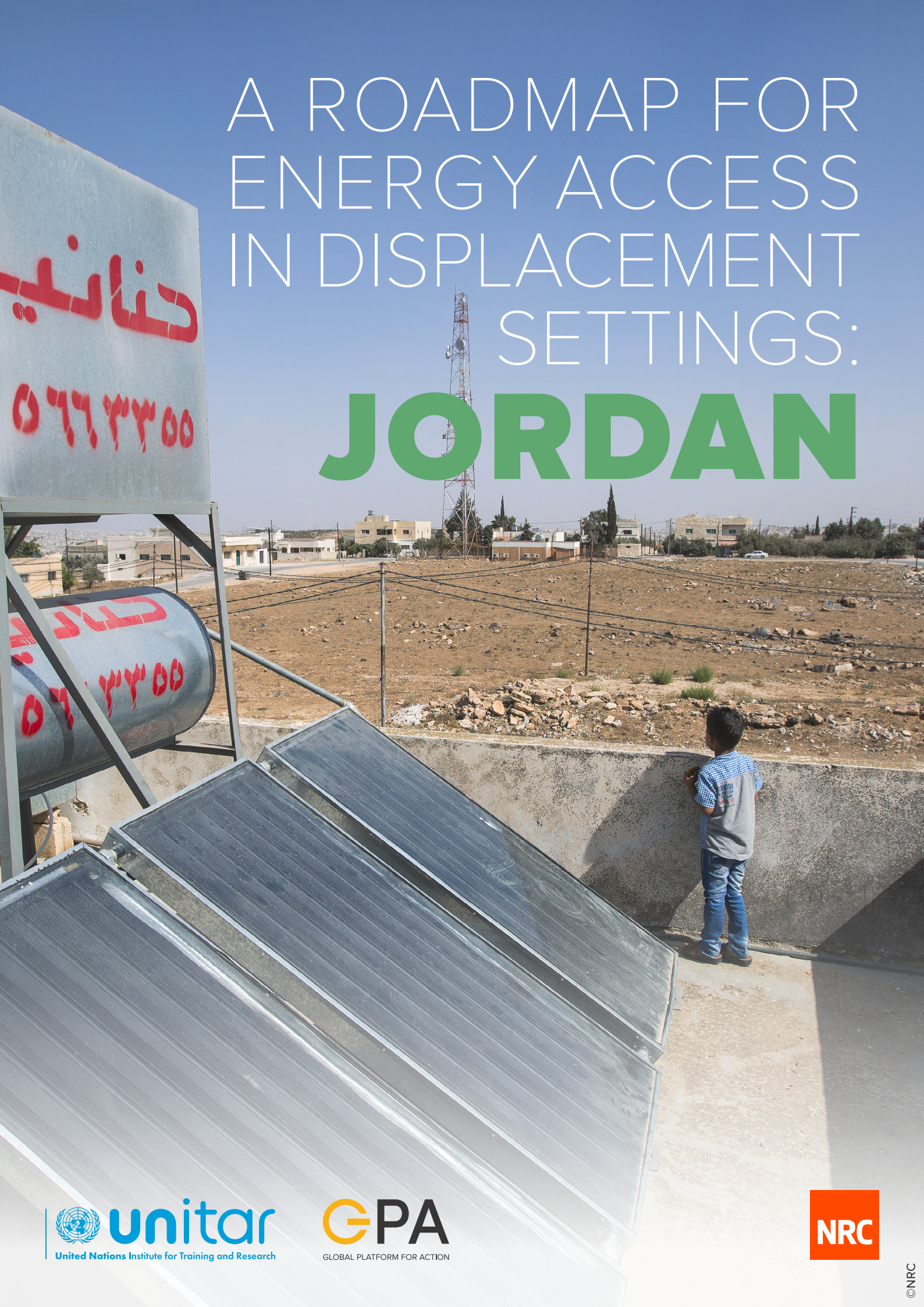
A ROADMAP FOR ENERGY ACCESS IN DISPLACEMENT SETTINGS: JORDAN



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Authors: Philip Sandwell, Elif Gül Demir, Rayan Shehada, Katherine Patterson, Megan Täuber

Peer reviewers: Ali Hamdan, Eva Lee, Georgina Stickels, Hani Almshaqbeh, Lama Gharaibeh, Mohammad Al Salem, Qusai Al-Abbassi, Roupen Ochagan Alexandrian, Shada Qahoush, Yanal Almadanat, Zaid Hatokay

Design: Élise Taponier

GPA Coordination Unit support: Mariana Soto, Sadiq Zafrullah, Mark Gibson, Aimee Jenks

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About the GPA

The **Global Platform for Action on Sustainable Energy in Displacement Settings** (GPA) is the global initiative to promote actions that enable sustainable energy access and use in displacement settings. The GPA strives to remove barriers to energy access in humanitarian settings by providing a collaborative agenda for energy, development, and humanitarian partners to deliver concrete actions of Sustainable Development Goal 7 (SDG 7) for displacement contexts. It promotes and contributes to the humanitarian sector's transition to renewable energy, which will increase efficiency and reduce costs and carbon emissions. Hosted by the United Nations Institute for Training and Research (UNITAR), the GPA Coordination Unit galvanises collective action towards the GPA's realisation.

About the READS Programme

The **Roadmaps for Energy Access in Displacement Settings (READS) Programme,** funded by the IKEA Foundation and implemented by the GPA Coordination Unit at UNITAR, will produce a "roadmap report" for each of the ten countries in its scope. The roadmap reports take stock of the state of energy access in displacement settings in each country with a focus on identifying gaps and high-impact project opportunities to increase sustainable energy access for displacement-affected communities.

These reports consolidate existing data and are informed by workshops with in-country stakeholders to develop and refine the research, including representatives of communities which have been affected by displacement, energy companies, humanitarian and development organisations, and governmental authorities, among others. The roadmap reports present project concepts that have been prioritised by local partners as being the most impactful areas for sustainable energy interventions in displacement contexts. Each roadmap report is produced in partnership with an organisation working in displacement contexts in the focus country.

About the READS Partner

The Norwegian Refugee Council (NRC) is an independent humanitarian organisation helping people forced to flee. It works in crises across 40 countries, providing emergency and long-term assistance to millions of people every year. NRC stands up for people forced to flee, advocating for their rights.

About the IKEA Foundation

The **IKEA Foundation** is a strategic philanthropy that focuses its grant making efforts on tackling the two biggest threats to children's futures: poverty and climate change. It currently grants more than €200 million per year to help improve family incomes and quality of life while protecting the planet from climate change. Since 2009, the IKEA Foundation has granted more than €1.5 billion to create a better future for children and their families. In 2021 the Board of the IKEA Foundation decided to make an additional €1 billion available over the next five years to accelerate the reduction of greenhouse gas emissions.

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Abbreviations

3RP	*Regional Refugee & Resilience Plan*	**MWH**	*Megawatt-hour*
EE	*Energy efficiency*	**NEEAP**	*National Energy Efficiency Action Plan*
EEPB	*Energy Efficiency in Public Buildings*	**NEPCO**	*National Electric Power Company*
EPC	*Electric pressure cooker*	**NGO**	*Non-governmental organisation*
EUR	*Euro*	**NRC**	*Norwegian Refugee Council*
GOJ	*Government of Jordan*	**PPA**	*Power purchase agreement*
GPA	*Global Platform for Action on Sustainable Energy in Displacement Settings*	**PV**	*Photovoltaic*
HFHJ	*Habitat for Humanity Jordan*	**RE4R**	*Renewable Energy for Refugees*
I-REC	*International Renewable Energy Certificate*	**READS**	*Roadmaps for Energy Access in Displacement Settings*
IBV	*Incentive-based volunteering*	**RISE**	*Regulatory Indicators for Sustainable Energy*
ISWG	*Inter-Sector Working Group*	**SDG 7**	*Sustainable Development Goal 7*
JGBG	*Jordan Green Building Guide*	**SRAD**	*Syrian Refugee Affairs Directorate*
JOD	*Jordanian Dinar*	**SWH**	*Solar water heating*
JOPACC	*Jordan Payments and Clearing Company*	**UN**	*United Nations*
JREEEF	*Jordan Renewable Energy and Energy Efficiency Fund*	**UNDP**	*United Nations Development Programme*
JRP	*Jordan Response Plan*	**UNHCR**	*Office of the United Nations High Commissioner for Refugees*
KW	*Kilowatt*	**UNICEF**	*United Nations Children's Fund*
KWH	*Kilowatt-hour*	**UNITAR**	*United Nations Institute for Training and Research*
LED	*Light-emitting diode*	**UNRWA**	*United Nations Relief and Works Agency for Palestine Refugees in the Near East*
LPG	*Liquefied petroleum gas*	**USD**	*United States Dollar*
MEMR	*Ministry of Energy and Mineral Resources*	**VAF**	*Vulnerability Assessment Framework*
MOPIC	*Ministry of Planning and International Cooperation*	**WASH**	*Water, sanitation, and hygiene*
MOU	*Memorandum of understanding*	**WFP**	*World Food Programme*
MW	*Megawatt*		

Overview of common energy terms

Energy technologies, and the terms used to describe them, can vary between countries, contexts, and organisations. The descriptions used in this report aim to conform with the most commonly-used definitions but may differ from those used by other organisations. ●

TERM	DESCRIPTION
DISTRIBUTED GENERATION OR DECENTRALISED ENERGY SYSTEMS	*"Distributed generation" or "decentralised" energy systems generate power independently of the national grid network. These can be of any size, ranging from smaller systems for households or larger systems for public institutions or entire communities. Such systems can be powered by fossil fuels such as diesel or renewable sources such as solar. Some systems require the national grid to be available during use (but provide power that would have otherwise would have come from the grid) whilst others can provide power when the grid is unavailable.*
ENERGY EFFICIENCY	*Energy efficiency measures include any actions or interventions which reduce the overall energy used for or during an activity or process. These measures could be behavioural (such as shutting windows when air conditioning is in use) or technological (such as using LEDs rather than incandescent bulbs).*
NATIONAL GRID	*The national grid is the main electricity infrastructure of a country. It provides power through high-voltage transmission and distribution lines and is supplied by large-scale generation, such as fossil fuel power plants or utility-scale renewables. The national grid can provide high-quality and reliable electricity but in some contexts the supply may be unreliable or unavailable.*
NET METERING	*Net metering is a mechanism that allows customers which generate electricity to provide that power to another user and be credited for that electricity at a different point in the billing cycle, rather than needing to use it immediately themselves. For example a household with solar panels could generate electricity, provide it to the national grid, and subsequently receive credit which would reduce their overall electricity bill at the end of the month or year.*
POWER PURCHASE AGREEMENT (PPA)	*A power purchase agreement (PPA) is a long-term agreement for the sale of electricity from a generator to a consumer. The price, duration, and quantities are defined by each agreement but could vary between PPAs. For decentralised generation, a PPA could be between a buyer (such as a school or hospital) and the owner of power-generating equipment (such as solar PV, which could also be installed on the buyer's premises) without the involvement of the electric utility.*
PRODUCTIVE USES OF ENERGY (PUE)	*Productive uses of energy (PUE) include any applications of energy for businesses, income generation, or economic activity. This could include appliances or machinery to make work easier or more efficient, or to make new activities possible. PUE usually refers to electricity, but it also includes energy for cooking and other applications.*
SOLAR PHOTOVOLTAICS (PV)	*Solar photovoltaics (PV) use panels to convert light into electricity. Solar PV systems can generate electricity to be used immediately, stored in batteries, or sent to the national grid network.*
SOLAR WATER HEATING (SWH)	*Solar water heating (SWH) systems use panels to raise the temperature of water. This could be for domestic uses such as bathing or washing dishes, or in other settings such as for schools and hospitals.*
STANDALONE SYSTEM	*A standalone system can provide electricity independent of the national grid, either fully off-grid or as a backup power source. Any type of electricity generation could supply a standalone system but these are usually powered by diesel or solar with battery storage. Standalone systems typically refer to those which supply buildings or operational purposes such as water pumps, but could include any off-grid system such as a mini-grid.*

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Jordan has a long history of hosting displaced people including around 620,000 registered refugees from Syria, 2.3 million Palestine refugees registered with UNRWA (most of whom now have Jordanian citizenship), and many more from Iraq, Yemen, and other countries as of late 2024. Whilst more than 120,000 people live in Azraq and Zaatari camps, most refugees live alongside Jordanian citizens in cities and towns across the country.

Whilst many government, humanitarian, and development organisations provide support, displaced people in Jordan face many challenges including limited opportunities for work and low incomes. Public services, such as schools and hospitals, have been strained by serving the increased population including from the impact of increased energy costs. Programmes for scaling up sustainable energy and energy efficiency have supported households, businesses, and public institutions in reducing energy consumption and costs, but many challenges remain.

Sustainable Development Goal 7 (SDG 7) calls for universal access to affordable, reliable, sustainable, and modern energy for all by 2030 – including people affected by displacement and their host communities. The Roadmaps for Energy Access in Displacement Settings (READS) Programme aims to support the achievement of SDG 7 in ten countries which host large populations of forcibly displaced people. This report consolidates the status of sustainable energy access among displacement-affected communities in Jordan, provides an overview of the stakeholders working towards SDG 7, and presents opportunities for high-impact projects to scale up sustainable energy and energy efficiency for displaced people and host communities in Jordan.

Energy for people living in camps

Electricity needs in Azraq and Zaatari camps are served through large-scale solar power plants and supplemented with off-site solar generation, with all shelters in the camps having electricity connections to provide lighting, phone charging, televisions, fans, and domestic appliances. Studies by UNHCR in 2018 found that electricity access had a benefits on households' wellbeing including through spending more time with family and friends, accessing media, supporting health-related impacts such as storing medication, and reducing food waste. The electricity network also supplies power to market streets in the camps and to humanitarian organisations providing services for camp residents.

Despite these benefits, the limited duration of power means that shelters lack electricity for most of the day: the plants were designed to supply around 12 hours of power per day but, owing to high demand and network capacity issues, the systems now provide around 6 hours of electricity per day depending on demand and weather conditions. Rehabilitating the camp network and increasing electricity generation, either on- or off-site, could increase the amount of power available to camp residents but would require significant investment in infrastructure.

Most households in Azraq and Zaatari camps use gas for cooking and distribution programmes ››

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have been in place for many years. Gas is also used for heating, including through additional support during winterisation packages, but the condition of shelters can make this inefficient and UNHCR estimated in 2024 that around half of shelters required some level of maintenance or support.

The amount of gas received by households as part of distribution programmes typically does not last the expected period and so refugees are required to purchase more, albeit at government-subsidised rates. The available funding for shelter rehabilitation is far below the needs in the camp and so shelters often offer poor thermal insulation whilst weather damage and wear and tear, such as cracks and mould, reduce the comfort of living conditions. Improving shelters with energy-efficient upgrades could improve thermal efficiency and reduce gas usage, potentially reducing energy costs for organisations responsible for energy distribution and households in the camps.

Energy for people living in urban settings

The majority of refugees live in urban areas and, despite living side-by-side with Jordanian citizens, face many additional energy-related challenges. Almost all households have a connection to the national grid network but UNHCR studies found that more than half struggled to pay bills; expenditure on electricity increased significantly since the removal of subsidies in 2022 and households reduced their consumption as a result. Interviews with Syrian refugees living in Amman also found that high bills were amongst respondents' greatest concerns, with their living situation – mostly rented accommodation – preventing them from accessing cost-saving measures such as solar panels.

Displaced people living in urban settings mostly use gas for cooking and heating. Like people living in camps, households in urban areas face high costs for fuel in the wintertime, with interviewees sharing that gas consumption increased two to three times during the coldest months.

Whilst all residents of Jordan face high energy costs, people living in rented accommodation – especially vulnerable people, including refugees – face additional challenges to reducing their expenditure. Interviewees in Amman shared that landlords often refused to install cost-saving measures (as these would require an investment from the property owner but the benefits would be enjoyed by the bill-paying tenant); households which could afford to install measures themselves, meanwhile, had no guarantee that they would be able to stay at the property long enough to break even.

Targeted financial assistance for vulnerable households struggling to pay their bills could provide immediate support to struggling families, whilst replicating successful agreements with landlords to provide renewable energy measures in exchange for rental guarantees could provide longer-term savings. ››

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Energy for public institutions

The influx of Syrian refugees into Jordan has greatly increased the number of people relying on key public services, especially for education and healthcare. Refugees in urban areas use the same schools and hospitals as Jordanian citizens and this increased demand has resulted in a corresponding increase in energy consumption and costs.

Many schools, especially in the northern governorates, hold a teaching session in the morning for Jordanian children and a second in the afternoon for Syrian children. This has extended school operating times, in some cases for nine hours per day over six days per week. Several programmes have implemented energy efficiency and renewable energy initiatives in schools to help reduce energy costs: these have been funded by the Jordan Renewable Energy and Energy Efficiency Fund (JREEEF), international donors, and private foundations, and have been implemented by organisations including NRC, Mercy Corps, and government ministries, as well as the private sector.

Hospitals and health centres expanded their services to Syrian refugees seeking care alongside local communities and, as a result, facilities in northern and central governorates observed an increase in energy demand by between 20% and 200% from 2011 to 2015. Similar to schools, health centres have been the focus of energy-saving interventions such as large-scale solar systems and energy efficiency upgrades through the work of government ministries, NGOs, humanitarian organisations, and the private sector.

Public facilities have been relatively well-served by renewable energy and energy efficiency programmes but many challenges still remain. The lack of data on energy consumption (such as due to missing energy bills or inconsistent monitoring) often makes it hard to assess where energy savings could be made. Electricity bills sometimes go unpaid, meaning that utilities can refuse to connect new solar equipment, and any savings from energy interventions are received by the Ministry of Finance – as the ultimate budget holder – rather than the facilities themselves. Improving and centralising data collection, designing budgetary agreements to share savings, and overcoming historic debts could each help to scale up renewable energy measures for schools and health facilities. ››

BARRIER	OPPORTUNITY
Limited duration of electricity supply in camps	Rehabilitate the network, increase the generation capacity of the solar plants, and install energy monitoring devices
Low budgets for camp shelter rehabilitation and energy efficiency upgrades	Coordinate with existing shelter maintenance programmes to integrate energy-related improvements
High electricity and heating bills for refugees living rented accommodation in urban areas	Reduce tariffs and use long-term rental agreements to install energy-saving equipment in partnership with landlords
Sparse data and facility-level energy assessments for public buildings	Work directly with facility managers and install energy monitoring devices
Financial savings from energy interventions do not directly benefit individual public buildings	Develop agreements between government departments to return savings to the facilities which generate them

As Jordan continues its progress towards increasing renewable energy and energy efficiency, it remains critical to ensure that its large population of displaced people also benefits from the advantages that sustainable energy can bring.

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Stakeholders in Jordan

Sustainable energy in displacement settings in Jordan is delivered through a complex network of stakeholders, each with its own mandates, projects, and objectives. Some organisations operate nationally or internationally, whilst others focus on issues in specific settings such as camps or urban areas.

Humanitarian and development organisations offer a wide variety of essential support to refugees, including energy-related programmes in collaboration with partners. Jordan has a well-developed private sector with many experienced companies capable of delivering renewable energy solutions and energy efficiency upgrades for households and public buildings alike, and these are supported by industry associations and advocacy organisations. The JREEEF has been instrumental in providing financing for many of Jordan's sustainable energy programmes, including those which have supported displaced people and the facilities they rely on. ››

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Opportunities to scale up sustainable energy

Increasing the uptake of sustainable energy and improving energy efficiency will require a concerted effort from stakeholders across Jordanian society. Humanitarian and development organisations, the private sector, government ministries, and many others will need to provide support for sustainable energy interventions, and the involvement of community members in the design of solutions will be crucial to ensure that projects meet their needs.

The READS workshop brought together a diverse range of stakeholders to co-design potential high-impact projects. Whilst each of these opportunities merits individual investment and implementation coordinated interventions across several sectors could have a truly catalytic effect on increasing the uptake of renewable energy and energy efficiency as a whole.

As Jordan continues its progress towards increasing renewable energy and energy efficiency, it remains critical to ensure that its large population of displaced people also benefits from the advantages that sustainable energy can bring. Despite ongoing uncertainty regarding the future of Syrian refugees in the country, scaling up sustainable energy for households in camps and urban areas, as well as the public services that both host communities and displaced people rely on, can provide more affordable and, clean energy for all residents of Jordan.

TABLE 1

High-impact project concepts to increase sustainable energy access with estimates of their potential reach, duration, budget, and scalability.

PROJECT	NAME	REACH	DURATION	BUDGET	SCALABILITY
1	*Increasing electricity availability for businesses in camps*	*2500 businesses*	*4 years*	*$2 million*	*Moderate*
2	*Vocational training for energy efficiency*	*100 trainees*	*2 years*	*$250,000*	*High*
3	*Energy efficiency upgrades for vulnerable households*	*500 households*	*3 years*	*$1 million*	*High*
4	*Electric cooking in Azraq and Zaatari camps*	*200 households*	*2 years*	*$100,000*	*High*
5	*Energy cost reductions for public buildings*	*100 public buildings*	*3 years*	*$750,000*	*High*

01

Setting the scene

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Setting the scene

Jordan has a long history of hosting displaced people. As a result, the country has established coordination mechanisms to ensure that governmental, humanitarian, and development organisations are able to provide assistance for refugees and vulnerable citizens. Jordan also has a well-developed energy sector which supports renewable energy and energy efficiency through its national policies, a wide variety of programmes, and a diverse private sector. Despite this, many challenges remain for both displaced people and the organisations that provide them with essential services.

Syrian refugees living in Zaatari and Azraq camps have access to electricity networks powered by solar energy but only for limited hours of the day, whilst far more displaced people in urban areas face high utility bills. In both camps and the host communities, many refugees' homes are often poorly insulated, which makes heating and cooling inefficient and costly. In the 10 official and three unofficial camps for Palestine refugees, meanwhile, grid connections are common but utility costs are high. Across Jordan public buildings, such as schools and hospitals, have extended their services to greater numbers of people and, as a result, use more energy at greater costs which diverts funds from other areas of programming.

Stakeholders from across Jordanian society and international organisations have implemented energy programmes to increase the uptake of renewable energy and energy efficiency to respond to these challenges. Whilst these have provided tangible benefits, more investment is required to develop long-term solutions that match the scale of the needs of displacement-affected communities in Jordan.

Addressing the challenge of achieving universal access to sustainable energy in displacement settings requires coordination at all levels – from local to global [1]. International targets for energy access are met through implementation on the ground with each country, region and community needing tailored consideration and planning to reach this shared goal.

Acknowledging this, the READS Programme aims to provide a country-level overview of sustainable energy and its benefits for Jordan's displaced and vulnerable populations. With the Programme working across ten countries, Jordan is the second country in the Middle East to be featured in a READS Roadmap Report after Lebanon, and the sixth in the series which includes reports focusing on Kenya, Uganda, Rwanda, and Ethiopia.

A goal of the READS Programme is to identify new opportunities for high-impact projects to increase sustainable energy access by consolidating the existing knowledge on sustainable energy in displacement settings. This includes pub- ››

At the READS workshop, stakeholders shared their experience through co-designing potential high-impact sustainable energy projects.

Setting the scene

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lished literature – such as government policies, programme output reports, datasets, academic papers, and press releases – as well as the experiences and expertise of practitioners implementing projects and, most importantly, of community members.

In support of this, the READS Programme hosted a workshop in Amman in April 2024 to engage with these stakeholders. Participants included representatives of displaced communities, humanitarian and development organisations, the private sector, and government authorities, among others. To complement existing literature which mostly focuses on people living in camps, the READS Programme undertook interviews with refugees living in Amman to better understand the situation, energy needs, and priorities for the majority of displaced people who live in urban areas around Jordan.

Using published literature, the knowledge and experiences shared during the workshop, and primary qualitative research, the READS Jordan Roadmap Report highlights the most pressing gaps, barriers, and opportunities for providing sustainable energy to some of Jordan's most vulnerable communities, as well as the roles of the stakeholders involved. It also provides a spotlight for potential high-impact projects, co-designed in the workshops by stakeholders from different types of organisations, which could rapidly and radically scale up sustainable energy in the country if they received support and investment.

The energy needs of each community, household, business, or public facility vary, as do the most effective ways of addressing them. This report aims to be as broad as possible in covering different kinds of sustainable energy, and as comprehensive as possible in each topic, but is inherently limited by the nascent nature of this area of research and the uniqueness of each context. The authors hope that further research – perhaps focusing on specific areas of energy access, settlements, or the impact of new projects – can build on this report by diving deeper into these areas and promote a greater uptake of sustainable energy in displacement contexts. ●

The ongoing situation in Syria

On 8 December 2024 the regime led by Bashar al-Assad collapsed during major offensives by opposition forces and was replaced by the Syrian transitional government. Whilst the situation remains uncertain, after more than 13 years of civil war there is renewed hope that Syrians who fled the country – seeking refuge from the war or the Assad regime – may be able to return home.

