute for Training and Research (UNITAR)

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World Food Programme (WFP)

Zero Emissions Resource Organisation (ZERO)

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Global sector leader of BCG's Renewables practice for Solar Energy

Global topic experts for Social Impact

Global sector leader of BCG's Energy practice for Commodity Trading and Risk Management

Global knowledge expert for Telecommunications

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