Regional leaders have called for backing of a Syrian-led process to rebuild the country as a secure and stable state, including humanitarian assistance for the safe and voluntary return of Syrian refugees [2]. UNHCR has acknowledged that stabilisation in Syria might encourage some people to consider returning but, as the situation will take time to develop, any returns should be voluntary and the legal protections afforded to Syrians have not changed [3]. UNHCR reported that 5,100 Syrian refugees returned to Syria in December 2024, a significant increase compared to previous months and more than the total for all of 2023 [4].

An Oxfam study in December 2024 found that 45% of focus group participants expressed a willingness to return to Syria under specific conditions, 36% firmly opposed the idea, and 19% were undecided [5]. It also highlighted that the decision to return is closely related to individual circumstances and is a multifaceted issue dependent on both emotional connections and practical considerations. A UNHCR flash intention survey conducted in January 2025, meanwhile, found that 40% of surveyed refugees in Jordan planned to return to Syria in the next 12 months and 34% intended to return in the next five years [6]. Respondents were mainly concerned about the availability of housing or property (66%), safety and security concerns (51%) and the availability of public services (41%).

The fundamental change in the situation in Syria could have radical implications for Syrians living in Jordan in terms of the number of people remaining in the country, the type and level of support they receive, and policies which affect them, amongst other issues. Whilst hoping for a swift and peaceful transition, most stakeholders anticipate that the situation in Syria will take time to stabilise and long-term durable solutions may not be immediately available.

The READS Jordan report was largely drafted before December 2024 and, as a result, represents the situation for displaced people living in Jordan before the fall of the Assad regime. Rather than speculating on future scenarios, the READS Jordan report reflects the situation as it was at the time of writing. Readers should therefore be mindful that conditions in Syria could change significantly and, as a result, affect the circumstances of Syrian refugees living in Jordan. ●

Whilst the situation in Syria remains uncertain, there is renewed hope that those who fled the country will soon be able to return home.

02

Forced displacement in Jordan

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National overview

The Hashemite Kingdom of Jordan has a population of around 11.5 million people [7]. Jordan is a lower middle-income country with 63% of its population below the age of 30, and its capital city, Amman, is the political, cultural, and economic centre of the nation. The most recent General Population and Housing Census in 2015 found that non-Jordanians composed around 30% of the country's population and around half of those (1.3 million people) were Syrian [8].

Jordan has a long history of hosting refugees and has the second-highest share of refugees per capita in the world [9]. Almost 690,000 refugees were registered with the Office of the United Nations High Commissioner for Refugees (UNHCR) as of late 2024 [10], 85% of whom had been in Jordan for 10 years or more [11]. Jordan also hosts more than 2 million Palestine refugees registered with the United Nations Relief and Works Agency for Palestine Refugees in the Near East (UNRWA), the largest number of all UNRWA fields of operation, with most having Jordanian citizenship [12].

Jordan has limited natural resources including agricultural land, energy, and water and so the large number of displaced people has added pressure to the country's budget, infrastructure, and labour market. Despite these challenges, Jordan has maintained stability and sustained an average growth rate of 2.5% over the past decade attributed to its strategic geopolitical positioning and recent political reforms. However, there is a pressing need to create jobs for Jordan's young population and to increase female participation in the labour market. The unemployment rate was 21.4% in the second quarter of 2024, still well above the levels seen before the COVID-19 pandemic, and the country is focusing on enhancing job creation, bringing more women into the workforce, and improving social protection programmes and sustainable resource management [13, 14].

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Displaced populations in Jordan

Overview

Jordan hosts many displaced people from conflict-affected countries. Approximately 620,000 registered Syrian refugees reside in Jordan (see Table 2) and live in all regions of the country with a significant concentration in the capital, Amman, and the northern governorates such as Irbid and Mafraq. Around 82% of the refugees live in urban areas alongside their host communities, while the remaining 18% reside in official camps [15]. Following a government decision, the registration of new asylum seekers with UNHCR has been suspended since January 2019 [16].

Zaatari Camp, in the north of the country around 10 km from the city of Mafraq, houses around 82,000 Syrian refugees as of late 2024 whilst Azraq Camp, in the northeastern Zarqa governorate, is home to around 40,000 Syrian refugees. Other significant populations include almost 50,000 refugees from Iraq, nearly 13,000 refugees from Yemen, and more than 5,000 refugees from countries including Sudan, Somalia, and others. In addition, Jordan hosts more than 2 million Palestine refugees, the majority of whom hold Jordanian citizenship. More than 20,000 Palestine refugees originally registered in Syria were also hosted by Jordan as of the end of 2023 [17]. ››

TABLE 2

The population of Jordan [18], the number of refugees in Jordan registered with UNHCR [10], and the number of Palestine refugees in Jordan registered with UNRWA [12].

		PEOPLE	%
POPULATION	**TOTAL**	***11,439,213***	***100***
	RURAL	*912,849*	*8.0*
	URBAN	*10,526,364*	*92.0*
REFUGEES REGISTERED WITH UNHCR	**TOTAL**	***689,880***	***100***
	SYRIA	*621,182*	*90.0*
	IRAQ	*49,793*	*7.2*
	YEMEN	*12,755*	*1.8*
	SUDAN	*4,934*	*0.7*
	OTHERS	*1,216*	*0.3*
REFUGEES REGISTERED WITH UNRWA	**TOTAL**	***2,307,011***	-

Displaced populations in Jordan

Syrian refugees in Zaatari and Azraq camps

Both Zaatari and Azraq camps are jointly administered by UNHCR and the Government of Jordan (GoJ) through the Syrian Refugee Affairs Directorate (SRAD). UNHCR, as the lead agency for refugees in the country, leads on camp coordination and supports displaced people's basic needs, community and economic empowerment, health, protection, security, and shelter [15]. UNHCR facilitates the issuance of civil status documents such as birth, death, and marriage certificates and offers protection services including legal assistance, documentation, and referrals for child protection and gender-based violence. A summary of the living conditions in the camps reported in the Vulnerability Assessment Framework (VAF) from 2024, a socioeconomic survey of refugees living in the camps, is shown in Table 3. ››

TABLE 3

Summary of findings comparing living conditions in Zaatari and Azraq camps from UNHCR's Vulnerability Assessment Framework (2024) [15].

METRIC	ZAATARI	AZRAQ
DEPENDENTS PER ADULT	*3.3*	*3.1*
SHELTERS WITH SUBSTANDARD ROOFS	*75%*	*42%*
SHELTERS WITH 5+ INDIVIDUALS	*13%*	*46%*
HOUSEHOLDS WITH ACCESSIBLE LATRINES	*90%*	*88%*
AVERAGE MONTHLY SPENDING ON WASH SERVICES	*19 JOD*	*17 JOD*
EMPLOYMENT RATE IN 2024 (CHANGE SINCE 2021)	*25% (-3%)*	*22% (-2%)*
JOBS WHICH ARE IBV-BASED	*28%*	*62%*
ACCEPTABLE FOOD CONSUMPTION (CHANGE SINCE 2021)	*75% (-13%)*	*64% (-21%)*
MONTHLY INCOME (CHANGE SINCE 2021)	*147 JOD (-41 JOD)*	*168 JOD (-25 JOD)*
HOUSEHOLD DEBT	*969 JOD*	*838 JOD*
MONTHLY HEALTH-RELATED SPENDING	*30 JOD*	*25 JOD*

Displaced populations in Jordan

Home to around 82,000 Syrian refugees, Zaatari camp has become a symbol of Syrian displacement throughout the Middle East since its establishment in 2012 [19]. Over time the camp has grown significantly and now includes over 26,000 prefabricated shelters. Owing to the age of these structures, there are ongoing efforts to maintain and upgrade them as funding allows. Seasonal challenges, such as impassable roads during winter, are addressed through infrastructure improvements.

Partnerships with governmental and international organisations support the delivery of services, including through 58 community centres, and aim to ensure that Zaatari continues to provide a stable and resilient environment [19]. Residents of Zaatari camp receive quarterly cash assistance from UNHCR to cover essential needs and have access to a range of livelihood opportunities, including operating informal shops and engaging in incentive-based volunteering (IBV). Education is supported by UNICEF, with around 22,600 children enrolled in formal education and additional support available for children with disabilities. Health services are provided through six medical facilities although funding constraints have limited some services. Food security is under the remit of the World Food Programme (WFP) which provides monthly assistance and school feeding programmes; meanwhile water, sanitation, and hygiene (WASH) needs are supported by UNICEF, which provides clean water and manages wastewater treatment. Zaatari receives power from its own solar plant.

Opened in 2014 to alleviate overcrowding in Zaatari, Azraq camp currently hosts around 40,000 Syrian refugees. Spanning almost 15 km², the camp is divided into four villages which aims to foster a stronger sense of ownership and community among the residents. Like Zaatari, Azraq camp offers essential facilities including a hospital, health clinics, schools, and community centres, and electricity is supplied from its solar power plant.

The camp is equipped to meet the basic needs of its residents through well-established support systems. UNHCR provides cash assistance upon arrival and regularly thereafter to help refugees purchase essential items, with most households receiving funds via mobile wallets. Livelihood opportunities within Azraq are supported through the IBV scheme which enables refugees to earn income by engaging in activities like translation, cleaning, and administrative work. Additionally the camp's market features around 390 shops run by refugees and Jordanians. The Azraq Camp Employment Office, established in collaboration with the International Labour Organization and the Ministry of Labour, facilitates work permits for refugees to seek employment outside the camp as well as providing work-related counselling and job-matching services.

UNICEF supports the Ministry of Education to ensure access to quality education for all school-aged children. Over 11,800 children are enrolled in formal education with additional support for children with disabilities and initiatives to address learning loss from the COVID-19 pandemic. Health services are robust, with three primary healthcare centres and a hospital offering a range of services including acute and chronic care, reproductive health, vaccinations, mental health, dental care, and paediatric services. Advanced medical services are also available at the camp's hospital.

UNICEF also leads WASH services and aims to provide a reliable water supply and proper waste management, with refugees receiving up to 68 litres of water per person per day in summer [20]. Azraq camp's infrastructure includes "caravan"-like shelters that have been upgraded with kitchens and expanded living spaces with each shelter connected to the camp electricity network. ››

Displaced populations in Jordan

Refugees in urban settings

More than 80% of refugees registered with UNHCR live in urban areas around the country. UNHCR's VAF in 2024 evaluated the living conditions of both Syrian and non-Syrian refugees (90% and 10% of the displaced populations respectively, and composing 89% and 11% of respondents) living in host communities, primarily towns and cities [21]. Most refugees live in formal homes but some (16% of Syrians and 12% of non-Syrians) live in informal shelters, such as unfinished buildings or tents. 69% of refugee households were found to live in substandard conditions characterised by the absence of natural lighting or ventilation, unsafe electrical wiring, inadequate protection, and homes with leaking roofs or broken windows. The VAF found that 93% of refugees rent their homes and 44% lack formal rental agreements to protect them against eviction. Monthly rent costs rose since the previous VAF in 2021, to 138 Jordanian Dinar (JOD, $195, 1 JOD = 1.41 USD) for Syrians and 149 JOD ($210) for non-Syrians, and electricity costs increased to 27 JOD from 20 JOD (to $38 from $28) owing to subsidy cuts.

The VAF assessed the employment of refugees living in host communities and found an employment rate of 33% amongst Syrian refugees compared to 17% amongst non-Syrians (down from 29% in 2021). Only 7% of Syrians held a work permit, citing high costs of renewal, and across all respondents there was a significant gender disparity with 55% of men employed compared to just 7% of women. The most common employment sectors were construction, agriculture, and accommodation and food services. Workplace hazards (reported by 82% of Syrians and 75% of non-Syrians) and a lack of contracts and low wages (66% and 73%) were common issues.

Syrian families had an average income from work of 116 JOD ($164) per month and generally relied on work for income. Non-Syrians, however, had an average income of 63 JOD ($89) per month and relied on more diverse income sources owing to limited job opportunities. The total average monthly household income from all sources was 217 JOD ($306) for Syrian households (down from 246 JOD, $347, in 2021) and 200 JOD ($282) for non-Syrians (down from 202 JOD, $285).

The VAF found that poverty rates amongst refugees increased from 57% in 2021 to 67% in 2024, with both Syrian and non-Syrian refugees decreasing their spending (from 83 JOD to 80 JOD, $117 to $113, and from 108 JOD to 106 JOD, $152 to $149, respectively). Against a backdrop of rising prices and limited humanitarian cash assistance, households prioritised spending on rent and food. The average debt of refugee households was estimated at six times their monthly income. The evaluation of other aspects of refugees' living conditions, such as WASH, education, and health, were assessed in the VAF with selected statistics shown in Table 4. ››

TABLE 4

Selected information comparing living conditions of Syrian and non-Syrian refugees residing in host communities from UNHCR's Vulnerability Assessment Framework [21].

METRIC	SYRIAN	NON-SYRIAN
HOUSEHOLDS WITH ACCESSIBLE LATRINES	*93%*	*92%*
EMPLOYMENT RATE IN 2024 (CHANGE SINCE 2021)	*33% (0%)*	*17% (-12%)*
MONTHLY INCOME (ALL SOURCES)	*217 JOD*	*200 JOD*
MONTHLY HEALTH-RELATED SPENDING	*41 JOD*	*46 JOD*
WORKING CHILDREN (AGES 5-17)	*11%*	*6%*
SCHOOL ENROLMENT (AGES 5-18)	*78%*	*84%*

Displaced populations in Jordan

Palestine refugees

More than 2.3 million Palestine refugees registered with UNRWA live in Jordan [12]. Around 18% live in ten recognised Palestine refugee camps located around the country (see Table 5) with others living nearby or in three unofficial camps. Most camps have similar socioeconomic conditions and, amongst other issues, poverty and high unemployment are commonplace. The population of each camp varies with Baqa'a camp, the largest in the country, hosting more than 131,000 UNRWA-registered refugees as of April 2023. UNRWA does not administer or police the camps but provides education and health services within them, with some UNRWA schools and hospitals equipped with solar systems to offset high utility costs.

Most Palestine refugees have been resident in Jordan following their displacement (or that of their families) as a result of the wars in 1948 and 1967. While most of these people now have Jordanian citizenship, approximately 178,000 Palestine refugees who fled from Gaza to Jordan in 1967 – most of whom now live in Jerash camp – do not have citizenship and therefore face restricted access to public services and livelihoods opportunities; as a result they remain some of the most vulnerable in Jordanian society [22]. More than 20,000 Palestine refugees from Syria have also been registered by UNRWA in Jordan but, without legal status in the country, they remain particularly vulnerable as they have limited access to job opportunities, humanitarian assistance, and public services. ››

TABLE 5

The ten recognised Palestine refugee camps in Jordan [12].

CAMP	ESTABLISHED	LOCATION	AREA (KM²)	UNRWA SCHOOLS	UNRWA HEALTH CENTRES
AMMAN NEW CAMP (WIHDAT)	*1955*	*Southeast of Amman*	*0.48*	*7*	*1*
BAQA'A	*1968*	*20 km north of Amman*	*1.4*	*16*	*2*
HUSN (MARTYR AZMI EL-MUFTI)	*1968*	*80 km north of Amman*	*0.77*	*6*	*1*
IRBID	*1951*	*Near Irbid*	*0.24*	*4*	*1*
JABAL EL-HUSSEIN	*1952*	*Northwest of Amman*	*0.42*	*4*	*1*
JERASH (GAZA)	*1968*	*Jerash*	*0.75*	*5*	*1*
MARKA (HITTEN)	*1968*	*10 km northeast of Amman*	*0.92*	*10*	*1*
SOUF	*1967*	*Jerash*	*0.5*	*4*	*1*
TALBIEH	*1968*	*35 km south of Amman*	*0.13*	*4*	*1*
ZARQA	*1949*	*Zarqa*	*0.18*	*4*	*1*

Displaced populations in Jordan

Refugees from Iraq

Most Iraqi refugees in Jordan arrived following their displacement due to the 2003 Iraq war, and the number of displaced people from Iraq increased further during the rise of ISIS and ongoing instability in their home country. The number of Iraqi refugees in Jordan is substantial but difficult to determine precisely, with around 50,000 people registered with UNHCR [10].

The majority of Iraqi refugees live in urban areas, particularly in Amman and other cities such as Zarqa and Irbid. This urban living arrangement presents its own set of challenges including higher living costs and competition for limited job opportunities. While there are no large-scale camps for Iraqi refugees, they receive assistance through various programmes aimed at integrating them into Jordanian society. UNHCR and Jordanian government agencies provide support and services to these refugees although many still face challenges related to employment, healthcare, and education. Official assistance includes cash support, access to education and healthcare, and protection services.

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Policy frameworks for displaced populations

Displaced people in Jordan are subject to a range of policies and frameworks which govern their rights, access to public services, and other critical aspects of everyday life. Jordan is not a signatory to the 1951 Refugee Convention or its 1967 Protocol; however, it has signed a memorandum of understanding (MoU) with UNHCR in 1998 which aligns with the Convention's definition of 'refugee' and commits to the principle of non-refoulement. In addition, the Jordanian constitution protects political refugees from extradition. Despite this, protection mandates have faltered. The 1998 MoU initially designated refugee presence as temporary, allowing for a six-month stay, with a mandate for finding a permanent solution (restricted to resettlement or voluntary return to their home country) through UNHCR. In 2014, this period was extended to one year; while this is stated in the law, its application can vary.

The absence of a specific asylum law in Jordan presents numerous legal and practical obstacles for refugee communities, many of whom have resided in Jordan for decades. Refugees are exempt from the jurisdiction of the Residence and Foreigners Affairs Law, which applies to other foreigners living in Jordan. Palestine refugees, meanwhile, are under the jurisdiction of the Department of Palestinian Affairs [23]. Established in 1988 after the legal and administrative disengagement with the West Bank, and the successor organisation of several ministries and committees formed after displacements since 1948, it supervises the affairs of Palestine refugees, oversees UNRWA's activities and programmes and those of international non-governmental organisations (NGOs), and works to maintain the infrastructure of the camps in collaboration with other ministries and governmental institutions.

Despite the lack of a comprehensive legal framework, Jordan has been recognised for providing asylum and access to services for refugees from many countries. UNHCR acknowledges that Jordan has granted Syrian refugees access to health, education, and other services in host communities, but Syrian refugees are referred to as "visitors" or "guests" by the Jordanian government without being granted residency. Instead, under the 1998 MoU, they are granted certain rights including the freedom to practise religion, access to courts, and exemption from overstay fines. However, concerns about the social and economic burden of refugees persist, impacting policy clarity and legal protection [24].

The Jordan Response Plan for the Syria Crisis (JRP) was developed to provide cross-sectoral coordination between the GoJ and humanitarian and development stakeholders [25]. With overall supervision from the Ministry of Planning and International Cooperation (MoPIC) and funding from the United Nations Development Programme (UNDP), the JRP outlines frameworks for what is needed in different sectors to assist Syrian refugees and vulnerable Jordanians, the processes for gaining approvals, and taskforces in each area to discuss specific needs and agree on priorities for funding. The JRP components include health, education, shelter, WASH, economic empowerment, social protection and justice, and public services [26]. After a streamlining of the components for the JRP 2020-2022, energy was included under public services and, as of the JRP 2023 update, has an estimated budgetary requirement of almost $41 million [27].

To foster collaboration between humanitarian, development, and government partners, the Inter-Sector Working Group (ISWG) aims to provide a framework for different organisations to work together to address the challenges faced by refugees [28]. The ISWG was established to support coordination, advocacy, strategic and operational planning, and overall resource mobilisation. It also facilitates the exchange of information between organisations, the standardisation of frameworks and workplans, and the active engagement of both the GoJ and refugee communities. The Inter-Agency Coordination Unit at UNHCR supports the ISWG and is responsible for coordination with the GoJ regarding national frameworks, such as the JRP.

In addition to the national response to the Syria crisis, Jordan is also included in the Regional Refugee & Resilience Plan (3RP) which aims to provide strategic planning and coordination of humanitarian and development partners across Jordan, Lebanon, Türkiye, Iraq, and Egypt [29]. The 3RP aims to provide a coherent regional plan which aligns with country-specific plans, such as the JRP, to highlight specific needs and channel funding to key areas.

Cash assistance and access to financial services

Since 2015, Jordan has seen a steady increase in access to financial services [30]. This has been supported by the Central Bank of Jordan's efforts to promote financial inclusion, culminating in a National Financial Inclusion Strategy 2018-2020, which was ratified in 2017. It identified refugees as a target population and eased regulations on organisations working on digital financial services. The potential of mobile wallets was recognised as a way to increase access to finance by allowing refugees to make payments, accumulate savings, receive remittances, and obtain a credit rating which could support them in taking out loans.

For this purpose several initiatives were launched, such as the Jordan Payments and Clearing Company (JoPACC) and its payment platforms JoMoPay and CliQ, which facilitate mobile payments and make transactions possible between bank accounts and mobile wallets [30]. The eFAWATEERcom platform has become widely used for making online bill payments, including through mobile wallets, whilst Cairo Amman Bank has become a world leader in iris scanning technology which is frequently used in systems that support financial services for refugees.

Although COVID-19 had a severely detrimental impact on refugees and Jordanians alike, it created huge momentum for the digitisation of payments [30]. The number of mobile wallets expanded from around 600,000 in January 2020 to more than 2,000,000 by October 2022. This was supported by the National Aid Fund which moved its delivery of assistance to vulnerable Jordanians to mobile wallets during lockdown.

This momentum has been matched by initiatives from humanitarian organisations to digitise aid payments. Refugees in Azraq and Zaatari camps receive cash assistance from UNHCR on a quarterly basis for essential items to meet their basic needs [19, 20]. In 2018 UNHCR began moving its clients to mobile wallets and, by 2022, it provided cash assistance through mobile wallets to 95% of refugees in Azraq and Zaatari camps and to 30% of refugees living outside of camps [30]. As of 2024, 99% of households in the camps receive cash assistance via mobile wallets and UNHCR has worked with Cairo Amman Bank to install ATMs in the camps to facilitate access to cash [19, 20]. Despite the increase in access to mobile wallets, access is mostly restricted to Syrian refugees only since most non-Syrian refugees do not have the necessary documentation. There is also a considerable gender gap in access to mobile payments with male users (63%) far outnumbering female users (37%). This is likely a reflection of the fact that, in most cases, the head of household and main participant in the labour force is male, whilst women typically take care of the children and home, and receive cash directly from their husband.

In addition, WFP provides all refugees residing in camps with 15 JOD ($21) per person per month to meet their dietary needs and has also expanded the use of mobile wallets in five governorates. This support from WFP has decreased significantly, however, and represents a 65% reduction in the amounts disbursed in previous years owing to funding cuts. ●

99%

of households received cash assistance via mobile wallets in 2024.

Livelihoods and employment

Syrian refugees in Jordan have been permitted to work in a limited number of sectors since 2016 such as agriculture, construction, and manufacturing; in 2021 this was expanded to all sectors open to non-Jordanians [31]. Refugees can now work in industries such as services and sales, as skilled workers in agriculture, fisheries, and factories, or as maintenance workers for electricity and air conditioning systems. This relies on individuals receiving work permits: in 2021, 62,000 work permits were issued to Syrian refugees of which half were flexible, allowing holders to move between similar jobs in the same sector, to a different employer, and to other areas of the country. Non-Syrians, meanwhile, are excluded from work permit schemes [21]. Previously Syrians were exempted from paying for work permits aside from a 10 JOD ($14) administrative fee and all workers, both Jordanians and non-Jordanians, must contribute to social security [21]. In October 2023, these payments increased from 18 JOD to 56.55 JOD ($25 to $80) per month for those with flexible work permits and, in July 2024, the exemption for Syrians was removed meaning that – with limited exceptions such as cash-for-work schemes – they now must pay the same fee for work permits as all non-Jordanians.

The VAF found that sector-specific restrictions compounded challenges to accessing jobs but the primary barrier was the overall scarcity of job opportunities: the unemployment rate across Jordan's labour market was 22.3% in 2023, 24% for Syrian refugees, and 42% for non-Syrian refugees [21]. The primary reason for working-age Syrians not participating in the labour force was household responsibilities whilst for non-Syrians it was due to other reasons, primarily legal restrictions and a lack of documentation according to the VAF.

Syrian refugees living in the camps are also able to access work permits. The Zaatari Office of Labour – a partnership between the International Labour Organization and the Ministry of Labour – issued 26,500 work permits between 2017 and 2023 to facilitate access to formal jobs outside the camp [19]. Its equivalent in Azraq, the Azraq Camp Employment Office, provided 1,300 work permits in 2023 of which 10% of which were issued to women [20]. The VAF reported that 9% of refugees in camps had a work permit in 2024, down from 16% in 2021, and 59% of those with permits were employed [15].

IBV is also a key source of income and an important component of delivering humanitarian services in the camps: owing to Azraq's remote location IBV roles represent 62% of jobs, compared to 28% in Zaatari [15]. At the end of 2023, around 10% of Zaatari residents aged over 18 (around 3,000 people) were involved in IBV schemes [19], whilst 3,800 refugees (of whom 46% were female) were involved in Azraq [20].

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03

National energy context of Jordan

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National policy overview

Jordan has a well-developed energy sector and universal access to electricity and clean cooking [32]. The majority of its total energy supply – including for industry, transport, households, and other uses – comes from fossil fuels such as oil (54%), gas (33%), and coal and others (3%), with a small proportion coming from renewables (10%). Whilst most of Jordan's electricity supply is sourced from fossil fuels, between 2017-2022 the share of electricity coming from renewables more than tripled to 24%.

Jordan has very high levels of solar irradiance, suitable for both electricity generation and heating water, as well as abundant wind resources. As a result, two-thirds of Jordan's renewable electricity comes from solar photovoltaics (PV) with wind power providing the remainder. Jordan continues to add generation capacity to meet its national energy demand and increased its solar capacity by 24 MW in 2023, but this was outweighed by an additional 235 MW of non-renewable electricity generation during the same year. Overall, Jordan has strong policies towards both renewable energy and energy efficiency (EE) compared to regional and global averages, as shown in Table 6.

TABLE 6

Regulatory Indicators for Sustainable Energy (RISE) Pillars for Jordan and the regional and global averages [33].

RISE PILLAR	JORDAN	MIDDLE EAST AND NORTH AFRICA	GLOBAL
OVERALL	*80*	*38*	***61***
RENEWABLE ENERGY	*72*	*57*	***55***
ENERGY EFFICIENCY	*68*	*50*	***46***

The Master Strategy for the Energy Sector 2020-2030 sets out the long-term objectives for the national energy landscape [34]. These are to secure a sustainable energy supply, diversify the energy mix, scale up domestic energy resources, achieve sustainability, and reduce the costs of electricity. Aligned with these broad goals, the Jordan Renewable Energy and Energy Efficiency Fund (JREEEF) became operational in 2015 to provide funding for sustainable energy and measures to optimise energy usage [35]. JREEEF is designed to provide both financial and technical support aligned with Jordan's energy priorities and to foster partnerships with national and international organisations.

JREEEF created several funding mechanisms including full or partial direct grants and revolving loans, co-financed by external organisations and funders [36]. It has also worked with civil society organisations and local associations based throughout the country. Between 2015 and 2023, JREEEF supported a range of projects across different sectors including solar PV and solar water heating (SWH) for households, renewable energy and EE for public buildings, hundreds of energy audit studies, and 53 MW of PV capacity installed across the country. ●

Government agencies

Jordan's energy sector delegates authority and responsibilities across a wide range of ministries and organisations. The GoJ's Ministry of Energy and Mineral Resources (MEMR) is at the top of the institutional structure and provides strategic oversight for planning and implementation of policies to develop the country's energy sector [34]. It is responsible for utilising domestic energy resources, attracting investment, developing policies such as the Jordan National Energy Strategy, and managing JREEEF. MEMR coordinates with other government departments (such as the Ministry of Environment and Ministry of Public Works and Housing) and local municipalities on energy policies that overlap with their respective mandates. The Energy and Minerals Regulatory Commission is the independent regulatory body for monitoring and ensuring the enforcement of laws and regulations related to the energy sector.

The electricity sector similarly features a diverse range of organisations [34]. Power generation is provided by large electricity companies including those owned by the state (such as Samra Electricity Power Company, which provided 9% of generated electricity in 2018) and those which are majority-private ly owned companies (such as Central Electricity Generating Company, which provided 37%), as well as private independent power producers (which together provided 39%). Renewable energy power producers (both for onward sale and those which consumed their own power) and the industrial sector also generate their own electricity.

The country's electricity transmission system is managed by the National Electric Power Company (NEPCO) [34]. It is the single-buyer and single-seller of electricity: under power purchase agreements (PPAs) NEPCO buys electricity from generators and sells it in bulk to distribution companies and large industrial consumers. NEPCO is also the single importer of fossil fuels such as liquefied petroleum gas (LPG) and oil. Jordan has three public shareholding distribution companies: Jordan Electric Power Company, serving central Jordan; Irbid District Distribution Company, serving northern Jordan; and Electricity Distribution Company, serving southern Jordan.

Other institutions related to the energy sector include the Central Bank of Jordan, which provides financing for energy projects, and industry associations [34]. The Royal Scientific Society provides quality testing and standard assessments for energy technologies whilst the Jordan Renewable Energy Society advocates for sustainable energy and provides trainings. ●

Jordan has a well-developed energy sector and around one quarter of its electricity comes from renewable sources.

Solar power

The regulatory framework in Jordan supports the deployment of solar power, and renewable energy more generally, in three ways: direct proposals, government-owned projects, and self-consumption [34]. Under direct proposals, investors can identify and propose energy projects to MEMR, which then operates a tender process for developers to submit proposals and tariff bids for potential PPAs. Government-owned projects have tenders issued by MEMR – supported by grants or loans – with the resulting developer responsible for designing, constructing, commissioning, and transferring ownership of the system to MEMR. Self-consumption projects allow the implementation of renewable energy systems for the benefit of the installer.

Jordan permits electricity wheeling – which allows an organisation to install renewables at a different location to the one where they use the power, connect it to the grid, and benefit from the electricity it generates – under the Electric Power Wheeling Scheme [34]. The scheme was designed to promote the "self-consumption" (albeit generated and consumed at different locations) of renewable energy amongst large electricity users and, as of 2020, more than 222 MW of wheeling projects had been installed in Jordan. UNHCR's solar plants in Azraq and Zaatari operate under this scheme.

Until recently, Jordan allowed net metering under the Directive Governing the Sale of Electrical Energy Generated from Renewable Energy Systems [34]. This permitted electricity to provide power to the grid and receive credit to offset their electricity bills, for example selling excess solar electricity during the daytime and receiving the equivalent amount of power from the grid during the night. Net metered users could cover their entire grid electricity consumption with power they generate, with any excess banked for future usage.

These programmes were successful in promoting self-consumption of solar power and increasing installed capacity but have presented their own challenges. Distribution companies needed to deal with high numbers of applications, a decrease in power sold to previously profitable high-consumption customers (who now generate their own electricity), and uncertainties about grid's ability to absorb additional solar capacity which led to a pause on new projects over 1 MW [34]. Managing this increase in solar power while maintaining a fair and financially sustainable tariff structure was identified by IRENA as one of the major issues facing the regulator EMRC. In 2024 the Royal Scientific Society was approved as the International Renewable Energy Certificate (I-REC) issuer for Jordan, allowing consumers and organisations to purchase I-RECs (each equivalent to 1 MWh of renewable energy) to support their sustainability goals [37]. ››

To support well-designed systems, Jordan has introduced new mechanisms for connecting renewable energy equipment to the national grid network.

Solar power

A regulatory change implemented in September 2024, however, introduced a new regime for connecting renewable energy systems to the national grid under four new modalities [38]:

1. "Net value mechanism outside the geographic location of consumption": this modality is mostly similar to previous wheeling regulations and is available to small and medium industries, hotels, and agricultural users to cover up to 50% of their annual consumption. Installations must have a capacity of at least 30 kW and any surplus is reset annually.

2. "Net value mechanism within the geographic location of consumption": this is largely similar to previous net metering regulations and is available to the same users to cover up to 50% of the annual consumption and also for households to cover up to 100% as long as the system does not exceed 16 Amps per phase.

3. "Zero-export": a mechanism under which it is not possible to provide power to the national grid. This is available for the above users as well as large industries, hospitals, and commercial users, amongst others; it is also open for applications such as vehicle charging, street lighting, and water pumping. Users can consume 100% of their own power but not provide it to the grid.

4. "Full export and full purchase": available to any generator, under this mechanism, all electricity is sold to the grid network at a rate of 0.05 JOD/kWh for residential users and 0.04 JOD/kWh for all others ($0.07/kWh and $0.06/kWh respectively), whilst all consumed energy is purchased from the grid at the official tariff rate.

Generators under the first three mechanisms are required to pay a grid service fee to connect their systems to the network per kilowatt-peak of solar capacity. The fee varies depending on the generator, for example 1 JOD for residential users, 2.5 JOD for hotels, 12 JOD for hospitals, and 13 JOD for the commercial sector ($1.41, $3.53, $16.92, and $18.33 respectively), whilst some – small and medium industries and agricultural users – have zero grid connection fees.

These changes, especially the latter two mechanisms, were implemented to support national energy planning and to incentivise facilities installing well-designed energy systems to meet their needs without relying on the national grid to absorb – and pay for – large amounts of excess power [39]. As the new regulations have been introduced only recently, companies and other organisations are establishing how the different mechanisms will be implemented in practice.

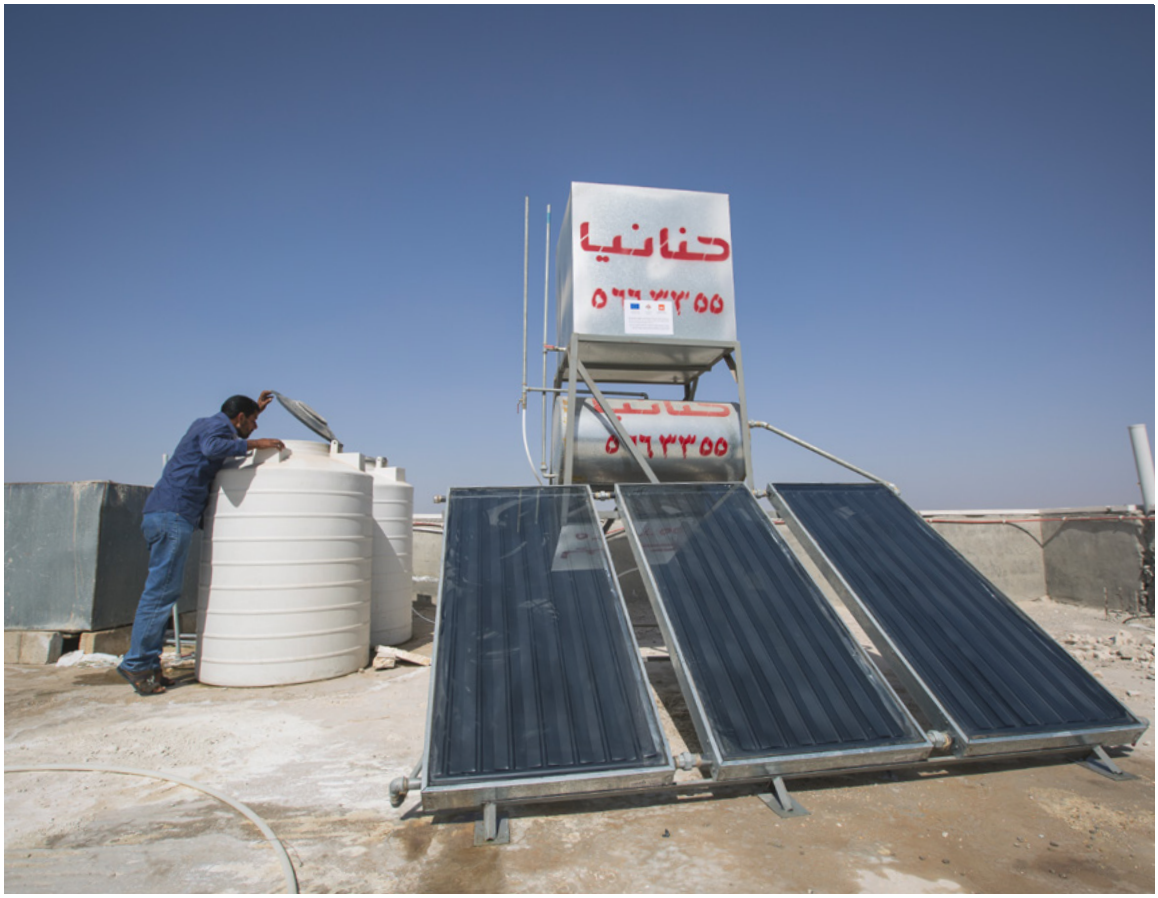
24 MW

of solar capacity was added to the Jordanian grid in 2023.

Solar water heating

Jordan has a well-developed market for SWH that caters to both household and industrial scales through local manufacturers and suppliers [34]. Whilst the policy landscape for SWH is less developed than for solar PV, financing for end-users was made available through JREEEF via community-based organisations for both households and institutions. Between 2015 and 2023, JREEEF supported 32,890 SWH systems (at various levels of subsidy) for households alongside large-scale SWH systems for 146 schools and seven hotels [36].

SWH has been included under national and municipality-level building regulations [34]. Countrywide mandates were introduced to ensure SWH systems are installed on all new buildings above a given area (for example 150 m^2 for apartments) and the first Jordan Green Building Guide (JGBG) had incentives for buildings that met high levels of energy and water savings. The Greater Amman Municipality, meanwhile, introduced regulations in 2015 to require solar systems on certain building types and to ensure they satisfy zoning requirements. Despite these measures SWH implementation has slowed, especially for domestic applications, owing to a change in the way JREEEF funds them, limited enforcement of mandates and subsequent penalties, and a lack of clear long-term targets for the market. ●



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Energy efficiency

Jordan acknowledges the importance of integrating EE measures into its wider energy policies and frameworks [34]. In 2013 the country adopted the National Energy Efficiency Action Plan (NEEAP, covering 2012-2014) which aimed to reduce energy consumption across five sectors (residential, industrial, commercial, water pumping, and street lighting) that reached almost half of its targeted 7.1% energy reduction by 2014. The updated NEEAP (2018-2020) aimed for a 17.5% reduction, mainly from the residential sector.

The JGBG was issued in 2013 and adopted in 2015 to incentivise greener design and construction practices by allowing increases in floor area ratio (the proportion of a plot of land that a building is permitted to occupy) [34]. Improved thermal insulation of walls, for example, above the mandatory building codes provides more points within the rating system and can allow up to a 25% increase in building area for a given plot [40]. Despite detailed codes and regulations, enforcement mechanisms have been lacking and compliance has been low.

Energy audits are required for large energy consumers and have been financed through JREEEF but uptake has been low and expertise to conduct them is relatively limited [34]. An area of success has been within GoJ ministries: the Ministry of Public Works and Housing, which manages all public buildings, conducted over 500 energy audits whilst the Ministry for Industry and Trade undertook audits for 17 institutions. Under JREEEF between 2015 and 2023, 252 energy audits were conducted (partially or fully subsidised by JREEEF or its partners) in schools, factories, hotels and government buildings [36].

With lighting accounting for around 30% of domestic energy consumption, one of the most prolific outputs of the JREEEF was the implementation of energy-saving LED units [36]. Between 2015 and 2023 more than 200,000 LED units were installed in over 46,000 households including 50,000 units under an IKEA Foundation-funded project in collaboration with MoPIC, 150,000 units through three distribution companies under a demand-side management project, and 10,000 units through corporate social responsibility projects with the Jordanian lighting company Bautak. A further 45,000 units were installed in schools, 28,750 units in government buildings, and 6,000 in businesses. The Jordanian Institution for Standards and Metrology has laboratory facilities to regulate and test the quality of imported LED units [34].

Energy efficiency is a core component of JREEEF, which has funded hundreds of energy audits for public buildings.

04

Energy for displaced people

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Refugees living in different settings face different challenges related to energy. For example, families living in Azraq and Zaatari have access to free electricity from large-scale solar plants but only for limited times of the day, whilst those living in urban areas alongside the host community have connections to the grid but pay high utility bills which stretches their finances. For cooking, meanwhile, gas is commonly used by all residents of Jordan and the government subsidises LPG, amounting to an estimated $11.12 million per year for Syrian households across both camps and urban areas [26].

While energy needs and priorities of each household vary, refugees within the same group face similar challenges. These tend to differ between people living in camps and those residing in towns and cities, whilst public institutions face their own challenges.

Acknowledging this, the key energy issues are separated to present each situation in turn. Information on energy in Azraq and Zaatari comes primarily from UNHCR, NGOs involved in projects such as NRC, and resources related to the large solar plants which serve the camps. Information relating to energy for refugees living in urban settings is generally scarcer, however, aside from UNHCR's 2024 VAF assessments. As a result, the READS Programme undertook interviews with refugees in Amman to better understand energy issues and how these affect their daily lives. Finally, analysis of energy for public buildings is taken primarily from a comprehensive report published by Chatham House in 2023 and supplemented with additional examples of interventions for schools and hospitals. ●

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Energy in Azraq and Zaatari camps

Over 120,000 Syrian refugees live in Azraq and Zaatari camps. Managed by UNHCR in partnership with SRAD and supported by numerous other stakeholders, these organisations provide critical support for the camps' residents including access to energy.

When Zaatari camp was first established in 2012, the electricity network was extended to the camp to provide essential services and streetlighting with the support of the Irbid District Electricity Distribution Company [41]. Over time, refugees made unauthorised connections to provide power to their households which overloaded the network. In response, the whole network was disconnected and reconstructed to provide a safer electricity supply to all camp residents and organisations, supported by the Government of the Czech Republic which provided 45 million Czech Koruna (around $1.9 million) in funding [42].

This provided the foundations for Zaatari camp to host the largest solar power plant in a refugee camp anywhere in the world, constructed at a cost of $17.5 million in 2017 [19, 43]. The 12.9 MW installation, composed of 40,100 solar PV panels equivalent in area to 33 football pitches, generates around 23,000 MWh per year and operates under Jordan's net metering scheme and is also supplied from the grid by IDECO [44].

Originally designed to provide 12 hours of free electricity per day to all camp residents for lighting, phone charging, televisions, fans, refrigerators, and washing machines, the plant now provides much less, sometimes only 4.5 to 6 hours per day depending on the weather and the level of demand on the network. Before use of solar power in the camp, Zaatari's electricity bill was estimated to be up to $500,000 per month [45]. The O&M of the camp electricity network was originally conducted on an ad hoc needs basis but this has since transitioned to a formalised agreement with a private contractor. For the solar plant, the implementing company Belectric oversaw O&M for the first two years before responsibilities were transferred to another provider.

When Azraq camp first opened in 2013 there was no electricity supply for displaced people, who instead relied on solar lanterns distributed by UNHCR [41]. Learning from the experience in Zaatari, especially with respect to illegal connections by households, in 2014 UNHCR resolved to provide equality of service for electricity provision in both camps. Shelters were connected to the camp network, supplied by EDCO, with those in Villages 2 and 5, the last areas to be connected, receiving access in 2018.

Whilst the solar plant in Zaatari remains the largest, Azraq was the first refugee camp ever to receive a solar plant. Funded by the IKEA Foundation, the solar plant was inaugurated in May 2017 [46]. Its initial capacity of 2 MW was expanded by an additional 1.5 MW in September 2018 with the support of EDCO and was estimated to cover 55% of the electricity needs of the residents' shelters. This was further increased in August 2019 through an off-site installation of 1.5 MW. The extension of the electricity grid to Azraq camp's solar plant was supported by the Saudi Fund for Development [46]; this allows power to be fed into the national electricity grid under Jordan's wheeling regulations and makes it possible for the electricity to be used throughout the day and also in the future if the camp were to close [34].

Overall, the total 5 MW of solar capacity provides free electricity to around 10,000 shelters from 10:00 to midnight every day, meeting around 70% of the shelters' consumption and the remainder coming from the grid. The 40,000 residents of ››

Life is more colourful, it's like seeing for the first time after you've been blind.

– Male focus group respondent on lighting in Azraq camp [41]

Energy in Azraq and Zaatari camps

Azraq have access to basic services in their shelters, such as lighting and phone charging, and are able to connect appliances such as fans and refrigerators [46]. Each shelter uses an average of 4 kWh per day [20].

To complement the solar plants in Azraq and Zaatari, UNHCR and the GoJ, in partnership with KfW, agreed to transfer energy from another solar plant in South Amman to increase the supply of power [45]. Under a deal financed by the KfW, the German development bank, part of the plant's 46 MW capacity is used to provide electricity to the camps under Jordan's wheeling regulations. As a result Azraq and Zaatari now run almost entirely on solar power with an estimated annual generation of 54,000 MWh, saving $12 million and 34,000 tonnes of CO_2 per year from the solar plants in the camps and South Amman.

A study by UNHCR, published in late 2018, investigated the impact of electricity access in Zaatari and Azraq [41]. By this time all shelters had access to lighting via a connection to the camp networks but lanterns (used by 16% of households), solar home systems (31%) and car batteries (10%) were employed when the grid was switched off. Most refugees had arrived in the camps with few electrical appliances, instead carrying cash to buy what they needed when they arrived; by 2018 ownership of mobile phones (98% of households across both camps), televisions (92%), and washing machines (55%) was commonplace.

Amongst the benefits of electricity, the UNHCR study reported that both lighting (inside and outside the home) and television contributed positively to dynamics between camp residents [41]. Focus group discussions highlighted safer living environments, more time being spent with family and friends, and greater willingness to travel longer distances around the camps. Respondents also felt more connected to family and friends outside of the camps through mobile phones and internet connections, and television allowed them to access Syrian and Jordanian media and entertain children.

Respondents also reported that electricity supported positive health-related impacts, with 82% agreeing that refrigerators improved their ability to store medication (especially insulin) and 91% saying that breastfeeding and hygiene for newborns had improved since the connection of stable electricity [41]. A reduction in food waste was reported by 95% of focus group participants, with refrig- ››

> If there is no light, how are you supposed to sit and eat? People who have light sit and have fun, whereas those who don't just stay as they are, sitting in the dark, seeing nothing in front of them.
>
> – Girl in Zaatari camp [41]

Energy in Azraq and Zaatari camps

erators allowing food storage for longer periods. The use of washing machines was also reported to improve hygiene and cleaner clothes increased the confidence and self-esteem of children.

The widespread access to electricity has also provided opportunities for energy efficiency in the camps. Domestic EE measures have been undertaken in Zaatari camp, with 27,000 LED bulbs distributed to households as of 2020 through multiple projects, including those funded by JREEEF and the IKEA Foundation [47]. In September 2018 UNHCR began monitoring the energy consumption of 24 shelters in Village 6 in Azraq in partnership with Schneider Electric [46] whilst smart meters have also been installed on 12 transformers around Zaatari camp [19]. Between 2020-23, with funding from the Innovation Norway Humanitarian Innovation Programme, NRC partnered with a Jordanian startup Neurotech to install energy controllers in 190 shelters to monitor and manage primary (critical) and secondary (desirable) electricity demands to increase overall power availability.

Energy for household cooking in Jordan's refugee camps is predominantly through LPG stoves. LPG distribution efforts in the camps have been ongoing for many years: in 2014, for example, almost 8,000 LPG cylinders were distributed in Azraq and Zaatari with refills for cooking gas received every four weeks (refills for gas for heating were received every two weeks) [48]. The cost to UNHCR was around $50 per cylinder and $14 per refill, with a voucher system introduced for purchasing cylinders and other appliances. Camp residents can buy LPG at the prices subsidised by the government for all residents of Jordan.

In 2015, NRC undertook a study to understand how residents of Zaatari were acquiring and using LPG for cooking [49]. It found that 75% of beneficiaries of NRC's distribution programme cooked inside their shelters; most of the remainder using communal cooking facilities or kerosene stoves. On average gas cylinders lasted for 18 days and were typically refilled in camp markets (50% of respondents) or by using NRC vouchers at the camp's malls (34%). Both female and male respondents reported cooking in their shelters was because of the distance or overcrowding of communal kitchens, amongst other reasons; those who used communal kitchens reported doing so because they did not have or could not afford gas and found communal kitchens to be safer. Over time, however, communal kitchens were found to be unpopular and suffered vandalism and theft of LPG cylinders, whilst also posing a potential high-risk area for sexual and gender-based violence.

Gas is also used for heating homes. Ahead of the winter, in late 2019 NRC distributed 3.3 million JOD ($4.6 million) in cash assistance to households in Zaatari to cover heating needs for five months [50]. This provided critical support for refugees living in the camps as many shelters have cracks and mould or require rehabilitation, including for thermal insulation and fire safety [51]. Progress has been made to improve living conditions, for example in 2023 all households in Azraq were upgraded to include kitchens as well as expanding the shelter space to 32 m^2 [20], but many more are in need of attention. In 2024 UNHCR estimated that around 19,000 of the 37,000 shelters across Zaatari and Azraq required some level of maintenance or support [51]. Limited funding, however, meant that UNHCR had only around half the funding it required; working with NRC, the partnership provided 470 new shelters, repaired around 800, and rehabilitated around 500, but many more were in need of support.

In addition to the benefits for households in the camps, sustainable energy has also provid- ››

Energy in Azraq and Zaatari camps

ed livelihoods opportunities for their residents. The market street in Zaatari, for example, hosts around 1,000 informal shops operated by refugees [19]. These include restaurants, food shops, and electronics stores. To support these businesses, the market street operates on a separate electricity network to relieve pressure on the main camp network which mostly supplies shelters.

UNHCR's impact assessment study in 2018 found that 78% of shops in Zaatari and 54% in Azraq require electricity to operate [41]. Lighting was found to be the most important use of electricity (by 53% of businesses in Zaatari and 38% in Azraq) followed by refrigeration (29% each), powering light tools and basic equipment (5% and 7%), using power tools or heavy machinery (3% and 7%), and powering electrical devices and laptops (1% and 12%), amongst others. The study also estimated that electricity reduced the duration of unpaid work, such as time spent on household chores, by around 12 hours per week. Focus group participants explained that washing clothes by hand took two or three hours per day but the uptake of washing machines (found in 60% of shelters in Zaatari and 44% in Azraq) reduced physical labour and provided free time for other activities.

The implementation of large-scale energy systems has also created livelihoods opportunities during both their construction and operation phases. In Zaatari, 38% of the labour used during the construction of the solar plant was provided by refugees and 144 refugees were trained to connect shelters and maintain electricity network through a joint training programme supported by UNHCR, NEPCO, and the Japan International Cooperation Agency [47, 52]. Further people were trained to undertake maintenance of the system with 101 refugees receiving internationally recognised training. Since then, community members have been working as electricians under the Refugee UN Volunteer programme which provides a source of income and work experience [19].

Finally, humanitarian organisations also use the main electricity network in the camps to provide vital services for displaced people and, as of 2020, 49 organisations and operational facilities in Zaatari were connected to the national grid [47]. In addition, around 2,100 streetlights have been installed in Zaatari camp to improve access to lighting in public spaces [47] and all of the streetlights now use low-energy LED lights [19]. ●

> I work in a shop that sells and fixes mobile devices and other things, and this type of work and equipment depends on electricity. So if there is no electricity, it cannot work, so I become unemployed.
>
> – Male youth in Azraq camp [41]

Barriers to energy access

Households in Azraq and Zaatari camps have access to free electricity through the main camp grid, supplied by solar PV and the national power network. Whilst this is far greater level of electricity access compared to most refugee camps around the world, many issues remain. The limited duration of electricity availability means that shelters lack power for more than half the day, especially in the morning, which restricts access to key services such as lighting and phone charging. This can also cause issues with electrical appliances which require a consistent supply of electricity, such as refrigerators, and limits the activities in the evening, such as children using lights to study after dark.

At the camp level, despite the solar plants in each location and additional capacity from South Amman now providing almost all the power in Azraq and Zaatari, the supply could still be increased. In addition to the limited duration of power, providing more electricity to the marketplace could expand the types of businesses and livelihoods available to refugees.

Whilst LPG is commonly available for cooking and heating, including through distribution programmes, the supply typically does not last the expected period and refugees are required to purchase more at government-subsidised rates. Other options for cooking are limited: communal kitchens have had limited uptake while widespread electric cooking would place an additional strain on the already limited network capacity.

Limited budgets for shelter rehabilitation mean that energy used for heating is lost to the outside environment. The shelters in Zaatari are typically prefabricated caravans, whereas those in Azraq are constructed from layers of metal sheeting, both of which offer poor thermal comfort. Whilst some materials and training have been given to refugees by NRC and UNHCR, households have limited funds and means to undertake necessary upgrades. Over time, weather damage and wear and tear, such as cracks and mould, build up and reduce the comfort of the living conditions. Furthermore relatively simple EE measures, such as thermal insulation, are not widely available or affordable for refugees to implement themselves.

The electricity networks in the camps provide livelihoods opportunities for refugees by powering market streets and through maintenance and operation work. However, refugee technicians are often confined to voluntary or low-paying roles despite receiving recognised qualifications through training programmes. The restrictions on sectors that refugees are allowed to work in can limit their potential to secure higher-paying jobs, especially outside the camps and with private companies which specialise in renewable energy technologies.

OPPORTUNITIES

Providing access to longer durations and higher levels of electricity by improving the capacity of the existing networks could increase the quality of life for refugees living in Azraq and Zaatari camps. As electricity is not available throughout the day for camp residents, scaling up the existing generation could facilitate this. Expanding on-site infrastructure could be an option, although acquiring off-site generation could be more cost-effective. Building on the existing agreement between UNHCR and the GoJ, earmarking generation from solar PV sites across Jordan to supply the camps through the country's wheeling regulations could increase both the duration and total electricity consumption for camp residents. This would require detailed and long-term agreements between all parties, for example to identify an off-taker if the camps were to close, and substantial long-term financing, likely from external donors.

An alternative or additional approach could involve improving the efficiency of the existing network and the appliances that residents use. Rehabilitating areas of the network that require maintenance, formalising any illicit connections to the grid, using energy monitors to control usage, and upgrading distribution infrastructure could provide efficiency savings and increase the amount of available electricity. It could also help minimise safety risks, such as from fires caused by overloaded wiring. This would require significant investment but could also support capacity-building opportunities and jobs for refugees and host community members, similar to those created during the construction of the solar plants. Supporting the uptake of more efficient appliances – such as LED lights, televisions, and appliances or machinery used by businesses – could similarly result in ››

Barriers to energy access

energy savings and be supported by distribution programmes, vouchers for efficient appliances, or market development by the private sector.

Exploring alternative cooking solutions to augment current practices could reduce the amount of LPG used and allow distributions to last longer. Introducing and scaling up electric cooking appliances, such as electric pressure cookers (EPCs), could provide an alternative to LPG especially for foods which take longer to cook. Whilst EPCs have relatively low power requirements compared to other electric cooking options such as hot plates, a widespread rollout in the camps would need to be carefully managed to avoid overloading the power network, especially at peak usage times. EPCs would likely be suitable for certain local dishes and pressure cookers have long been used in Jordan, though it would also be necessary to ensure that EPCs are compatible with cooking preferences and potential users receive guidance on the usage and benefits of new appliances.

Improving shelters with EE upgrades could help reduce the amount of energy required for heating in winter, as well as providing a more comfortable environment year-round. Incorporating energy-related measures such as thermal insulation, coordinating with and building on other initiatives to improve shelter quality and thermal comfort, could provide additional benefits to shelter rehabilitation and so reduce LPG usage and related expenses. Scaling up current programmes implemented by UNHCR and NRC for material distribution, incentives, and training refugees to repair their own shelters could provide an established entry point for widespread upgrades.

Reducing the costs of work permits and expanding the sectors refugees can work in could support them in making use of their training and better integrate into the local economy. Partnering with companies to provide employment opportunities for skilled workers could be mutually beneficial, increasing self-reliance and incomes for refugees whilst providing certified technical skills through existing or new training programmes. This would require coordinating closely with stakeholders (such as companies, training organisations, and government ministries) and, if required, additional certification for the training refugees have received.

BARRIER	OPPORTUNITY
Limited duration of electricity supply to households is inconvenient and restricts the types of appliances that can be used	Increase capacity of existing solar plants or arrange new agreements for off-site generation Rehabilitate and improve the existing network infrastructure and increase access to energy-efficient appliances to reduce energy losses Use energy dispensers to monitor usage, support basic needs, and potentially introduce tariffs for additional consumption
Distributions of LPG are insufficient and there are few alternatives for cooking	Explore options for low-power electric cooking, such as EPCs
There are limited budgets for shelter rehabilitation and EE upgrades	Scale up existing shelter maintenance programmes with specific components for energy-related improvements
Refugees have certified electrical training but opportunities for employment are limited	Work with government ministries and the private sector to support employment opportunities outside of the camps

Energy in urban settings

The majority of refugees in Jordan live in urban areas. Whilst refugees and Jordanian citizens live side-by-side in towns and cities across the country, their energy-related challenges often present a stark contrast.

The national electricity grid is available throughout Jordan but a UNHCR study on refugees living in host communities found that 5% of refugee households reported living in accommodation without electricity [53]. It also found that those with electricity spent an average of 26 JOD ($37) per month on power and more than half had difficulty paying for electricity in the past three months. This was the highest proportion of any essential goods or services covered by the survey aside from clothes, and was higher than food, health, medicine, and petrol.

UNHCR's VAF in 2024 reported a similar figure, that refugee households living in the host communities pay 27 JOD ($38) per month for electricity – an increase from 20 JOD ($28) in 2021 owing to reductions in subsidies in April 2022 [21]. The average monthly bills varied across governorates, with Syrian refugees in Aqaba (36 JOD, $51), Tafilah (32 JOD, $45), and Karak (29 JOD, $41) – located in southern Jordan, where cooling is required for most of the year – spending the most per month whilst those in Ajloun (24 JOD, $34) and Mafraq (21 JOD, $30) spent less. The study stated that families often cut back on food expenditures to manage rising utility prices, including for electricity, which were exacerbated by reductions in WFP cash assistance. ››

TABLE 7

The proportion of refugee households living in the host community with selected assets associated with cooking, heating and cooling [21].

ASSET	SYRIAN REFUGEES	NON-SYRIAN REFUGEES
GAS/ELECTRIC OVEN	*39%*	*31%*
GAS STOVE	*54%*	*56%*
KEROSENE STOVE	*1%*	*1%*
WATER HEATER	*50%*	*56%*
FIREPLACE	*3%*	*1%*
GAS HEATER	*65%*	*52%*
KEROSENE HEATER	*10%*	*22%*
ELECTRIC HEATER	*4%*	*8%*
ELECTRIC FAN	*83%*	*77%*
AIR CONDITIONER	*6%*	*11%*

Energy in urban settings

The use of LPG is widespread for cooking and, in many refugee households, heating. UNHCR's VAF found that 54% of Syrian refugees and 56% of non-Syrian refugees used gas stoves for cooking, whilst 39% and 31% respectively used combined dual-fuel gas/electric ovens [21]. In 2023, a UNHCR study found that 81% of Syrian refugees and 46% of non-Syrian refugees living in host communities relied on gas heaters, whilst 13% did not use any source of heating (in comparison, the same study found that households in camps spent 6% of their expenditure on gas) [53]. UNHCR's VAF in 2024, meanwhile, found that 65% of Syrian refugees and 52% of non-Syrian refugees owned gas heaters, the most common type ahead of kerosene heaters (10% and 22% respectively) and electric heaters (4% and 8%) [21]. Most households (83% and 77%) owned electric fans for cooling, whilst few (6% and 11%) owned air conditioners. The ownership rates of other household assets associated with cooking, heating, and cooling are shown in Table 7.

Heating during the wintertime presents an additional financial burden. To address this, for the winter period from October 2022 to March 2023 UNHCR evaluated the need for cash assistance and assessed that households in the host community would require three gas refills per month at a total cost of 126 JOD ($178) for the six-month period (7 JOD, $9, per 12.5 kg refill) [54]. For a family of four, these refills accounted for 32% of the total winterisation assistance package – the largest single component – with gas heaters comprising an additional 13% of costs.

Organisations including NRC have implemented projects to reduce energy bills for refugee families living in urban areas. Under the Implementation of Replicable Renewable Energy Pilots in Jordan project, NRC installed 328 SWH systems for families living in northern governorates between 2015-17. Following this, the Renewable Energy for Refugees (RE4R) project replicated and scaled up this work with 602 households receiving SWH systems and 158 households receiving EE upgrades. These interventions were estimated to reduce households' energy bills by an average of 29% [55].

While these initiatives established innovative opportunities to reduce energy bills, they also faced challenges. As many refugee families live in rented accommodation, part of the projects involved agreements with landlords for rent reductions in exchange for ownership of the equipment at the end of the agreed period. In addition to the complexity of the agreements themselves, some landlords were hesitant to be involved as they were unconvinced of the long-term benefits [55]. Furthermore the high values of the SWH system, around 400-600 EUR each, meant that the project was proposed to tenants with stable incomes who would benefit from reductions in their bills, rather than the most vulnerable families who may have had to sell the systems to meet their immediate needs. ●

> The assistance is barely enough to pay the electricity bill. – Refugee in Irbid, April 2024 [21]

Interviews with Syrian refugees living in Amman

The READS Programme conducted interviews with refugees in Amman to understand their energy usage and challenges. Most interviewees highlighted how their main uses of electricity were typical of anyone living in Amman, for example using lights, charging their phones and laptops, and running refrigerators. Some also mentioned two of their priorities were using higher-power appliances, such as washing machines, kettles, and toasters, and appliances for heating and cooling.

> **"We need energy in the summer for fans, to do laundry, for the boiler for hot water... These are the most basic needs for energy we can't live without."**
> *– Syrian man, 63, living in Marka, Amman*

Most respondents shared that their electricity consumption was the highest during winter because of water and space heating needs. While gas heaters were common and considered to be cheaper than using electricity, several respondents ran out of LPG and switched to electric heaters, particularly in smaller rooms where gas heaters might be unsafe. Some interviewees remarked that the price of LPG, around 7 JOD ($10) per cylinder, was manageable but gas consumption in winter was two to three times higher than in summer owing to its use for both cooking and heating. Some households, however, estimated that the use of air conditioning made their energy expenditure higher in the summer.

> **"When we run out of gas for heating, we turn to electric heaters – thus our electricity bill increases."**
> *– Syrian man, 36, living in Marka, Amman*

Although Syrian refugees face limitations on their right to work in Jordan, several respondents held informal jobs and enterprises. Several worked as freelancers or IT specialists, relying on their laptops for their livelihoods. Others ran craft businesses, such as making homewares or printing on clothes using a hot press machine. These interviewees worked from their homes which increased their electricity consumption, but highlighted that this comprised only a small fraction of their overall consumption and their additional income outweighed the higher utility bills.

The most consistently reported issue was the high cost of electricity. Many residents of Jordan – both citizens and non-citizens alike – feel that electricity is expensive, exacerbated by recently-introduced tariff structures dependent on times of usage, however Jordanians are able to receive subsidised electricity [56]. Lower rates are accessed through a "family book" and, with one available per Jordanian household, landlords typically use this for their own residence which means that ››

When we run out of gas for heating, we turn to electric heaters – thus our electricity bill increases.

– Syrian man, 36, living in Marka, Amman

Interviews with Syrian refugees living in Amman

those living in the rental properties pay higher tariffs, resulting in higher bills or forcing lower consumption. Monthly electricity bills – typically around 40-70 JOD ($55-100) – doubled since previous support measures were removed and were double what Jordanian households would pay for the same usage. One respondent shared how the increased tariffs had driven his household into a debt of 700 JOD ($990); to resolve this, he set up a payment plan with the electricity company of 20 JOD ($28) per month to slowly repay the deficit.

"Electricity bills are increasing and are a huge financial burden on refugees... Now we are overwhelmed by large debts. This is very frustrating as our income is not sufficient to meet our basic needs."
– Syrian man, 63, living in Marka, Amman

Some respondents received government support through their marriage to Jordanian citizens. They shared that, overall, electricity tariffs were affordable and a fair price for the levels of service they receive. Whilst many interviewees without such support complained about the high costs, there was broad consensus that electricity was available whenever they needed it and that power cuts were rare.

Respondents mentioned various ways in which they reduced their power consumption to cope with high bills. Using air conditioners only during the daytime and in the summer, limiting how often they used hot water heaters, and only using one fan were mentioned. Several stated how they used LED lights and some other energy-efficient appliances, and one explained how they had integrated plants and trees for natural shading and cooling of their home.

"I control my consumption by turning on electrical devices only when I need them, like the lights, boiler, and heater. I make regular maintenance to the home boiler for it to function as efficiently as possible."
– Syrian woman, 33, living in Wadi Seer, Amman

"Natural shading is very effective and affordable. Putting plants on the terrace and in the windows is very helpful in improving the atmosphere inside the house."
– Syrian woman, 26, living in Hashmi, Amman

A common issue, however, is that those renting their accommodation – both Syrian refugees and many low-income Jordanians – are not able to benefit from EE measures, solar PV, or SWH systems. As electricity bills are paid by tenants, several mentioned that there were no incentives for their landlords to make energy-saving investments. Others highlighted that the high costs of EE and renewable energy meant that they were unaffordable and, even if they were able to fund such measures, there would be no guarantee that they would benefit from them in the long term as they could be evicted and lose their investment.

"If I were the landlord I could implement these measures, but I can't because they are expensive and I'm not allowed to work here. The landlord is not interested, he didn't even install energy-saving light bulbs, I did this myself."
– Syrian man, 65, living in Sahab, Amman ››

Interviews with Syrian refugees living in Amman

Most interviewees believed that this situation was unlikely to change. Some respondents, especially those who were older or did not have jobs, stated that their low and often unstable income would make it impossible for them to invest in improvements to their homes even if their landlords permitted it. They also highlighted how their present incomes were barely enough to afford food and other essentials, meaning any larger or long-term purchases would be out of reach. Others, especially those who are married to Jordanians with better access to government services and support, had considered installing solar PV or SWH but had not done so because of the high upfront costs.

UNHCR's nationwide VAF surveys and the interviews undertaken by the READS Programme in Amman tell a similar story: refugees living in urban areas generally have access to reliable electricity and energy for heating but the costs are high and unaffordable for many. Refugees frequently limit their own energy consumption to reduce their bills and, although they are aware of the savings that renewable energy and EE measures can bring, the often-precarious living situations in rented accommodation can make it impossible for displaced people to benefit from them. ●

"Whether in the summer or the winter, despite all the means they use to lower their consumption, the bills are always very high. Even though we use electricity so wisely, why are the bills so high? There should be support and subsidies for Syrian refugees as well, not just national citizens."

– Syrian woman, 33, living in Wadi Seer, Amman

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Barriers to energy access

The high cost of electricity is the most prevalent energy-related issue for refugees living in urban areas. Both UNHCR's VAF and the READS interviews highlighted that monthly electricity bills were a recurring concern for households and resulted in coping mechanisms such as limiting their electricity usage and reducing spending on other essentials. Many interview respondents mentioned that the tariffs that they pay, which are higher than those for Jordanian citizens, unfairly increased their bills and represented a large financial burden and, in some cases, significant debt. Meanwhile efforts to reduce their utility bills, such as limiting the usage of high-power appliances like air conditioners and water heaters, were unable to provide further savings.

Households also struggle with energy for heating. Whilst the cost of LPG – used for both cooking and heating – was generally considered manageable, the increased consumption during the winter when used for both cooking and heating placed a further financial burden on households. Whilst gas heaters were the most commonly-owned form of heating appliance, some interview respondents also relied on electric heaters when they ran out of LPG; whilst this provides immediate warmth when needed, they shared that it results in higher costs overall in their electricity bill.

The accommodation situation of refugee households presents further barriers in reducing their energy bills. Those who rent their accommodation would require permission from their landlords if they wanted to install energy-saving or renewable energy equipment, such as solar PV or SWH. If this were granted, many interview respondents said they would be unlikely to invest in such interventions as their precarious rental agreements could be cancelled and they could be evicted, meaning that their investments would be lost. Underlying all these issues is the reality that energy-saving measures are expensive and, with many on very low incomes, such investments are financially out of reach. Landlords themselves, meanwhile, have little incentive to implement these measures as utility bills are paid by the tenants.

OPPORTUNITIES

The high electricity costs which burden households could be reduced by allowing refugees to access the same subsidised electricity tariffs available to Jordanian citizens. Several interview respondents stated that they were happy with the quality of electricity services and would be willing to pay the same tariffs as Jordanians, which they estimated would halve their utility bills, whilst some refugee respondents married to Jordanian citizens with access to lower rates were grateful for this advantage. Facilitating this change would require government support, as it would have significant cost implications for the country. Alternatively, targeted subsidies or assistance from government ministries or UNHCR could support households with specific needs or vulnerabilities. While this would still require significant financial resources, it would be more cost-effective than a nationwide tariff reduction and could be implemented through existing frameworks for assessing vulnerable households.

Incentivising EE and renewable energy measures in rented accommodation would help reduce utility bills for refugees. For households that can afford such measures but are hesitant to install ››

Barriers to energy access

them owing to the risk of eviction, long-term rental agreements – for example lasting at least three to five years – could enable tenants to recoup their investment. This would likely need oversight from NGOs or other organisations with experience of refugee rights and legal procedures.

Relying on similar rental agreements could be used to support households that lack the funds to invest in EE and renewable energy measures. Replicating the work done by NRC, through which EE measures and SWH systems were installed in rented accommodation in return for rent reductions and guarantees for tenants and the systems being handed over to the landlords after a defined period, could be expanded to include other energy interventions. Installing solar PV for refugee households could directly reduce electricity bills without needing complex agreements between government ministries and would be subject to the same standard approvals as any other residence. Focusing on EE measures, building maintenance and improvements, and thermal insulation could reduce the amount of LPG required for heating and save costs overall and could be integrated alongside other shelter-focused interventions.

BARRIER	OPPORTUNITY
High electricity bills and high tariffs for refugee households	Align tariffs for refugees with those for Jordanian citizens Targeted financial support for utility bills for vulnerable households Install solar PV to reduce consumption from the national grid
Households that live in rented accommodation could be evicted and lose any investments in energy interventions	Long-term rental agreements and support schemes to install solar and EE measures to ensure tenants see a return on their investment Provide incentives for landlords to install energy saving interventions
Energy improvements are unaffordable for many households with low incomes	Support from NGOs to install improvements alongside rental guarantees
High costs of heating homes with gas or electric heaters	Invest in energy efficiency measures alongside regular maintenance and shelter improvement projects

Energy for public buildings

The influx of Syrian refugees into Jordan greatly increased the number of people relying on key public services, especially for education and healthcare. Refugees living in urban areas use the same schools and hospitals as members of the host community and this has put pressure on these institutions to match the increased demand. Amongst other issues, this led to increased energy usage and higher costs. This is against a backdrop of rising prices and high utility tariffs: public buildings in Jordan (including ministry buildings, hospitals, and schools) pay higher tariffs than commercial users for consumption above 750 kWh per month [57]. In 2018 the energy cost was estimated to be 20.3 million JOD ($28.6 million) for the Ministry of Education and 10 million JOD ($14 million) for the Ministry of Health.

Sustainable energy for schools

In response to the large number of new arrivals from Syria, as well as population growth in Jordan, schools have needed to adapt their operations to accommodate these students. Many schools, especially in the northern governorates, run two teaching sessions per day, typically with one in the morning for Jordanian children and one in the afternoon for Syrian children. These extended operating hours, sometimes for nine hours per day and six days per week, have led to increased electricity and heating bills.

This pressure has led the GoJ and international donors to identify opportunities to support schools, including projects related to energy. These include [57]:

- The Schools Heating and Cooling Program, which upgraded 300 schools in the northern governorates by 2020 in its first two phases and a further 139 by 2022 in its third phase;
- The Implementation of Replicable Renewable Energy Pilots in Jordan project, led by NRC, which supported 23 schools in Irbid with PV systems in 2016-17;
- The RE4R-NRC Solar for Schools programme, also implemented by NRC between 2017-22, which focused on solar and EE upgrades in schools in Irbid;
- The Sustainable Education through Renewable Energy project, led by the Princess Alia Foundation, which provided PV and heating and cooling systems for 120 schools between 2017-20;
- The Solar for Schools project, implemented by Mercy Corps and Modern Arabia for Solar Energy between 2018-20, which improved eight schools through solar PV, air conditioning, and LED lighting; and
- The scale-up of the Energy Efficiency in Public Buildings (EEPB) project which retrofitted 138 schools, implemented by the Ministry of Public Works and Housing and GFA Group Consulting.

These projects have been implemented by different types of organisations working in partnership including NGOs, companies, and government ministries [57]. They were funded by JREEF, international donors such as the EU and the Netherlands, and private foundations including the IKEA Foundation and Princess Alia Foundation.

One of the most extensive projects was the EEPB project which aimed to improve EE and reduce energy bills across a range of public buildings [57]. Across its seven years of operation it scaled up its pilot phase from five to 200 buildings during its full rollout, focusing on interventions which ››

Energy for public buildings

would have payback times of less than five years. In addition to the 138 schools that it retrofitted, it also reached 44 health facilities and 21 Ministry of Public Works and Housing buildings. The project provided upgrades and replacements for electrical systems, hot water, heating, and air conditioning and was funded through a 16.5 million EUR ($18.3 million) loan from KfW and 1.5 million EUR ($1.7 million) from the Jordanian government.

These energy projects have provided significant savings for schools. The Implementation of Replicable Renewable Energy Pilots in Jordan project, led by NRC, installed a cumulative capacity of 426 kWp across 23 schools in Irbid at a cost of over 290,000 JOD ($410,000) and reduced the electricity bills for each school by 70-90% [57]. These systems provide around 10,000 JOD ($14,000) in savings every month and, with an estimated payback time of 2.5 years, have already recouped the initial investment since their installation in 2016-17.

NRC's work under the RE4R project also focused on energy for schools. Between 2018-21, eight schools were rehabilitated with EE upgrades and 14 schools received solar PV systems to reduce energy bills. The project also trained 50 government stakeholders on the operation and maintenance of PV systems, and 115 youths received vocational training.

Several projects have assessed the impacts of energy-related interventions. A study by NRC under the RE4R project conducted an energy audit of Khawla bin Al-Azwar mixed primary school and found that a suite of options could reduce energy usage by 38% [57]. These included behaviour-change measures, such as turning off electrical items when not in use (saving an estimated 332 JOD or $468 per year) and improving student awareness of EE (252 JOD, $356). Other improvements included retrofitting lighting (saving 1,600 JOD, $2,250) and air conditioning units (535 JOD, $755), installing a SWH to replace an electric water heater (312 JOD, $440), and air conditioning units to replace heaters (161 JOD, $227). Implementing behaviour change measures can have an immediate payback time whilst the other interventions, with estimated payback times of two to three years, would recoup their costs many times over across their lifespan. An internal NRC assessment of the Solar for Schools programme, meanwhile, estimated that participating schools achieved cost savings of at least 80%.

Renewable energy has also supported safe spaces for vulnerable children and young people. Since 2016 UNICEF has operated more than 140 Makani ("My Space") Centres provide spaces for children and youths from refugee and host communities to learn, develop skills, and improve their wellbeing [58]. With funding from the Government of Germany and the European Union, UNICEF invested $475,000 to install solar systems on 52 Makani Centres which provide an estimated cumulative saving of around $175,000 per year. Additionally, in 2021 UNICEF partnered with the Royal Health Awareness Society to introduce environmental clubs to 22 Makani Centres to teach young people about topics such as renewable energy, waste management, and climate change.

Many of these projects aimed to go beyond energy alone and include additional components to benefit the schools, teachers, and students. Focus group discussions conducted during some of the projects revealed that fixing building problems – such as draughts and leaks, or aging and damaged roofs and windows – was an important first step [57]. The projects implemented by NRC included awareness-raising sessions for pupils and staff whilst others integrated team-building activities between Jordanian and Syrian students and training programmes. A project funded by the Netherlands and implemented by the local NGO Royal Marine Conservation Society (JREDS) ››

Energy for public buildings

in 2018-19, for example, focused on renewable energy and EE in schools in the north of the country and included awareness raising activities for both Jordanian and Syrian students [59].

Whilst many projects have focused on school-aged children, some have provided training for youths and adults on solar energy and electrical installations. NRC's work has included capacity building on solar installation and maintenance for engineers at the Ministry of Education. Meanwhile the Wadi Seer Training Centre, a technical and vocational education and training centre in Amman run by UNRWA, has offered hands-on training for solar energy systems to Palestine refugees since 2015 [60]. UNRWA also intends to construct a 3 MW solar plant at the training centre to supply up to 80% of the organisation's electricity consumption under Jordan's wheeling regulations, with estimated savings of $1.2 million and 3,000 tonnes of CO_2 per year [61, 62].

Across these projects, the key focus in addition to energy and cost savings was improving the learning environment for students [57]. Increasing thermal comfort and avoiding the need to curtail electricity usage because of limited budgets can help students learn and provide a better work setting for teachers. Other related measures, such as building repairs, were reported to help students feel safer in their schools. ››

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Energy for public buildings

Sustainable energy for hospitals

The provision of quality healthcare services is highly dependent on a reliable, high-power electricity supply for medical equipment, lighting, refrigeration for medicines and vaccines, and data services. Hospitals also require heating and cooling to provide a safe environment for treatment and the comfort of patients. Hospitals and health centres across Jordan have needed to expand their services in response to the large number of refugees in the country and this increase resulted in energy demand in health centres in northern and central governorates to increase by between 20% and 200% across different facilities from 2011 to 2015 [57].

The Ministry of Health operates 30 hospitals and more than 700 healthcare centres across the country [57]. These provide around one-third of the total hospital beds and serve the poorest communities, including most of the refugee population, with many more health facilities overseen by the Ministry of Defence, the Royal Medical Services, and smaller private centres. Between 2015 and 2020, the total expenditure on electricity was estimated to be 85.8 million JOD ($120 million) with an additional 18 million JOD ($25 million) spent on diesel. As a result, many projects have aimed to reduce energy usage and costs through EE measures and the implementation of renewable energy systems, for example:

- Solar thermal and PV for Al-Bashir Hospital in Amman, implemented between 2016-18 by Millenium Energy Industries;
- The EEPB project which implemented renewable energy and EE in two hospitals and one health centre during its pilot phase (2015-19) and a further 41 Ministry of Health facilities between 2019-22, led by the Ministry of Public Works and Housing and GFA Group Consulting; and
- Belectric's implementation of 46 MW of PV and 2.6 MWh of battery storage across 33 hospitals and health centres, which was completed in 2022.

As for other projects for public buildings, these relied on consortia composed of government ministries, NGOs, and companies, and were funded through JREEEF and international donors such as Germany (through KfW) and the UK (DfID, now FCDO) [57].

Whilst many projects have been implemented around the country, several have targeted areas in the northern governorates to support areas with higher numbers of displaced communities. One example is the project implemented by Belectric, supported by the Ministry of Health, MEMR, KfW, UNHCR, and UNICEF, which also included a humanitarian focus by integrating wheeling agreements to offset power for Zaatari and Azraq camps [57].

These interventions have resulted in significant savings on energy bills. Research focusing on Jordan University Hospital in Amman, which serves more than 500,000 people, estimated that its SWH system met all of the demand for hot water between April and October (with diesel supplementing it during the winter months) and that it would have a return on investment of 1.6 million JOD ($2.26 million) over 25 years, with a payback time of just three years [57]. Studies on 11 military hospitals, meanwhile, estimated that SWH reduced diesel demand by more than 750,000 litres per year and saved 620,000 JOD ($870,000) annually. The Al-Mowasah Hospital run by Médecins Sans Frontières, meanwhile, installed 60 kW of solar PV to meet 8% of the hospital's energy needs and saves an estimated 20,000 EUR per year with a 1.5 year payback time [63].

Whilst much of the focus of these projects is on reducing electricity usage and costs, most included additional components to support their longevity. Two to three years of maintenance was typical across the projects (either through monitoring equipment, obligations of the contractor, or equipment warranties) as well as knowledge transfer and capacity building [57]. ››

Barriers to energy for public buildings

Despite the large number of renewable energy and EE projects implemented in Jordan, many challenges remain. One major issue is the lack of data: although some programmes have supported energy audits and assessments, very little facility-level information is available on the energy usage or current expenditure, which could help identify opportunities for potential savings. Even in projects where energy monitoring devices were installed, the systems often failed or were not utilised during or after the original project duration. The Ministry of Health, for example, does not have a department to conduct energy assessments and bureaucracy can inhibit companies from undertaking energy audits for hospitals. Whilst institutional staff are usually supportive of energy saving measures and renewable energy, identifying and quantifying these benefits can be impossible without a dedicated assessment.

Another challenge is the unavailability of energy bills, which could be used to approximate the total consumption of public buildings, especially if disaggregated by month to estimate seasonal differences between summer and winter. Different public buildings have different bill payment procedures and some are connected to several electricity meters, further complicating matters. Energy bills for some facilities are available online and NRC found that, when working with schools, it was possible to access bills if the meter number was known; sometimes, however, multiple users connected to the same meter which introduced uncertainties when estimating the electricity consumed by the school.

The Ministry of Finance allocates budgets to government ministries which are then responsible for paying energy bills for their respective public buildings. As a result any cost savings achieved by renewable energy and EE projects on individual buildings do not financially benefit the facilities themselves, but the overall ministry budgets. As one of the biggest drivers for these interventions – monetary savings on energy which could be reallocated to other areas of programming to accommodate the increased number of users of each facility – is generally not experienced by the facilities themselves, it potentially limits incentives to implement these solutions.

This is compounded by the fact that, in some cases, utility bills for hospitals and schools are not paid; one hospital, for example, was found to have an outstanding debt of 620,000 JOD ($870,000) [57]. This causes further issues in that the cost savings of new energy interventions are put towards paying these debts to utility companies, rather than realising a financial benefit for either the building or its government ministry.

The situation becomes more challenging if solar PV is installed as part of a project as the electricity distribution companies can delay approving new connections until all outstanding debts are cleared. This has caused issues for several schools and hospitals which, despite having solar PV installed on their premises, were unable to get connected because of the ministries' unpaid bills [57].

Finally, focus groups with staff in public buildings revealed many behaviours that lead to energy wastage [57]. Common examples include leaving lights on and using heating or air conditioning whilst windows are open. Whilst the Ministries of Health and Education have issued guidance on energy-saving practices, individual buildings and facility managers generally lack the discretionary budget to invest in training and awareness-raising activities for staff to address these issues. ››

Barriers to energy for public buildings

OPPORTUNITIES

The lack of data on energy consumption in public buildings, such as schools and hospitals, presents a barrier to designing targeted and impactful energy interventions. Working directly with facility managers to access any available data, usually reliant on knowing meter numbers to access online bills or knowledge of any previous energy assessments, should be a critical first step in any energy project.

Centralising the implementation of energy monitoring devices, either through a unit within a government ministry or outsourced to an external organisation, could provide more robust and longer-term solutions. If a single stakeholder were responsible for repeating the same work in multiple public buildings, this could help standardise energy assessments and recommendations for interventions whilst maintaining and growing institutional knowledge. Reusable energy monitoring devices, which can be installed in a building for a given period before being relocated for the next project, could help reduce costs.

The centralisation of budgets and utility payments by government ministries, rather than individual facilities, provides an opportunity for greater interministerial cooperation. An agreement in 2018 between the Ministry of Finance and Ministry of Health stated that at least 50% of the cost savings from energy projects would be provided to the Ministry of Health to fund health services [57]. If similar agreements could be extended to reallocate energy savings to underfunded programmatic areas, it could both incentivise energy projects and improve the services that students and patients receive. Furthermore, directing these savings back to the specific facilities that generate them could provide incentives and promote additional engagement from the building managers.

Another institutional issue is the delay in connecting renewable energy equipment installed in public buildings to the national grid because of unpaid utility bills. One solution could be to settle these debts through long-term financing agreements. A financial institution, such as a bank or investor, could pay off the utility debts upfront and the ministry or public building could repay the loan over time which could allow for renewable energy equipment to be connected to the grid sooner. Suitable guarantees would need to be in place to ensure that the transfer of debt is handled appropriately and the new loan is paid off over time. ››

Energy efficiency and renewable energy measures can reduce costs for public buildings but these savings are experienced by their responsible ministries, rather than the facilities themselves.

Barriers to energy for public buildings

Alternatively, public buildings could operate without connecting their equipment to the national grid. Engaging renewable energy and EE companies to build and operate equipment under long-term service agreements could offer savings to the facilities if the payments to the company are less than the facility's current energy bills. This could offer a faster way for schools and hospitals to benefit from energy improvements but it would rely on public-private partnerships and potentially involve lengthy approval processes.

Finally, providing funding for dedicated staff training on energy efficiency and behaviour change could be a cost-effective means of reducing energy wastage. Government ministries have encouraged these activities through organisational policies and staff are usually supportive of such measures, but tailored training or awareness programmes are rare. Additionally, staff would likely be able to help identify energy-related issues in the buildings where they work – such as outdated equipment, issues with buildings, or inefficient practices – and using their knowledge and experience could help prioritise areas for future intervention. Providing financial support for training programmes, either centralised through the ministries or organised independently, could result in both energy savings through behaviour change and opportunities for targeted interventions in specific schools and hospital buildings.

BARRIER	OPPORTUNITY
Lack of data and facility-level energy assessments	Work directly with facility managers to access any available data Temporary standardised energy monitoring schemes coordinated by a central body
Monetary savings from energy interventions do not benefit individual public buildings	Agreements across government departments to share cost savings
Unpaid utility bills slow or stop the connection of renewable energy equipment to the grid	Settle debts to utilities with long-term financing agreements Engage with companies to implement and operate interventions with ministries paying off the debts over time
Little or no funding for staff training on energy efficiency	Earmarked funding for training and awareness raising for staff

05

Stakeholders and energy projects

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Overview of stakeholders in Jordan

Sustainable energy in displacement settings in Jordan is delivered through a complex network of stakeholders, each with their own mandates, projects, and objectives. Some organisations operate across the country or internationally, whilst others focus on issues in specific settings such as camps or urban areas.

The stakeholders working in Jordan can be classified into broad categories:

- **Government agencies** with mandates and responsibilities defined by the Government of Jordan.
- **Humanitarian, development, and non-profit organisations** which typically address specific issues including UN agencies operating across the world, international NGOs with projects in Jordan, and local NGOs working across the country or in certain areas.
- **Industry associations and energy sector advocacy organisations** which promote sustainable energy and energy efficiency, or aspects thereof, on behalf of the members and constituent organisations.
- **Private sector** companies which offer energy equipment or services on a commercial basis.
- **Finance institutions** which offer access to banking and other financial services to organisations, companies, and community members.
- **Other organisations** with a focus on issues that are related to sustainable energy or displaced people.

This section provides a short summary of the most relevant organisations working in the energy, humanitarian, and development sectors in Jordan, their work, and relevant partnerships. It also provides deep dives into some of the projects and organisations aiming to scale up sustainable energy and energy efficiency in Jordan. The directory of stakeholders included in this section intends to be extensive but not exhaustive.

Jordan has a well-developed network of organisations working in both the energy sector and supporting the humanitarian response.

Overview of stakeholders in Jordan

JORDANIAN-GERMAN ENERGY PARTNERSHIP
Intergovernmental partnership
NATIONWIDE

MINISTRY OF ENVIRONMENT
Government ministry
NATIONWIDE

SYRIAN REFUGEE AFFAIRS DIRECTORATE (SRAD)
Government department
NATIONWIDE

MINISTRY OF WATER AND IRRIGATION (MWI)
Government ministry
NATIONWIDE

MINISTRY OF ENERGY AND MINERAL RESOURCES (MEMR)
Government ministry
NATIONWIDE

ENERGY AND MINERALS REGULATORY COMMISSION (EMRC)
Government ministry
NATIONWIDE

ENATIONAL ELECTRIC POWER COMPANY (NEPCO)
Government ministry
NATIONWIDE

NORWEGIAN REFUGEE COUNCIL (NRC)
International NGO
NATIONWIDE

MERCY CORPS
International NGO
NATIONWIDE

FOOD AND AGRICULTURE ORGANISATION OF THE UNITED NATIONS (FAO)
UN agency
NATIONWIDE

HABITAT FOR HUMANITY
International NGO
NATIONWIDE

PRINCESS ALIA FOUNDATION (PAF)
Local NGO
NATIONWIDE

THE ROYAL MARINE CONSERVATION SOCIETY (JREDS)
Local NGO
NATIONWIDE

NEAR EAST FOUNDATION
Regional NGO
NATIONWIDE

INTER-ISLAMIC NETWORK ON WATER RESOURCES DEVELOPMENT AND MANAGEMENT (INWRDAM)
Regional NGO
NATIONWIDE

UN-HABITAT
UN agency
NATIONWIDE

UNITED NATIONS RELIEF AND WORKS AGENCY FOR PALESTINE REFUGEES IN THE NEAR EAST (UNWRA)
UN agency
NATIONWIDE

OTHER NON-PROFIT AND HUMANITARIAN ACTORS
Non-profit actors
NATIONWIDE

UNHCR
UN agency
NATIONWIDE

ECOPEACE MIDDLE EAST
Regional NGO
NATIONWIDE

JORDAN RIVER FOUNDATION (JRF)
Local NGO
NATIONWIDE

ASSOCIATION OF COMPANIES WORKING IN THE FIELD OF RENEWABLE ENERGY
Industry association
NATIONWIDE

JORDAN GREEN BUILDING COUNCIL (JORDAN GBC)
Local NGO
NATIONWIDE

ASSOCIATION OF ENERGY ENGINEERS
Industry association
NATIONWIDE

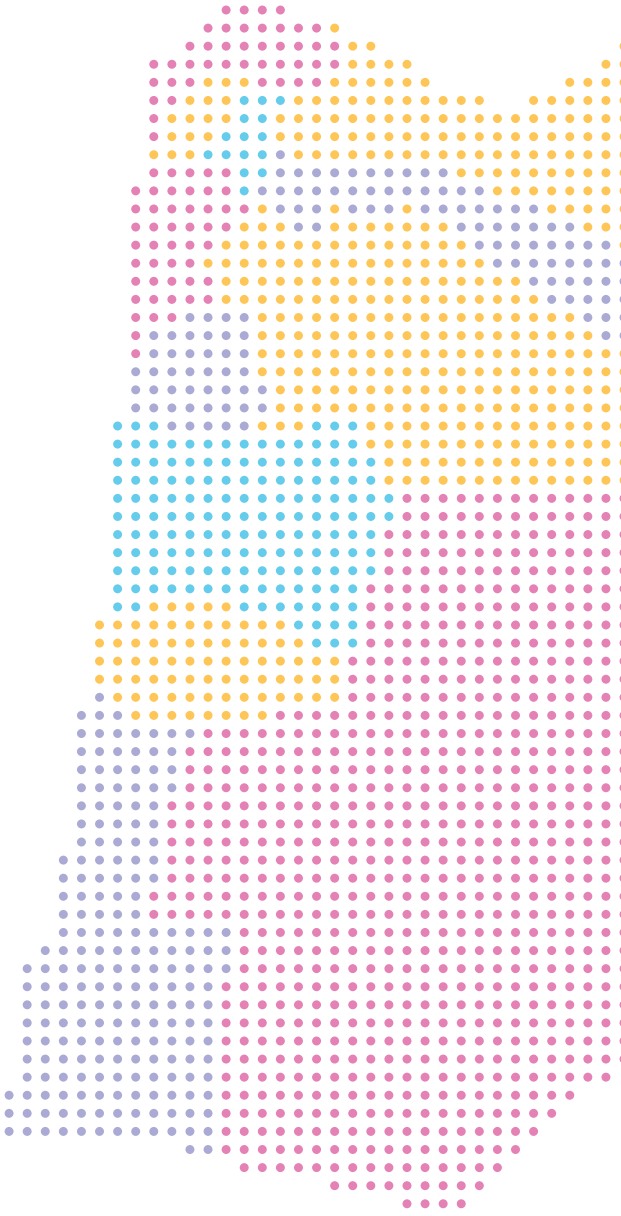
RENEWABLE ENERGY AND ENERGY EFFICIENCY MANAGEMENT COMPANIES SOCIETY (REES)
Industry association
NATIONWIDE

EDAMA ASSOCIATION
Industry association
NATIONWIDE, AZRAQ CAMP, ZARQA CITY

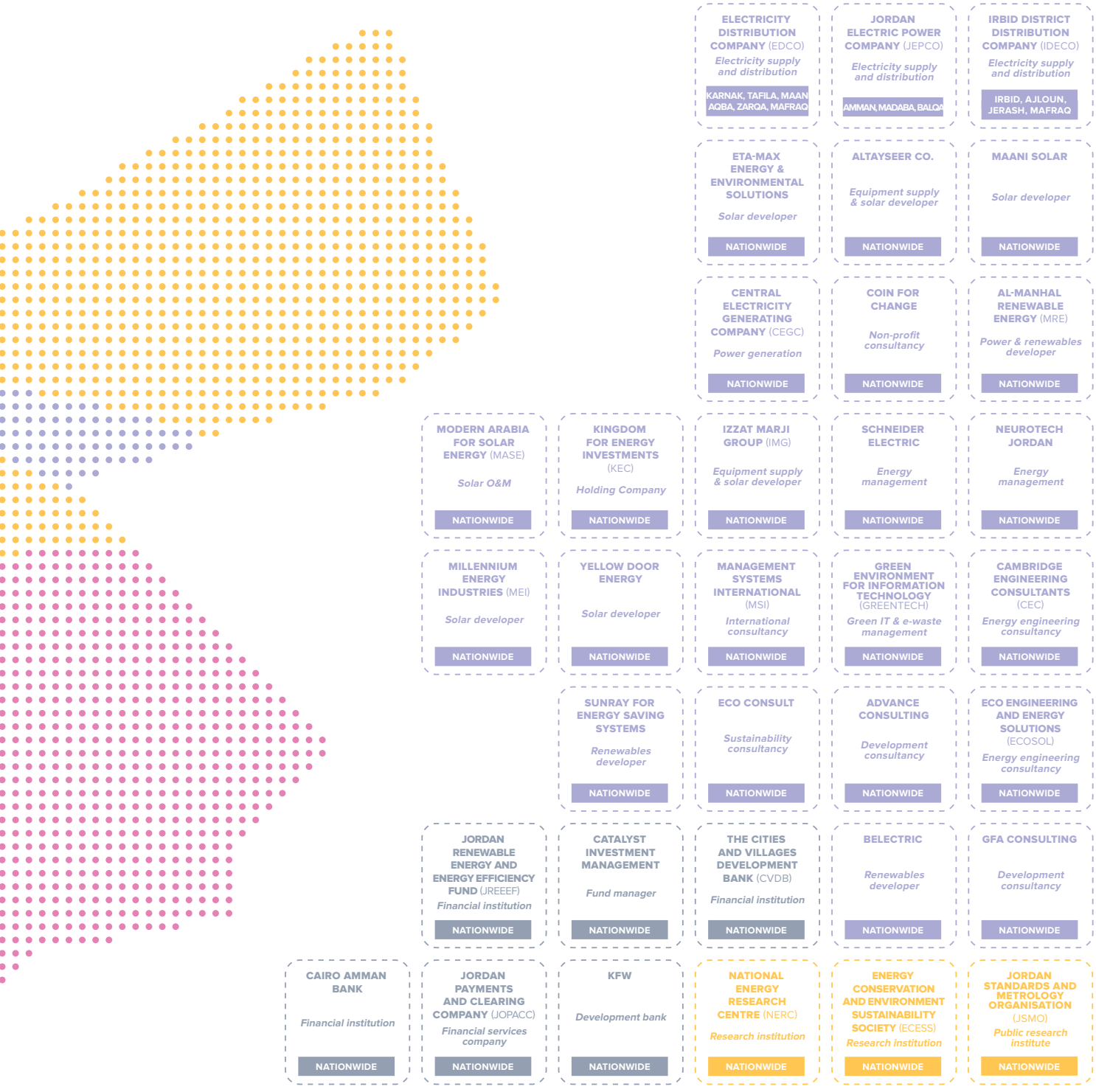
ENERGY CONSERVATION AND SUSTAINABLE ENVIRONMENT (E-CASE) SOCIETY
Advocacy group
NATIONWIDE

ARAB RENEWABLE ENERGY COMMISSION (AREC)
Regional NGO
NATIONWIDE

JORDANIAN RENEWABLE ENERGY SOCIETY (JRES)
Advocacy group
NATIONWIDE



Overview of stakeholders in Jordan



Stakeholder directory

GOVERNMENT

MINISTRY OF ENERGY AND MINERAL RESOURCES (MEMR)

Government ministry

NATIONWIDE

The **Ministry of Energy and Mineral Resources (MEMR)** is responsible for overseeing Jordan's energy sector, including the development of the country's national energy strategy and planning. **MEMR** writes all relevant laws, bylaws and rules for implementation, which then typically require approval from the Council of Ministers (CoM). **MEMR** is responsible for attracting investments in electricity production and the oil and gas sector. Additionally, the ministry oversees electricity trade and energy efficiency policy and manages the JREEEF.

ENERGY AND MINERALS REGULATORY COMMISSION (EMRC)

Government ministry

NATIONWIDE

The Energy and Minerals Regulatory Commission (EMRC) is the independent legal entity responsible for regulation and monitoring of the electricity, nuclear safety and security, and mining sectors. **EMRC** was established in 2017 as the successor of three previously separate regulatory agencies.

NATIONAL ELECTRIC POWER COMPANY (NEPCO)

Government ministry

NATIONWIDE

The **National Electric Power Company (NEPCO)** is a state-owned single-buyer and single-seller of electricity, and it is also responsible for managing the country's transmission system. **NEPCO** re-sells procured electricity to three regional distribution companies: **JEPCO**, **EDCO**, and **IDECO**. **NEPCO** is also responsible for signing power purchase agreements with independent power producers.

JORDANIAN-GERMAN ENERGY PARTNERSHIP

Intergovernmental partnership

NATIONWIDE

Hosted in Amman, the Jordanian-German Energy Partnership was established in April 2019 to facilitate high-level expert exchange between representatives of government, industry, civil society, and academia to support the energy transition of both countries. The main partners to the partnership are the German Federal Ministry for Economic Affairs and Climate Action (BMWK) and Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) which supports Germany's implementation of the partnership. Priority areas for the partnership include transition economics, education on renewable energy sources, system integration of renewables, expert exchange, and women's inclusion in the energy sector.

Stakeholder directory

GOVERNMENT

MINISTRY OF ENVIRONMENT

Government ministry

NATIONWIDE

The **Ministry of Environment** reviews impact assessments for energy projects and is responsible for waste management, including for e-waste. The ministry also leads on the country's climate change mitigation and adaptation efforts, including Jordan's nationally determined contributions.

MINISTRY OF WATER AND IRRIGATION (MWI)

Government ministry

NATIONWIDE

The **Ministry of Water and Irrigation (MWI)** is responsible for the overall monitoring of Jordan's water sector including supply, water and wastewater management, national policymaking, research and development, water-related information systems, and procurement of financial resources. MWI also manages the country's water-related data.

SYRIAN REFUGEE AFFAIRS DIRECTORATE (SRAD)

Governmental department

NATIONWIDE

The **Syrian Refugee Affairs Directorate (SRAD)** was established under the Public Security Directorate to support the Government of Jordan's response to the Syrian refugee crisis. **SRAD** works closely with **UNHCR** to administer Zaatari and Azraq camps. It implements government policies related to Syrian refugees, including registering new cases, issuing documents, and facilitating legal and other transactions related to refugees.

Stakeholder directory

HUMANITARIAN AND DEVELOPMENT

UNHCR

UN agency

NATIONWIDE

The **Office of the United Nations High Commissioner for Refugees (UNHCR)** is the lead UN agency for refugees in Jordan, responsible for issuance of civil documents and the provision of protection services. In cooperation with the GoJ's Syrian Refugee Affairs Directorate it jointly administers Zaatari and Azraq, the country's two largest refugee camps. **UNHCR's** responsibilities in the camps include the operation and maintenance of energy access infrastructure, including on-site solar plants. It manages the provision of grid electricity in cooperation with several government entities and government-owned distribution companies.

NORWEGIAN REFUGEE COUNCIL (NRC)

International NGO

NATIONWIDE

The **Norwegian Refugee Council (NRC)** is an independent humanitarian organisation helping people forced to flee and affected by displacement. **NRC** works across six areas: food security, education, shelter, legal assistance, protection from violence, and water, sanitation, and hygiene. **NRC** provides support in the Zaatari and Azraq camps as well as surrounding host communities with a focus on the northern governorates. **NRC's** energy programming has focused on energy efficiency measures to reduce customer bills and emissions. Through the Replicable Renewable Energy Pilots project and Renewable Energy for Refugees (RE4R) projects, **NRC** has funded energy efficiency upgrades for households and schools, such as weatherisation and solar water heater installation. **NRC** has also conducted awareness-raising activities around energy efficiency, as well as studies on energy-related topics in refugee camps and host communities.

MERCY CORPS

International NGO

NATIONWIDE

Mercy Corps is a global non-governmental humanitarian aid organisation working across 40 countries. In Jordan, **Mercy Corps** has implemented projects to support refugees in camps as well as urban and rural contexts, often partnering with the private sector, community organisations, and governmental authorities. Energy-related programming has included initiatives to solarise schools and other public institutions, including in Maan governorate. Its AMAZE initiative supported energy needs assessments, recommendations, energy efficiency capacity building, and energy services market access for 300 businesses in the Zaatari camp. **Mercy Corps** is also supporting the development of Tahammul, an interactive platform mapping climate change resilience projects across the country. Its Livelihoods and Environment Actions for Development (LEAD) project aims to boost climate resilience by improving water and food security in Al Zubraieya.

Stakeholder directory

HUMANITARIAN AND DEVELOPMENT

FOOD AND AGRICULTURE ORGANISATION OF THE UNITED NATIONS (FAO)

UN agency

The Food and Agriculture Organization of the United Nations (**FAO**) is engaged in activities across Jordan to enhance social stability, food security, and local economies for both refugee and host communities. Its programming focuses enhancing the climate resilience and productivity of agricultural systems and food supply chains, including through the installation of renewable energy sources such as solar irrigation systems. **FAO** has solarised its facilities in Amman in line with its broader strategy to decarbonise operations. **FAO** engages relevant stakeholders in Jordan in dialogue about the water-energy-food nexus and efficiency water management systems.

NATIONWIDE

HABITAT FOR HUMANITY

International NGO

Habitat for Humanity is a US-based international non-profit focused on the development of affordable housing for vulnerable communities. In Jordan, **Habitat** collaborates with community organisations and government stakeholders to support shelter rehabilitation for Syrian refugees and vulnerable host community members; these include the Ministry of Education, Ministry of Health, Greater Amman Municipality, and Ministry of Social Development. This support includes the provision of microloans to support rehabilitation projects as well as technical assistance and capacity building to enable the use of green building techniques that improve household water and energy efficiency.

NATIONWIDE

UN-HABITAT

UN agency

The **United Nations Human Settlements Programme** (**UN-Habitat**) is mandated to foster socially and environmentally sustainable urban development, and human settlements. In Jordan, **UN-Habitat** works across Amman, Irbid, Mafraq, Jerash, Kerak, Jordan Valley, and Madaba. Its programming focuses on enhancing the climate adaptation and resilience of refugee and other vulnerable populations. Projects have included conducting climate and flood risk assessments, development of response plans, promoting water management practices, and mobilising resources for risk management. **UN-Habitat** facilitates community-led development of multi-use public spaces, including as a trust-building opportunity for refugee and host communities in Amman and Zarqa. It also works to reduce inequality and poverty by enhancing urban planning frameworks, including supporting the development of the National Urban Policy for Jordan.

NATIONWIDE

Stakeholder directory

HUMANITARIAN AND DEVELOPMENT

UNITED NATIONS RELIEF AND WORKS AGENCY FOR PALESTINE REFUGEES IN THE NEAR EAST (UNWRA)

UN agency

NATIONWIDE

The **United Nations Relief and Works Agency for Palestine Refugees in the Near East (UNRWA)** is the UN agency which registers and provides assistance for Palestine refugees in Jordan. **UNRWA** provides refugee support, healthcare, education, financial, and other services across ten refugee camps across the country but does not administer or police the settlements. **UNRWA** has made efforts to decarbonise its operations in Jordan, including through the construction of a solar plants to power its facilities. The agency has also supported Palestine refugee organisations in procuring renewable energy to power community facilities and conducted solar vocational training programmes for youth.

PRINCESS ALIA FOUNDATION (PAF)

Local NGO

NATIONWIDE

The **Princess Alia Foundation (PAF)** is a non-profit, non-governmental organisation founded by Her Royal Highness Princess Alia Al Hussein of Jordan and takes a holistic approach to promote social development. **PAF** supports a number of projects spanning education, animal welfare, wildlife protection, and social and community development. Between 2017 and 2020, **PAF** led the Sustainable Education through Renewable Energy project which equipped 120 schools with solar heating and cooling systems.

THE ROYAL MARINE CONSERVATION SOCIETY (JREDS)

Local NGO

NATIONWIDE

The Royal Marine Conservation Society (JREDS) is a Jordanian non-profit NGO founded in 1993 by a group of ecologically-minded divers. It is headed by Her Royal Highness Princess Basma bint Ali. **JREDS** engages in projects focused on marine conservation, outreach and advocacy, and sustainable development. Through its sustainable development workstream, in 2018 and 2019, JREDS co-implemented the Sustainable Education through Renewable Energy and Energy Efficiency project in the northern areas of the country. This programme included awareness raising activities for Jordanian and Syrian students and was implemented in partnership with **PAF,** Horizons for Green Development, and Future Pioneers.

NEAR EAST FOUNDATION

Regional NGO

NATIONWIDE

The **Near East Foundation (NEF)** is a US-based international NGO supporting people facing situations of displacement, conflict, exclusion, and climate vulnerability. **NEF** works with local partners across the Middle East, Africa and the Caucasus to implement community-led economic and social development programs. In Jordan, **NEF** supports refugee and vulnerable members of host communities in developing enterprises through the provision of vocational training, business development support, and start-up grants, and assets.

Stakeholder directory

HUMANITARIAN AND DEVELOPMENT

INTER-ISLAMIC NETWORK ON WATER RESOURCES DEVELOPMENT AND MANAGEMENT (INWRDAM)

Regional NGO

The Inter-Islamic Network on Water Resources Development and Management (**INWRDAM**) was founded in 1987 to implement practical solutions related to the water-energy-food-ecosystems (WEFE) nexus. To that end, the **INWRDAM** organises a regional community of practice on the WEFE nexus, coordinates a regional dialogue on water diplomacy, and promotes water resilience in climate systems. It also conducts research and analysis on nexus-related challenges and opportunities, supports the development of innovative technologies, and conducts capacity building through training and education programs. **INWRDAM** supports local and regional projects that demonstrate the benefits of integrated resource management.

NATIONWIDE

ECOPEACE MIDDLE EAST

Regional NGO

EcoPeace Middle East aims to bring together Jordanian, Palestinian, and Israeli environmentalists with the aim of advancing sustainable development and building lasting peace. The organisation has offices in Amman, Ramallah and Tel-Aviv and has a proposed Green Blue Deal for the Middle East focused on cross-border collaboration on adaptive water management, renewable energy, and management of other shared natural resources. The organisation is also engaged in advocacy around improved water supply and sanitation in the Gaza Strip, as well as rehabilitation of the Dead Sea, Jordan River, and trans-boundary waterways. **EcoPeace** employs a bottom-up approach focused on education of local constituents, as well as a top-down approach to advocate for policy changes.

NATIONWIDE

JORDAN RIVER FOUNDATION (JRF)

Local NGO

The **Jordan River Foundation** (**JRF**) is an NGO chaired by Her Majesty Queen Rania Al Abdullah and focuses on child safety and community empowerment. Through its Jordan River Community Empowerment Program, **JRF** supports Syrian refugee and host communities. Activities include protection services and economic empowerment opportunities for women and girls, promoting access to digital financial services, promoting livelihood improvements through mentorship and economic opportunities, supporting farmers with water conservation, and supplying grant funding to community initiatives and organisations, among other programmes. **JRF** also promotes of women and children's safety through community centres and a wide variety of social support offerings, as well as supporting the development of social enterprises in Jordan.

NATIONWIDE

OTHER NON-PROFIT AND HUMANITARIAN ACTORS

Non-profit actors

Other humanitarian and development organisations working on issues aligned with energy and the environment in Jordan include the **United Nations Childrens Fund (UNICEF)**, the **United Nations Development Programme (UNDP)**, the **World Food Programme (WFP)**, and **Médecins Sans Frontières (MSF)**.

NATIONWIDE

Stakeholder directory

INDUSTRY ASSOCIATIONS AND ENERGY SECTOR ADVOCACY ORGANISATIONS

ASSOCIATION OF ENERGY ENGINEERS

Industry association

NATIONWIDE

Founded in 1977, the **Association of Energy Engineers (AEE)** is a US-based international industry association committed to advancing sustainable energy practices through the provision of education and professional certifications, as well as the promotion of quality energy management standards. The Amman chapter of **AEE** was established in 2019 and is an authorised provider of training courses and exams developed by **AEE** on energy management and other topics. The local chapter also organises technical lectures, webinars, seminars and field trips. It is affiliated with the Renewable Energy and Energy Efficiency Management Companies Society.

RENEWABLE ENERGY AND ENERGY EFFICIENCY MANAGEMENT COMPANIES SOCIETY (REES)

Industry association

NATIONWIDE

The **Renewable Energy and Energy Efficiency Management Companies Society** (**REES**) is a non-profit Jordanian industry association established in 2014. **REES** represents and supports companies working in the renewable energy sector in Jordan, providing support to and safeguarding the interests of its members, advocating around sector development, and promoting industry standards. Its members are primarily EPC companies, contractors and manufacturers. It is affiliated with the local chapter of the **Association of Energy Engineers** in Jordan.

EDAMA ASSOCIATION

Industry association

NATIONWIDE, AZRAQ CAMP, ZARQA CITY

The **EDAMA Association** was established in 2009 as a Jordanian non-governmental business association promoting the shift toward a green economy. Its membership includes public and private sector entities, NGOs, and research institutions. **EDAMA** holds sector networking events and conducts capacity building programmes which have included training on solar PV module and site cleaning for Syrian refugees and vulnerable Jordanians. Through its Green Links program, **EDAMA** promotes circular economy strategies, technological solutions, and community engagement to optimise resource use, reduce waste, and create livelihood opportunities for Syrian refugees living in Azraq camp as well as Jordanians living in the surrounding community and in Zarqa city.

ASSOCIATION OF COMPANIES WORKING IN THE FIELD OF RENEWABLE ENERGY

Industry association

NATIONWIDE

Established in 2014, the **Association of Companies Working in the Field of Renewable Energy** aims to promote the renewable energy sector in Jordan, contribute to the development of human capital and quality standards in the sector, and represent the interests of renewable energy companies to authorities and in the private sector.

Stakeholder directory

INDUSTRY ASSOCIATIONS AND ENERGY SECTOR ADVOCACY ORGANISATIONS

JORDANIAN RENEWABLE ENERGY SOCIETY (JRES)

Advocacy group

NATIONWIDE

The **Jordanian Renewable Energy Society (JRES)** aims to promote the development of renewable energy resources in Jordan and globally. It aims to develop a platform of researchers, engineers, economists, entrepreneurs, educators, and decision-makers which will raise awareness about the benefits of renewable energy, facilitate technology and knowledge transfer in Jordan's energy and water sectors, and encourage investment in the sector by advocating for necessary legislative and regulatory reforms.

JORDAN GREEN BUILDING COUNCIL (JORDAN GBC)

Local NGO

NATIONWIDE

The **Jordan Green Building Council** (**Jordan GBC**) is a non-profit green business association advocating for the adoption of green building practices and certifying green buildings in the country. It is affiliated with the World Green Building Council and MENA Regional Network of Green Building Councils. The **Jordan GBC** conducts research on topics related to innovative green building practices and its technical arm, the Green Academy, provides training courses and awareness raising workshops. Its projects have included retrofitting 48 low-income houses, a gap analysis of the US-developed LEED Building Rating System in the Jordanian context, development of an energy efficient building course, and the publication of guidance on developing net zero buildings in Jordan.

ARAB RENEWABLE ENERGY COMMISSION (AREC)

Regional NGO

NATIONWIDE

The **Arab Renewable Energy Commission (AREC)** was founded in 2011 by 16 Arab countries as a non-profit civil society organisation representing all stakeholders involved in the renewable energy sector in the Arab World. Headquartered in Amman, it operates under the Council of the Arab Economic Unit of the League of Arab States. **AREC** works to attract investments in renewable energy in the region and it holds conferences, seminars, workshops, and dialogues in Arab states as well as provides trainings and consultations regarding projects related to renewable energy and its uses.

ENERGY CONSERVATION AND SUSTAINABLE ENVIRONMENT (E-CASE) SOCIETY

Advocacy group

NATIONWIDE

The **Energy Conservation and Sustainable Environment (E-Case) Society** was established in 2004 in Amman with the mission of promoting energy efficiency, renewable energy, and sustainability in the building sector as well as increased use of hybrid and low-carbon fuel vehicles and public transportation services. The **Society** aims to educate the public on the importance of environmentally friendly technologies.

Stakeholder directory

PRIVATE SECTOR

ELECTRICITY DISTRIBUTION COMPANY (EDCO)

Electricity supply and distribution

Electricity Distribution Company (EDCO) is a public shareholding company licensed to distribute electricity across approximately 55% of Jordan. It provides 18% of national electricity consumption and its service area includes the southern governorates of Karnak, Tafila, Maan, and Aqba, as well as portions of Zarqa and eastern Mafraq. Founded in 1997 as a state-owned utility, 100% of the company's shares were acquired by Kingdom Electricity Company in 2008 as part of the government's strategy to privatise the electricity sector.

KARNAK, TAFILA, MAAN, AQBA, ZARQA, MAFRAQ

JORDAN ELECTRIC POWER COMPANY (JEPCO)

Electricity supply and distribution

Jordan Electric Power Company (JEPCO) is a public shareholding company licensed to distribute electricity across Amman, Madaba and Balqa governorates. Founded in 1938, its service area accounts for around 55% to 65% of national electricity consumption.

AMMAN, MADABA, BALQA

IRBID DISTRICT DISTRIBUTION COMPANY (IDECO)

SHS company

Irbid District Distribution Company (IDECO) is a public shareholding company licensed to distribute electricity across Irbid, Ajloun, Jerash and parts of Mafraq governorate. Its service area accounts for around 17% of national electricity consumption. **EDCO** holds a 55.4% stake in **IDECO**.

IRBID, AJLOUN, JERASH, MAFRAQ

KINGDOM FOR ENERGY INVESTMENTS (KEC)

SHS company

Kingdom for Energy Investments Company (**KEC**) is a holding companies in Jordan which invests in energy generation and distribution companies and utilities. Its main shareholders are Jordan's Social Security Investment Fund, the Privatization Holding Company of Kuwait, and Arab Jordan Investment Bank. The company was established in 2007 to support the privatisation of the country's electricity sector. It owns 100% of **EDCO** and holds an indirect 55.4% stake in **IDECO** via **EDCO**. The company also holds stakes in several power projects, including solar and gas plants.

NATIONWIDE

CENTRAL ELECTRICITY GENERATING COMPANY (CEGC)

Power generation

Central Electricity Generating Company (**CEGC**) is a majority privately-owned generation company which accounted for 37% of power generated in the country in 2018, including from its solar and gas power plants. It also provides O&M services to other companies in the power sector, including Saudi company ACWA Power, which holds a stake in the Aqba Thermal Power Plant.

NATIONWIDE

Stakeholder directory

PRIVATE SECTOR

COIN FOR CHANGE

Non-profit consultancy

Coin for Change is a non-profit consulting venture dedicated to bridging the gap between the public and private sectors in the realm of new technology utilisation. In Jordan, Coin for Change co-leads the Tahammul project which builds a collaborative interactive database mapping stakeholders and projects in the climate sector in Jordan, in collaboration with **Mercy Corps.**

NATIONWIDE

SCHNEIDER ELECTRIC

Energy management

Schneider Electric is a French multinational company primarily operating in the fields of digital automation and energy management. The company aims to increase energy access globally through its training entrepreneurship program, social and inclusive business practices, and impact investment funds. In Jordan, **UNHCR** works with **Schneider Electric** to monitor energy consumption across 10 shelters in Village 6 of Zaatari refugee camp.

NATIONWIDE

NEUROTECH JORDAN

Energy management

Neurotech is a Jordanian start-up focused on energy management and digital automation. The company offers a dedicated energy demand monitoring system targeted for use in camp settings and remote areas. **NRC** partnered with **Neurotech** to install energy controllers in 190 shelters to monitor and manage electricity demand and increase overall power availability. The company also installs and operates residential solar systems using a pay-as-you-go model.

NATIONWIDE

IZZAT MARJI GROUP (IMG)

Equipment supply & solar developer

Izzat Marji Group (**IMG**) is a supplier of heating and cooling systems, as well as sanitary supplies, fixing systems, plumbing materials, and power tools. The company also provides solar PV EPC and O&M services, green building consulting services, energy efficiency studies, and energy audits.

NATIONWIDE

Stakeholder directory

PRIVATE SECTOR

YELLOW DOOR ENERGY

Solar developer

Yellow Door Energy is solar developer providing EPC and O&M services to a range of customers in the private and public sectors, including the **MEMR** and General Intelligence Department (GID). The company primarily develops commercial and industrial solar installations, including several sites over 10 MW for large corporate customers, which it sells outright or leases under long-term power purchase agreements. **Yellow Door Energy** also develops battery energy storage systems, electric vehicle charging systems, LED street lighting, solar water treatments, and green cooling systems. The company's O&M portfolio in Jordan stands at 80 MW, while across the Middle East and Africa it has 200 MW of cumulative capacity.

NATIONWIDE

MAANI SOLAR

Solar developer

Maani Solar is a solar developer headquartered in Amman with a regional presence. It primarily develops custom commercial and industrial installations but is also capable of developing utility-scale projects. **Maani Solar's** cumulative installed capacity is 20 MW.

NATIONWIDE

ALTAYSEER CO.

Equipment supply & solar developer

Altayseer Co. is a piping and radiator manufacturer, distributor of energy products, and solar project developer. The company distributes a wide range of energy systems and equipment, including air conditioners, heat pumps, gas boilers, solar thermal systems, inverters, mounting structures and cables. Since 2016 it has also developed PV systems mainly for residential, commercial, and industrial applications. **Altayseer** has a cumulative development portfolio of 8 MW and an O&M portfolio of 5 MW.

NATIONWIDE

ETA-MAX ENERGY & ENVIRONMENTAL SOLUTIONS

Solar developer

ETA-max Energy & Environmental Solutions develops commercial and industrial solar systems. It also provides energy auditing services to help companies optimise their consumption and reduce their carbon footprint. **ETA-max** provides customised trainings and workshops on energy topics and operates in Jordan and the broader MENA region.

NATIONWIDE

Stakeholder directory

PRIVATE SECTOR

AL-MANHAL RENEWABLE ENERGY (MRE)

Power & renewables developer

NATIONWIDE

Established in 2014, **Al-Manhal Renewable Energy** (**MRE**) specialises in electric power and renewable energy. The company has developed solar, wind and biomass solutions for residential, commercial, and industrial customers. It also provides uninterruptible power supply (USP) back-up systems and batteries, as well as generators. **MRE** is a certified provider of energy audits and offers consulting, power monitoring, and training services.

MILLENNIUM ENERGY INDUSTRIES (MEI)

Solar developer

NATIONWIDE

Millennium Energy Industries (MEI) is an Amman-based developer of solar thermal and PV systems. The company has implemented projects for a wide range of commercial, industrial, and institutional customers in Jordan and the Middle East. Between 2016 and 2020 **MEI** implemented solar thermal and PV systems for Al-Bashir Hospital in Amman.

MODERN ARABIA FOR SOLAR ENERGY (MASE)

Solar O&M

NATIONWIDE

Modern Arabia for Solar Energy (MASE) is a solar engineering company based in Amman which focuses on the provision of O&M services. The company also offers power and strategic services, including technical due diligence and remote monitoring. Between 2018 and 2020, **MASE** collaborated with **Mercy Corps** to improve eight schools through the installation of solar energy systems, air conditioning, and LED lighting.

SUNRAY FOR ENERGY SAVING SYSTEMS

Renewables developer

NATIONWIDE

Established in 2010, **Sunray for Energy Saving Systems** is a renewable energy developer and provider of advisory services in Jordan and the MENA region. Its cumulative installed capacity has reached 15 MW.

MANAGEMENT SYSTEMS INTERNATIONAL (MSI)

International consultancy

NATIONWIDE

Management Services International (**MSI**) is a subsidiary of US engineering services company Tetra Tech. **MSI** is implementing the Jordan Monitoring and Evaluation Support Project (MESP) which aims to help USAID's Jordan Mission improve its programming. In particular, the programme aims to strengthen the capacities of the monitoring, evaluation, and learning community in Jordan, including through the development of its three-month M&E Apprenticeship Program.

Stakeholder directory

PRIVATE SECTOR

GREEN ENVIRONMENT FOR INFORMATION TECHNOLOGY (GREENTECH)

Green IT & e-waste management

NATIONWIDE

Green Environment for Information Technology (**GreenTech**) is a green IT company which provides the supply of off office and IT equipment, website and application development services, logistics solutions, and business management and security software. The company also supports e-waste management by recycling and refurbishing out electronic equipment. **GreenTech** as a program to distribute refurbished equipment to vulnerable communities.

BELECTRIC

Renewables developer

NATIONWIDE

Belectric is a German renewable EPC service provider with cumulative global footprint of 5,000 MW and experience installing over 500 solar plants. In Jordan, **Belectric** implemented the 46 MW solar project with 2.6 MWh of battery storage financed by KfW which supplies electricity to 33 hospitals. Wheeling agreements were integrated into the project to offset power consumption and Zaatari in Azraq camps.

CAMBRIDGE ENGINEERING CONSULTANTS (CEC)

Energy engineering consultancy

NATIONWIDE

Cambridge Engineering Consultants (**CEC**) is a full-service building design, building information modelling, energy management, and sustainability consulting firm based in Amman. Its building design services include HVAC, plumbing, fire protection, power distribution and lighting. The company provides energy auditing, modelling, and LEED certification consulting services. **CEC** also installs building solar systems. The consultancy has worked with a range of commercial and institutional clients.

ECO ENGINEERING AND ENERGY SOLUTIONS (ECOSOL)

Energy engineering consultancy

NATIONWIDE

Eco Engineering and Energy Solutions (**EcoSol**) is an energy, water, and sustainability consulting agency based in Amman. The company provides LEED certification, energy and water auditing, solar design and installation, energy value engineering, lighting management, and energy and water management solutions.

Stakeholder directory

PRIVATE SECTOR

ADVANCE CONSULTING

Development consultancy

Advance Consulting is an international development consulting firm working across all sectors, with a focus on agriculture, circular economy, and renewable energy with offices in the Netherlands, Kenya, and Jordan. Its offers business development and fundraising support for SMEs and NGOs, market research and business intelligence, and implementation of projects and private sector development programmes. From 2019 to 2022, **Advance Consulting** led a project in partnership with the Dutch government and Wageningen University to enhance the competitiveness of Jordanian farmers via horticultural innovations, and support to increase productivity, reduce water use, and improve crop quality.

NATIONWIDE

ECO CONSULT

Sustainability consultancy

ECO Consult is a Jordanian consulting and development group tackling fundamental development and sustainability challenges in Jordan, the Middle East, Asia, and North Africa. **ECO Consult** supports clients in establishing environmental and social management and compliance systems, implementing resource allocation and management programmes, conducting environmental and social impact assessments and due diligence, and developing national and local opportunities in green economy sectors. **ECO Consult** also takes on projects focused on government and service sector development, SME capacity building and business support, developing and increasing the efficiency of infrastructure and municipal services, and agriculture sector development. Its clients include donor and financing institutions, national and local governments, community and civil society organisations, and businesses.

NATIONWIDE

GFA CONSULTING

Development consultancy

GFA Consulting is a German development consulting agency operating in South America, Africa, the Middle East, Eastern Europe, and Asia. The company works across a wide range of themes including agriculture and rural development, climate change and the environment, energy, health, education, private sector development, water, sanitation, and waste management. Among other projects, in Jordan **GFA** supported the government in developing policies and the enabling environment to reach its renewable energy and energy efficiency targets. **GFA** also supported implementation of the Ministry of Public Works and Housing in retrofitting 138 schools.

NATIONWIDE

Stakeholder directory

FINANCIAL INSTITUTIONS

THE CITIES AND VILLAGES DEVELOPMENT BANK (CVDB)

Financial institution

NATIONWIDE

The **Cities and Villages Development Bank** (**CVDB**) provides funding, banking services and advisory support to local authorities in relation to development projects. It engages with all municipalities in the country through the provision of loans, with a focus on energy efficiency upgrades and infrastructure projects. **CVDB** also facilitates the disbursal of national budget allocations to municipalities. The bank aims to promote public-private partnerships and drive larger climate adaptation and mitigation impacts in Jordan. It was the first national direct access entity in the country to be accredited by the Green Climate Fund.

CATALYST INVESTMENT MANAGEMENT

Fund manager

NATIONWIDE

Established in 2006, **Catalyst Investment Management** is an Amman-based investment management firm focused on the renewable energy and water sectors in Jordan and the MENA region. **Catalyst** has launched three funds investing in greenfield and brownfield climate and renewable energy infrastructure; SMEs working in the clean energy, energy efficiency, and water sectors; and early-stage water and energy ventures.

JORDAN RENEWABLE ENERGY AND ENERGY EFFICIENCY FUND (JREEEF)

Financial institution

NATIONWIDE

The **Jordan Renewable Energy and Energy Efficiency Fund (JFREEEF)** was established to fund energy efficiency and renewable energy measures at the end-user level in Jordan. Administered by the **MEMR,** the fund provides revolving credit, grants, loan guarantees, equity financing, soft loans, and other financial products to finance relevant projects. Additionally, the **JREEEF** provides technical support and capacity building in line with Jordan's energy goals. In recent years, **JREEEF** has supported the installation of solar electricity and heating systems for households as well as renewable energy and efficiency measures for public buildings. **JREEEF** also supports energy audits. Cumulatively it has facilitated the installation of 53 MW of solar across the country.

CAIRO AMMAN BANK

Financial institution

NATIONWIDE

Cairo Amman Bank is a full-service bank headquartered in Amman and operating in Jordan and Palestine. It supports the provision of financial services to unbanked populations through the use of iris-scanning technology. **Cairo Amman Bank** has worked with the **UNHCR** to administer cash-based assistance through the use of this technology and the installation of ATMs in Azraq and Zaatari refugee camps.

Stakeholder directory

FINANCIAL INSTITUTIONS

JORDAN PAYMENTS AND CLEARING COMPANY (JOPACC)

Financial services company

NATIONWIDE

The **Jordan Payments and Clearing Company (JoPACC)** is a domestic payment system operator in Jordan responsible for administering several digital financial services platforms, including JoMoPay, CliQ, and eFAWTEERcom, which target financial inclusion for the unbanked population, including refugees. **JoPACC** has partnered with the **UNHCR** and other humanitarian partners to equip refugees with mobile wallets through which they can receive cash-based assistance and access basic financial services. Through its outreach programs, **JoPACC** also conducts financial education and awareness raising sessions for refugee communities in the country.

KFW

Development bank

NATIONWIDE

KfW is a German development bank with a long track record of investing in water and energy infrastructure in Jordan, including in refugee settings. **KfW** provided 15 million EUR in financing to construct the 46 MW solar plant from which a portion of the generation is used to supply Azraq and Zaatari refugee camps.

Stakeholder directory

OTHER ORGANISATIONS

NATIONAL ENERGY RESEARCH CENTRE (NERC)

Research institution

The **National Energy Research Centre** (**NERC**) promotes renewable energy and energy efficiency in Jordan, including through the development of minimum performance labelling and standards. **NERC** also supports the development of national strategies related to clean cooking, cooling, and other energy transition and equity topics. It supports local municipalities in developing sustainable energy and climate action plans (SECAPs). **NERC** also engages in research and project support, including with international development partners. The centre conducts energy-related capacity building and awareness initiatives through training and knowledge dissemination programs. **NERC**'s host organisation, the Royal Scientific Society, is Jordan's largest applied research centre and has been approved to issue International Renewable Energy Certificates.

NATIONWIDE

ENERGY CONSERVATION AND ENVIRONMENT SUSTAINABILITY SOCIETY (ECESS)

Research institution

The **Energy Conservation and Environment Sustainability Society** (**ECESS**) conducts research on issues related to water and energy conservation, environmental protection, and the use of natural resources. **ECESS** also holds conferences, seminars, and lectures to raise awareness about environmental and conservation issues. It advocates to influence the development of laws, regulations, and instructions related to energy and water, as well as provide a convening space for stakeholders in these sectors

NATIONWIDE

JORDAN STANDARDS AND METROLOGY ORGANISATION (JSMO)

Public research institute

The Jordan Standards and Metrology Organisation (JSMO) was established to drive the adoption of a national system for standardisation and metrology based on international best practices, with the aim of ensuring the quality of products and services and protecting the health and safety of Jordanian citizens. **JSMO** has labs that test the quality of LED lighting units imported into the country.

NATIONWIDE

NRC Jordan: Energy interventions for refugee and host communities

The Norwegian Refugee Council (NRC) is an independent humanitarian organisation which helps people affected by displacement. The organisation works across six areas: food security, education, shelter, legal assistance, protection from violence, and water, sanitation, and hygiene. NRC has undertaken several interventions in Jordan to address energy issues for members of both refugee and host communities and, like the contexts of displacement in the country, NRC's energy work has focused on camps, urban settings, and public buildings.

NRC's work in Azraq camp

Households in Azraq camp have access to the electricity network but for only limited times of the day. To address this NRC partnered with a Jordanian startup, Neurotech, to investigate whether monitoring and controlling electricity usage could increase the availability of power without greatly increasing consumption [64]. Supported through funding from Innovation Norway, Neurotech developed energy controllers which could differentiate between and regulate critical primary electricity needs (such as for lighting and refrigerators) and non-essential secondary usage. When a household approached its energy consumption limit, the controller automatically cut off power to secondary appliances to preserve energy for primary uses.

The partnership installed 190 controllers in Village 2 in Azraq camp, reaching around 850 people. After testing and numerous iterations, the controllers offered promising results and enabled an increase in the average daily electricity access from 11.5 hours to 21.1 hours which significantly reduced food spoilage and supported essential activities. Participants found the controllers easy to understand and around half of the shelters showed considerable energy savings. NRC worked closely with UNHCR, which provided support for a stable 24/7 power supply to maximise the controllers' effectiveness and reduce strain on the power network.

Although the intervention concluded in June 2023, the lessons learned from the work of NRC and Neurotech have provided important insights and laid the groundwork for future opportunities. UNHCR plans to install smart energy dispensers at the shelter level which can provide a way for households to view their consumption and remaining credit for the day or week; this is set to roll out in 2025 to promote equitable electricity access across the camps. ››

NRC has implemented energy projects for shelters in camps, households in urban settings, and schools serving refugee and host community children.

NRC Jordan: Energy interventions for refugee and host communities

Sustainable energy in urban settings

Public schools in Irbid and Jerash experienced substantially higher electricity bills as a result of operating two shifts to accommodate both Jordanian and Syrian students. To help reduce costs, NRC installed solar PV systems across 24 schools that provided around 70% of their energy needs. In theory the reduced electricity bills would also allow schools to use these savings to cover other operational expenses, however as school budgets are allocated at the ministerial level, it was not possible to determine how the funds were redistributed. Nevertheless, the project significantly reduced schools' energy expenses and demonstrated the potential of renewable energy investments to support both displaced and host communities.

The organisation also worked directly with households to reduce their spending on energy. NRC conducted a survey on SWH systems and found that only around 30% of households used them, often due to the perception that it was an outdated technology. To promote the use of SWH among refugees and vulnerable populations, many of whom live in rented accommodation and cannot install systems themselves, NRC negotiated with landlords to provide a rent reduction (typically around 30%) in exchange for NRC installing SWHs. Funded by the European Union, the project ran from 2015 to 2017 and provided systems for 500 households. A one-size-fits-all approach was used in partnership with a private sector provider and this was the first time the model of SWH system was deployed. The project also included a coordination component through which an Energy and Water Task Force was established with the Ministry of Energy.

The RE4R project in Jordan

The Renewable Energy for Refugees (RE4R) project, implemented from 2018 to 2021, built on NRC's experience. Funded by the IKEA Foundation via Practical Action, a UK-based NGO which oversaw the wider RE4R project, NRC implemented its work in Jordan through three components [65]:

- SWH systems were installed for 602 refugee families living in rented accommodation in urban areas, expanding on the earlier work of NRC's shelter team. These systems reduced energy spending by an average of 29%. In addition, NRC undertook a pilot for energy efficiency in 158 households; as retrofitting an entire building or apartment can be complicated and costly, the organisation maximised the effectiveness of the measures by focusing on improving thermal comfort in at least one room per household.

- Training programmes provided new skills for Jordanian and Syrian youths to enter the sustainable energy sector. Led by NRC's youth programme, the six-month training courses trained 115 young people on renewable energy, whilst 107 students became certified technicians and 90 were trained on environmental initiatives. Students also learned interview skills and were matched with potential employers to increase their chances of finding employment opportunities.

- In Irbid, NRC's construction team implemented 14 solar PV systems for schools and rehabilitated eight with energy efficiency upgrades such as LED lighting, shading panels on windows, and SWH systems. The work also included training components for staff and teachers.

The RE4R project brought together different areas of NRC's expertise in sustainable energy and energy efficiency. It also provided the opportunity to coordinate with other organisations and programmes, such as JREEEF, to ensure that the organisation's work was aligned with the broader sector. ››

NRC Jordan: Energy interventions for refugee and host communities

Lessons learned

NRC's projects were the first time that a humanitarian organisation in Jordan had worked on energy efficiency and, whilst it could build on its experience, it also needed to ensure that its staff with appropriate expertise were involved in the relevant projects. These projects were also the first time that NRC had collaborated so closely with different government ministries and this required dedicated coordination to keep key stakeholders engaged as the projects progressed. Finally, in some of the projects, NRC partnered with the private sector (rather than engaging them as service providers alone) which required new ways of working to navigate the systems and procedures which are different in NGOs and companies.

The NRC team gained valuable experience in working with and managing different kinds of partners. Overall the coordination was successful and the organisation benefitted from maintaining its energy-related programming. As these projects came to an end, however, efforts to continue the work needed to increase. NRC has been exploring the potential to add energy efficiency measures to its shelter programme, for example through standard bills of quantities, but this would likely require earmarked funding. Current donor priorities include green growth and, whilst this is not yet well defined, NRC's work has shown the benefits – and often immediate impact – that renewable energy and energy efficiency can have on reducing costs for vulnerable households and Jordan's public buildings.

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Reflections on UNHCR Jordan's renewable energy initiatives

Establishing the solar plants

Establishing the solar plants in Azraq and Zaatari, respectively the first and largest such systems in refugee camps worldwide, was a significant undertaking. The construction of the solar plants came relatively early in UNHCR Jordan's operation and, requiring significant upfront capital investment, the organisation worked with several donors and energy companies to set up the project when funding and donor interest were high. Jordan provided a unique environment for implementation and was supported by a strong national energy sector with readily available expertise and human capital.

Refugees have been involved in the solar plants and wider electrical systems since the very beginning. Community members were included in focus group discussions, interviews, working groups, and other engagement activities to ensure that their voices were heard throughout the decision-making process.

Refugees also helped to build and maintain the systems as part of incentive schemes and through volunteering. As shelters in the camps receive only around half of the electricity of those in the host community, refugees have been actively involved in discussions and schemes to share consumption more evenly – such as by using energy dispensers – to improve the situation overall.

Operation and managing energy consumption

After construction there were several challenges. The harsh weather in Zaatari affected the operation of the inverters, for example, and so UNHCR has worked with the manufacturer and suppliers in Jordan to minimise the impact on electricity supply. Learning from this, UNHCR plans maintenance around one year in advance to keep stock of critical components and avoid faults as specialised technical support is often not available locally.

Energy consumption has changed over time and this has affected the electricity system. Originally designed to provide for basic needs and supply around 12 hours of power per day, many shelters now have access to high-power appliances such as inefficient air conditioners and high-resistance electric heaters (having switched from gas heaters) which have led to overconsumption. In combination with the harsh climate, this can limit power availability to around 4-6 hours per day depending on weather conditions. UNHCR anticipates that introducing energy dispensers, which have limits on both the total energy consumption per day and the amount of power that can be used at any one time, will help to more equally share the available electricity between shelters.

Like all humanitarian actors, UNHCR is subject to budget constraints and has limited funding to rehabilitate and upgrade the systems. Operation and maintenance of the systems is relatively costly, around $3-4 million per year, and is paid by UNHCR rather than the government or a utility as would be the case for many other plants. In addition, any difference between the energy generation of the solar plants and the consumption in the camps is paid by UNHCR. Furthermore UNHCR is subject to the highest electricity tariffs and, whilst new regulations have not impacted the solar plants, they have affected plans to solarise the organisation's offices. ››

Reflections on UNHCR Jordan's renewable energy initiatives

The future of the solar plants

The uncertainties surrounding the return of refugees to Syria bring the long-term operation of the solar plants into question. If a significant number of refugees return, but many others stay, then those who remain could have access to electricity for longer periods. If the situation changes and the plants need to be sold, however, a buyer would need to be found – potentially a distribution company – and a viable business model would need to be developed to ensure its continued operation, likely supplying the Jordanian grid.

Humanitarian operations are often forced to focus on fixing immediate day-to-day issues. The solar plants demonstrate how changing this mindset, to investing in capital-intensive solutions when funding is high, can significantly reduce costs and greenhouse gas emissions in the long term when resources may be more limited. Making continued investments over time, for example in maintaining electrical networks and improving efficiency, is also an important factor in keeping running costs low.

The solar plants in Azraq and Zaatari stand as two of the best examples of how to supply electricity at scale in refugee camps. Despite their challenges and uncertainties for the future, the plants continue to provide invaluable evidence and practical insight into how to build and operate such systems and the benefits they can bring for saving costs, reducing emissions, and ensuring that refugees living in the camps have access to sustainable electricity.

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Mercy Corps' projects for sustainable livelihoods

Mercy Corps has been involved in initiatives across the country to improve sustainability, resilience, and economic opportunities for displacement-affected communities and small enterprises. The NGO has implemented projects focusing on enhancing energy efficiency, promoting sustainable energy practices, and advancing the adoption of innovative technologies across urban and rural settings.

Livelihoods and Environmental Actions for Development (LEAD)

Mercy Corps implemented the LEAD project in the village of Al Zubraieya, located in Al Shobak District of Ma'an Governorate. The project focused on enhancing water and food security, sustainable livelihoods, and economic opportunities, with a strong emphasis on community ownership and climate resilience.

The LEAD project used comprehensive needs assessments, including a study conducted in collaboration with a global water technology company, to evaluate community water systems, agriculture, and economic sustainability. Mercy Corps also utilised a participatory development process by working with Al Furat, a community-based organisation that has fostered local trust and mobilisation, alongside other stakeholders to identify urgent water and livelihood challenges in Al Zubraieya.

Limited financial resources and outdated infrastructure had previously hindered the sustainability of water and agricultural systems. The LEAD project therefore introduced renewable energy solutions, efficient irrigation techniques, and enhanced water governance mechanisms to support long-term resilience for the community. Water infrastructure improvements reduced water losses by 63% and improved maintenance efficiency, providing both lower operational costs and faster repairs. The solar-powered water system reduced the dependency on unstable grid power, lowered electricity costs by 83%, and is estimated to save 133 tonnes of CO_2 per year, whilst the automated chlorination system provides safer potable water for households and agriculture.

The LEAD project also distributed organic fertilisers and natural pesticides, introduced greywater recycling for soil health, and established two digital learning hubs in the village for young people to improve their digital literacy and access online work opportunities. Amongst participating farmers, 74% adopted sustainable practices to improve their yields and 93% reported increased agricultural knowledge. Meanwhile 198 youth, of whom 158 were female, were trained in digital literacy and 95% improved their skills.

The LEAD project integrated sustainable water management, modern agricultural practices, and economic inclusion strategies to build a holistic and climate-resilient model for community development. The project's exit strategy supported local governance structures – particularly Al Furat and community-based initiatives – to maintain and build upon its progress. By fostering community ownership, private sector partnerships, and evidence-based interventions, the project has laid the foundation for long-term development impact. ››

The needs in Zaatari camp have evolved significantly, including for energy.

Mercy Corps' projects for sustainable livelihoods

Tahammul: Mapping climate action

Mercy Corps, in partnership with Coins for Change, launched Tahammul, a digital platform designed to map and coordinate climate change programmes across Jordan. The Tahammul platform serves as an open database of climate projects, facilitating decision-making and engagement across sectors. Tahammul identifies and connects organisations involved in climate resilience efforts, including government agencies, NGOs, research institutions, private sector actors, and environmental consultancies.

The platform provides a centralised hub for tracking climate programmes across the country. As well as providing a showcase for existing work, Tahammul helps local and international stakeholders to engage with partners in Jordan and explore opportunities for new climate-related projects. Having established the platform through internal funding, Mercy Corps aspires to continue working with Coins for Change to expand the platform, increase its uptake amongst policymakers and organisations, and develop new features to provide deeper insights for climate action.

Advancing Market Access for Zero-Emission Energy (AMAZE)

Mercy Corps' AMAZE programme was designed to tackle the growing energy challenges faced by refugee businesses in Zaatari camp while fostering a sustainable and accessible energy market. By promoting renewable energy adoption and energy-efficient solutions, the initiative aims to reduce energy costs, improve financial stability, and strengthen the resilience of businesses and households.

The first phase of the programme involved conducting energy efficiency studies and energy audits for 350 businesses to identify opportunities to reduce costs. This was supported by business training to increase operational efficiency. Mercy Corps partnered with 30-40 enterprises with the highest energy consumption, such as butchers and restaurants, to facilitate their transition to sustainable energy practices. In support of this, Mercy Corps signed an agreement with a company to assess the energy consumption patterns of refugees in the camps and urban settings; the company will distribute energy monitors to enable users to track and manage their energy consumption more effectively.

Mercy Corps will also explore opportunities to establish a sustainable energy ecosystem that is better connected to the broader Jordanian market. Building on the findings from its first phase, subsequent stages will adopt a market-based approach to expand partnerships with local shops, build the capacity of businesses, and support young people to access livelihoods opportunities, ultimately improving access to sustainable energy solutions.

The programme's launch was delayed due to government approvals but activities are now underway. Mercy Corps has identified collaboration with government agencies, the private sector, and local communities in planning and implementation as one of the key success factors for any project or intervention.

The needs in Zaatari camp have evolved significantly between 2012 and 2024, including for energy. Adapting to this changing situation requires more comprehensive studies to address the current priorities for displaced people and support their access to sustainable and meaningful livelihoods. Through the AMAZE initiative, Mercy Corps envisions a future where refugee businesses are empowered with the knowledge, tools, and market connections to adopt sustainable energy solutions, ensuring resilience, growth, and economic self-sufficiency. ●

Home rehabilitation with Habitat for Humanity Jordan

Since 2002, Habitat for Humanity Jordan (HFHJ) has been dedicated to supporting low-income families by improving access to housing finance, promoting volunteerism and community engagement, and raising awareness through capacity-building initiatives. The organisation focuses on rehabilitating homes for vulnerable populations and enhancing public facilities. Through its Middle East Refugee Crisis Initiative (MERCI) program, launched in 2018, HFHJ has provided critical support to refugees and host communities, benefiting over 300,000 people. This includes rehabilitating 780 shelters and green homes, as well as improving 52 public facilities such as schools, medical centers, infrastructure projects, public gardens, and centres for women, youth, orphans, and people with disabilities.

Promoting green homes

Funding from HFH-Netherlands for its green homes programme, *Promoting Green, Sustainable Households in Low-Income, Vulnerable Households & Communities across Jordan*, enabled HFHJ to improve home weatherisation, reduce energy and water consumption, and improve overall living conditions. Following a socioeconomic assessment to determine eligibility, 44 homes were rehabilitated with thermal insulation, electric water heaters, and upgraded plumbing. Energy and water bills were tracked three months before and after the interventions, as well as winter heating costs, and found a reduction in energy expenses. Upgrades included high-performance double-glazed windows, roof insulation, water and sewer network maintenance, electrical system repairs, and LED lighting. The project reduced energy bills (for heating and electricity) by up to 10% and water bills by up to 20%. Many households used these savings for essential needs such as healthcare and rent. The practical insights gained from this initiative informed HFHJ's future work, with approximately 40% of its bill of quantities now incorporating more green interventions in subsequent projects.

The same project built six green homes across Jordan, each designed to suit the local climate in different governorates. These homes integrate sustainable features such as strategic orientation, energy-efficient materials, insulation, skylights, grey water reuse, and rainwater harvesting. The selected locations – Al-Azraq, Al Balqa' (Al-Salt and Jordan Valley), and Irbid – were chosen for their diverse climates, ranging from arid deserts to fertile agricultural regions.

Projects in Palestine refugee camps

These efforts also influenced HFHJ's work in Palestine refugee camps, particularly in Hitten Camp near Amman, where access to basic services is limited. The organisation rehabilitated 85 homes and eight community facilities, including shelters, youth centres, and schools, and is estimated to have benefitted over 13,000 people. Renovations included structural repairs, electrical upgrades, painting, and accessibility improvements for people with disabilities.

The 13 Palestine refugee camps in Jordan are overseen by the Department of Palestinian Affairs, which manages land and infrastructure, while certain services are provided by UNRWA. As a result, the camps operate under different ››

Home rehabilitation with Habitat for Humanity Jordan

systems from the rest of the country. HFHJ found that building strong relationships with NGOs, UN agencies, and government departments was crucial for navigating this complex environment and successfully implementing projects.

One key partnership was with the camp development committee, composed of community leaders, which served as a focal point for coordination. The committee provided valuable insights during project design and implementation. HFHJ also applied the Participatory Approach for Safe Shelter Awareness (PASSA), developed by the International Federation of Red Cross and Red Crescent Societies, to incorporate community feedback into its work.

Building for the future

Beyond Jordan, Habitat for Humanity leverages its experience to inform global advocacy. Its Home Equals initiative draws on findings from 40 countries to promote policies for improved housing, climate resilience, and greater community participation. Initially, HFHJ expected the Home Equals project to impact only Hitten Camp. However, recognising its broader relevance, the organisation now supports similar initiatives across all 13 Palestine refugee camps in Jordan. From its experience, HFHJ has learned that achieving impact and scale – especially in infrastructure improvement – takes time. Long-term commitment in the same areas is essential for sustainable success and lasting improvements for vulnerable communities.

Building on this success, HFHJ aims to expand its efforts by constructing more energy-efficient homes, retrofitting existing structures, and advocating for the wider adoption of green building principles in Jordan's housing sector. Additionally, the organisation will continue to empower communities through awareness programs focused on sustainable living and disaster preparedness.

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06

Potential high-impact projects

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Overview of the design process

Effective long-term solutions cannot be implemented in isolation. Close coordination among stakeholders and fostering learning between different organisations are essential for using resources as efficiently as possible and to scale up existing work. Designing potential energy interventions collaboratively – bringing together the experience and expertise of many different stakeholders – can help identify the most impactful areas of programming as well as the potential barriers and enablers that will affect implementation.

In support of this, the READS workshop featured a session in which groups of diverse participants came together to learn about each other's work and co-design potential high-impact projects, building on the lessons learned from existing interventions. Each group focused on a different energy issue with the goal of outlining a viable project opportunity that would directly address some of the greatest issues currently faced in displacement contexts in Jordan.

By involving a range of stakeholders in the collaborative co-design process, the project concepts aim to address the barriers and gaps that the participants identified as the most pressing. They draw on piloted approaches that show potential to be either replicated in different areas or scaled up.

Building on these initial designs and incorporating elements from successfully implemented projects in Jordan, these ideas have been further developed into the project concepts presented in this section. These summaries provide an outline of each potential project including:

- The proposed location and scale,
- The project activities and potential implementation partners,
- Enablers and barriers which could affect its realisation,
- How these projects link to previous work through replication and scaling, and
- Ideas for community engagement, gender mainstreaming, and inclusivity.

The estimated costs of the projects are included as a guide and will vary significantly depending on their scale and complexity. The project concepts are designed to be a starting point to further develop interventions, scope out potential partnerships, attract investment, and ultimately increase access to sustainable energy. Whilst the situation for many Syrian refugees living in Jordan remains uncertain, the projects presented here reflect interventions which could have positive impacts as of the time of writing.

The READS workshops featured a co-design session for stakeholders to develop viable, high-impact projects to increase access to sustainable energy for their specific area.

Important considerations for project design

There are considerable differences between the experiences of people living in camps and in urban areas around the country, and local needs and priorities will determine the kinds of interventions that would have the greatest effect in scaling up sustainable energy in each location. In all interventions, efforts must be made to address the needs of both host communities and refugees so as not to disadvantage one group and to promote social cohesion and peaceful coexistence.

A one-size-fits-all approach will not be able to account for these nuances. Before beginning any of these projects, further research and detailed assessments at the local level will be necessary to better understand the specific situations on the ground. Such assessments should also be independent, objective, and afforded appropriate time and resources to best develop long-term implementation plans. These should be done with stakeholders who best understand their energy needs and are therefore best positioned to shape the proposed interventions.

Many of the project concepts aim to use market systems to support the private sector in the provision of sustainable energy. As Jordan has many well-established companies which can provide renewable energy and energy efficiency measures, efforts should focus on mechanisms to better support displaced people, vulnerable populations, and public buildings in being able to pay for energy improvements – where possible, and without compromising their wellbeing or financial stability – for example from the savings accrued through the interventions. All companies and organisations that implement sustainable energy technologies should facilitate ongoing and independent evaluations to assess their benefits to the user in the field, not just under laboratory or ideal conditions, to monitor their continued usage and long-term benefits.

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Community involvement

Community members should be involved from the outset when designing sustainable energy interventions as they understand best their own energy needs and priorities. Community members are particularly well-placed project partners owing to their networks and contextual knowledge, and should therefore have important roles to play in the design and implementation of interventions. Some potential opportunities to involve the community include:

- Working with community groups and a range of leading figures to gather input on design of intervention plans, and to advocate for sustainable solutions with other stakeholders and within their communities,
- Consulting with different community segments during the design phase of interventions and for delivery model development, such as through focus group discussions, co-design workshops and community mapping interventions, whilst coordinating with other organisations to minimise overlap and survey fatigue,
- Equitably targeting both displaced and host community members for training, capacity building, employment opportunities, and the benefits of interventions, and
- Directly collaborating with humanitarian and development actors, the private sector, and other organisations for project planning, management, auditing, and other key activities.

Gender mainstreaming

Sustainable energy interventions could have different implications for women and men. This can be exacerbated when decision makers, typically men, are not the same gender as the primary users of energy technologies, for example typically women with regards to domestic responsibilities. Considering these differences and their effects during both the design and implementation of energy projects can allow interventions to better meet the needs of all community members and promote gender equality. Gender mainstreaming will vary depending on individual contexts and communities but could be integrated into projects by:

- Using single-gender focus groups during initial scoping phases to identify gender-specific concerns,
- Targeting equal opportunities for training and employment for both women and men,
- Increasing opportunities for training and employment for women in roles that are traditionally seen as “men’s work”,
- Identifying employment opportunities for women which are compatible with family, childcare or household responsibilities, for example near to their homes,
- Scheduling engagement events at convenient times of the day and/or providing stipends to avoid conflicting with childcare responsibilities and to enable mothers to participate, and
- Collecting gender-disaggregated monitoring data.

Inclusivity strategies

Achieving sustainable energy for all requires understanding and meeting the needs of every member of the community. Some people may have specific vulnerabilities or require different considerations, for example if they have a disability. Including these individuals in project design and offering strategies for their inclusion during implementation can ensure that energy interventions meet their needs more effectively. Some inclusivity considerations could include:

- Holding focus groups with people with specific vulnerabilities to ensure an intervention will be accessible to them and meet their needs, and
- Including people with disabilities in trainings and employment opportunities whilst accommodating any specific needs.

Project concepts

INCREASING ELECTRICITY AVAILABILITY FOR BUSINESSES IN CAMPS

1/2

LOCATION

Azraq and Zaatari camps

BACKGROUND

Businesses in Azraq and Zaatari camps provide livelihoods opportunities for refugees and are an important source of income. These businesses receive free electricity from the camp networks but this is unmonitored and subject to the limited operating hours of the grid. Increasing the amount of electricity available to businesses could help them grow, increase their profits, and provide more jobs for camp residents.

Introducing additional solar PV generation and battery storage could supply this electricity. Energy monitoring devices could track how much power is consumed by each business, dispense energy more equitably, and potentially charge users for any power used when the main camp network is unavailable. Businesses could be further supported by capacity building activities such as bookkeeping schemes, loans for energy-efficient appliances to improve their services, and start-up support for new enterprises established by women or young people.

ACTIVITIES

Identify and install energy monitoring equipment for businesses

Conduct baseline study of business energy use

Run a tender process to select a company to design and install the solar PV and battery storage system

Conduct community engagement with existing businesses to understand their willingness to pay for additional electricity

Work with authorities to establish the potential viability of camp businesses paying for electricity

If permissible, establish a financial model and payment system for businesses to purchase electricity, such as through prepayments or credit schemes, and install prepaid meters for businesses

Support new businesses through capacity building and financial support, especially for women and young people

Establish a monitoring and evaluation system to track indicators such as the number of businesses connected to the system and the number of new businesses

ENABLERS

Many well-established businesses in the camps

Institutional experience of integrating solar power into the camp network

Refugees have been trained on electricity network maintenance and could be involved in installation

Stakeholders recognise the need for greater availability of electricity

High solar irradiance

BARRIERS

Potentially lengthy approvals process for the energy system

Authorisation required for businesses to pay for electricity, which may require changes in policies

Businesses may be unwilling to pay for electricity which they receive for free at other times, or sign up for the scheme but then back out

Requires large amounts of grant funding and/or concessional financing

Ongoing uncertainty about the return of Syrian refugees

Project concepts

PROJECT REACH, TIMELINE AND BUDGET

2500 refugee businesses
$2 million
Four years

FURTHER INFORMATION

Implementing a new energy system is a complex and long-term process. The execution of the project in its entirety would support businesses in the camp but the completion of each of the staged activities would also bring benefits. An improved understanding of electricity use by businesses could help provide related support, such as for energy-efficient appliances or new equipment to scale their operations, and capacity building would provide transferable skills to entrepreneurs. As humanitarian organisations cannot receive payments from refugees, a private company would need to run the scheme; if this is unviable then the electricity could be provided for free (as it is at present) but distributed as part of a monitored allowance.

A new energy system could augment the existing generation capacity of the camp networks and excess generation not used by businesses could supply households and humanitarian operations or be sent to the grid under Jordan's net metering regulations. Agreements with the GoJ to transfer ownership of the energy infrastructure in the event of the camps' closure may be required and would ensure the equipment is used for its entire lifespan. Whilst both camps could benefit from this intervention, stakeholders in the READS workshop suggested Zaatari could be more suitable for initial implementation.

REPLICATION & EXPANSION

Solar plants are present in both camps

Energy monitoring has previously been implemented by NRC and Neurotech, UNHCR, and Schneider Electric

STAKEHOLDERS AND ROLES

Private sector companies to install energy monitoring equipment; to design, install, and operate solar and battery system; and to run the scheme and collect payments from customers

Humanitarian organisations to identify relevant businesses to participate, manage permits and access

NGOs to assess energy usage, support financial model development, and run trainings for entrepreneurs

Government ministries to provide oversight, authorisations and approvals for the energy system

Donor or financial institution to fund the upfront costs of energy monitoring equipment and the energy system

SCALABILITY

Moderate: The number of businesses reached and size of energy system could be scaled depending on the resources available and the results of the preliminary assessments.

INCREASING ELECTRICITY AVAILABILITY FOR BUSINESSES IN CAMPS 2/2

Project concepts

VOCATIONAL TRAINING FOR ENERGY EFFICIENCY

1/2

LOCATION

Urban areas in Northern Governorates (Irbid, Ajloun, Jerash, Mafraq)

BACKGROUND

Energy efficiency measures have resulted in savings for many public buildings and more could benefit from such interventions. Meanwhile vocational training programmes on energy efficiency, building maintenance, and heating and cooling systems can provide a skilled workforce to implement these measures whilst also offering job opportunities. This could provide a steady income for young people from both the refugee and host communities.

An effective training programme delivered by a consortium of partners could provide a pathway for young people to move from education to employment. After designing the programme, participants could spend six months learning skills followed by a further six-month vocational placement with a company. After completing the course and receiving accredited qualifications, the graduates could continue working with the same companies or search for other skilled employment.

ACTIVITIES

Develop a consortium with local municipalities, training organisations, and energy service companies

Research and identify key skills desired by energy service companies

Adapt existing training programmes (if necessary) to train and assess participants on advanced energy equipment installation, maintenance, and other skills

Form agreements with local companies to offer on-the-job practical training and routes to long-term employment

Coordinate with government and regulatory bodies to ensure they certify the programme and recognise the qualifications

Select an equal number of trainees from refugee and host communities to participate

Implement programme in partnership with local training organisation

Process work permits or other necessary employment documentation

Link trainees with companies for on-the-job education

Identify opportunities for graduates to work with the companies after completing the programme

Set up a monitoring and evaluation framework to track percentage of graduates employed six months after completing the programme, any increase in income for participants after training, and feedback from employers to check if graduates meet required qualifications

ENABLERS

Need for skilled workers to install and maintain energy equipment

Potential to build on established training programmes

Provides recognised qualifications to improve long-term employment prospects

Works with both refugee and host communities

Many organisations have implemented youth training and vocational programmes, including for energy

BARRIERS

Potential limitations on refugees' right to work in relevant sectors

Requires commitment from companies to employ trainees

Diverse consortium partners need to be aligned on the project's goals and activities

Previous programmes have struggled to ensure job opportunities for graduates

Ongoing uncertainty about the return of Syrian refugees

Project concepts

PROJECT REACH, TIMELINE AND BUDGET

100 trainees from refugee and host communities

$250,000

Two years

FURTHER INFORMATION

Vocational training programmes offer an opportunity for young people to develop sought-after skills in a practical environment. They can also offer the chance for members of different communities to work together. Training should focus on advanced technologies and skills to provide graduates with a competitive advantage in the job market.

Linking with companies to provide eventual job opportunities to programme graduates will be critical, both to ensure a pathway to employment and using the skills and to increase participants' investment in the scheme. It could also allow the private sector to recommend the kinds of skills and training it sees as most important for future employees. As unemployment is high across both refugee and host communities, especially among young people and women, the programme could have significant potential for job creation and employment prospects.

REPLICATION & EXPANSION

NRC has implemented youth training programmes on energy work

Many organisations, such as the Vocational Training Corporation, have supported numerous technical training courses for young people to acquire skills for the labour market

STAKEHOLDERS AND ROLES

Private sector to support programme design, offer on-the-job training, and hire graduates

NGOs and technical and vocational education and trainings to design and implement trainings

Industry associations to approve and authenticate the qualifications

Humanitarian organisations to manage the administrative processes to enrol trainees

Community-based organisations to publicise and identify candidates from the refugee and host communities

Government ministries to approve work permits for graduates

SCALABILITY

High: the programme could be widely scaled across the country and accommodate large numbers of students if suitable placements with companies could be identified.

VOCATIONAL TRAINING FOR ENERGY EFFICIENCY

2/2

Project concepts

ENERGY EFFICIENCY UPGRADES FOR VULNERABLE HOUSEHOLDS

1/2

LOCATION

Urban areas in Northern Governorates (Irbid, Ajloun, Jerash, Mafraq), Amman, and Zarqa

BACKGROUND

Households in urban areas often struggle with high energy bills both for electricity and heating. Vulnerable households are more likely to be in rented accommodation and so implementing measures to increase energy efficiency can be challenging. Landlords have few incentives to invest in such measures to reduce bills for their tenants, whilst renters who might be able to afford them have no guarantee that they will be able to stay in their accommodation to receive the benefits.

Upgrading living conditions can help to address several of these issues simultaneously. Implementing energy-saving measures (such as LED lights, water heater upgrades, thermal insulation, sealing windows, and routine maintenance) in return for rental guarantees (such as maintaining rents or providing longer rental periods) provides valuable investments for landlords and reduces energy consumption and bills for renters. Measures could be subsidised by different amounts – potentially including contributions from landlords – depending on household circumstances. Some households could contribute a proportion of their utility bill savings on a regular basis, whilst the most vulnerable could have the measures fully subsidised.

ACTIVITIES

Learn from previous projects which focused on solar PV and SWH systems

Develop and design legal agreements for landlords and tenants

Publicise the opportunity to participate in the programme via local media and links to community groups

Conduct assessments of household vulnerability and shelter situations to select participants

Run tenders for companies to provide services, or develop a voucher system to contribute to costs from suppliers selected by participants

Implement shelter upgrades and rental agreements

Provide monitoring and ongoing support for households to ensure agreements are upheld

Collect data to quantify savings on utility bills and impacts on household budgets

ENABLERS

Potential to partner with and leverage experience from shelter-focused organisations

Builds on the work of earlier projects

High need to reduce utility bills

Large numbers of vulnerable people living in urban areas

BARRIERS

Requires large upfront investment

Relies on long-term coordination between landlords, tenants, and third-party project implementers

Long-term tenancy agreements may need to be legally enforced, which could be costly and time consuming

Ongoing uncertainty about the return of Syrian refugees

Project concepts

PROJECT REACH, TIMELINE AND BUDGET

500 refugee and vulnerable Jordanian households

$1 million

Three years

FURTHER INFORMATION

High utility bills are one of the most pressing issues that households face. Especially for refugees, who pay higher tariffs than Jordanians and are more likely to live in rented accommodation and have low incomes, saving on electricity and heating can free up money for other essential purposes. If households or landlords are able to contribute financially to the cost of the upgrades then the project could reach more households. Similar previous projects found that the most vulnerable households may need to sell the equipment they receive, such as SWH systems, to receive cash to meet their immediate needs; investing in building maintenance and upgrades can provide savings with a reduced risk compared to standalone equipment.

REPLICATION & EXPANSION

Implementation of Replicable Renewable Energy Pilots in Jordan, implemented by NRC, used similar methods for SWH

The RE4R Project, also implemented by NRC, provided SWH and EE upgrades under the same modality

STAKEHOLDERS AND ROLES

Landlords and tenants to participate in the scheme

NGOs to conduct assessments, liaise between partners, and monitor the programme

Energy companies to undertake improvement works

Government ministries to approve the scheme and potential works

Financial institution to disburse funds and manage payments

SCALABILITY

High: the programme could be widely scaled across and within cities and reach large numbers of households of different levels of vulnerability.

ENERGY EFFICIENCY UPGRADES FOR VULNERABLE HOUSEHOLDS 2/2

Project concepts

ELECTRIC COOKING IN AZRAQ AND ZAATARI CAMPS

1/2

LOCATION

Azraq and Zaatari camps

BACKGROUND

Households in Azraq and Zaatari camps have access to electricity from the camp networks but only for limited hours of the day. LPG is used for cooking and is provided by humanitarian organisations but households often run out before the end of the allocation period and must purchase more fuel themselves. Households could use electricity for cooking but only if the supply of electricity is reliably available at times when meals are prepared. Electric pressure cookers (EPCs) or other electric cooking appliances could reduce the need for LPG and costs for households and humanitarian organisations. Electricity control and monitoring devices could be installed to allow power supply to specific cooking appliances even when the main network is unavailable, ensuring that households are able to cook at any time without interruption. Piloting EPCs and assessing their potential to reduce LPG consumption, mitigate negative coping mechanisms owing to a lack of fuel, improve safety and indoor air quality, and other factors could provide valuable data to assess the benefits of scaling up electric cooking across the camps.

ACTIVITIES

Conduct focus group discussions with different members from the camp communities to understand their cooking needs, priorities, preferences, and opinions for the potential of electric cooking

Assess the technical feasibility and requirements for electricity control and monitoring devices

Upgrade wiring in shelters, where required

Work with communities to identify households to participate in the programme

Identify and procure suitable electric cooking appliances

Undertake baseline assessments of cooking habits

Distribute cooking appliances to participating households and train recipients on their usage through cooking sessions

Conduct research by using monitoring devices to understand cooking times and electricity demand

Implement midline and endline surveys to get feedback and input from users

Ensure households have access to prompt maintenance and repair services in case of any issues

Assess the potential to scale up across the camps

ENABLERS

Camp electricity networks supply power to all households

Desire to reduce LPG costs amongst both households and humanitarian organisations

Electric cooking appliances can be used for foods with long cooking times, significantly reducing LPG usage

Pressure cookers are commonly used outside of camp settings

BARRIERS

Electricity control and monitoring could be technically challenging to integrate into existing systems

Shelters may require extensive upgrades to internal wiring to avoid fire hazards

Increases overall electricity demand of the camps which increases costs and could be politically sensitive

Differences in the types of foods that can be easily cooked using LPG stoves and electric cooking appliances

Electric cooking appliances must be compatible with cultural cooking practices

Electric cooking appliances can be expensive and might be sold

Ongoing uncertainty about the return of Syrian refugees

Project concepts

PROJECT REACH, TIMELINE AND BUDGET

200 refugee households

$100,000

Two years

FURTHER INFORMATION

Electric cooking interventions must be sensitive to users and their cultural practices as well as the technical and engineering aspects of providing and powering new appliances. Managing each of these elements is critical to providing a sustainable intervention that meets the needs of its users in a reliable way. Pressure cookers for LPG stoves are relatively common in Jordan and Syria but gaining a better understanding of how people use electric cooking appliances, both in terms of practical usage and electricity consumption, will be important in assessing the potential to scale up electric cooking in the camps.

REPLICATION & EXPANSION

Energy monitoring has previously been implemented by NRC and Neurotech, UNHCR, and Schneider Electric, including for electric load prioritisation

Electric cooking pilots have been implemented in other refugee camps with large-scale electricity networks including in Kakuma, Kenya

STAKEHOLDERS AND ROLES

Humanitarian organisations to provide authorisations, approve connections, provide electricity through the camp network, and facilitate technical installation and maintenance

Companies to install energy devices and provide cooking appliances, as well as providing maintenance and support

NGO to administrate the project, identify participants, conduct technical and qualitative assessments, and evaluate impacts

Community leaders to support the project and help identify participants

SCALABILITY

High: the project could be widely scaled across the camps depending on the availability of funding.

ELECTRIC COOKING IN AZRAQ AND ZAATARI CAMPS 2/2

Project concepts

ENERGY COST REDUCTIONS FOR PUBLIC BUILDINGS

1/2

LOCATION

Nationwide

BACKGROUND

Public buildings such as schools, hospitals, and government offices have been included in energy efficiency and renewable energy projects to reduce consumption and costs. Dedicated energy audits could identify further savings for both buildings involved in previous projects and facilities which have not been evaluated.

Establishing a centralised service for energy assessments, training for staff, and developing business cases for energy interventions could highlight opportunities for further cost savings. Providing a replicable process for buildings of the same type and standardised outputs could improve efficiency for the project and allow energy companies to assess which sites to engage with. Building managers involved in the project, meanwhile, could form a community of practice to learn from each other.

ACTIVITIES

Identify an energy company to establish the monitoring system and conduct audits

Install energy monitoring devices and collect data for several months

Establish a network of companies which could provide energy-saving equipment, renovations, solar PV, and SWH

Conduct building assessments, analyse energy data, and run focus groups with staff to identify energy improvements and quantify the potential savings

Remove energy monitors and reinstall them in new buildings after data collection is complete

Design and implement standardised business cases including the potential energy savings for each building, suggestions for the equipment to be installed, and information which can inform future tender documents

Share business cases with building managers, companies, government ministries, and other stakeholders

Provide staff training on energy-saving behaviour change and nominate energy champions

Establish a network and learning events for building managers to continue engagement after the assessments are complete

Use information from across the project to produce sector-wide research and identify further opportunities for savings

ENABLERS

Many well-established energy companies which could participate

Relevant trade associations and industry bodies such as Jordan Green Building Council

Strong desire to reduce energy costs amongst facility managers and government ministries

Motivation amongst staff members to improve building conditions and save energy

Several previous projects included energy monitoring components

Project could benefit from and support other priority areas, such as building maintenance and renovation

New electricity regulations incentivise well-designed and appropriately-sized systems

BARRIERS

Installing energy monitoring devices and energy interventions could require lengthy permissions processes from building managers, government ministries, and other authorities

Buildings could have diverse needs and require different kinds of solutions

Energy monitors should be left in place for suitable durations and may require maintenance or troubleshooting

Companies may require additional support to move from business cases to project implementation

Systems must comply with new electricity regulations and processes may not yet be clear

Project concepts

PROJECT REACH, TIMELINE AND BUDGET

100 public buildings

Three years

$750,000

FURTHER INFORMATION

Energy bills for public buildings are often unavailable and even when monitoring devices have been used the data can be sparse or incomplete. This lack of information makes it difficult to estimate the savings that energy interventions could bring. Quantitative energy monitoring data should be combined with qualitative inputs from staff members who are often best-placed to identify potential efficiency savings, both from behaviour change and building maintenance.

Previous projects have installed energy monitoring devices but typically for individual audits or small numbers of buildings. One organisation providing a centralised system for many buildings, and moving energy monitors to new locations when enough data has been gathered, could significantly reduce costs and promote standardisation and replicability. To avoid conflicts of interest, the company which oversees the monitoring and business case development might not be permitted to also implement the interventions.

REPLICATION & EXPANSION

EEPB project aimed to reduce energy bills across a range of public buildings

Implementation of Replicable Renewable Energy Pilots in Jordan and RE4R Project, led by NRC

Sustainable Education through Renewable Energy project, led by the Princess Alia Foundation

STAKEHOLDERS AND ROLES

NGO to administrate and oversee the project implementation, and coordinate the building manager community of practice

Company to install monitors, conduct assessments and staff trainings, and develop business cases

Private sector to engage with business cases and implement interventions

Government ministries to provide permissions and authorisations

Research organisation or university to analyse data for sector-wide findings and further opportunities for savings

SCALABILITY

High: the number of assessments is readily scalable to any number of public buildings as resources allow.

ENERGY COST REDUCTIONS FOR PUBLIC BUILDINGS

2/2

07

Conclusions

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Key issues for energy access

Jordan has a long history of hosting displaced people including around 620,000 registered refugees from Syria, 2.3 million Palestine refugees registered with UNRWA (although most now have Jordanian citizenship), and many more from Iraq, Yemen, and other countries as of late 2024. More than 120,000 people live in Zaatari and Azraq camps but most refugees live alongside Jordanian citizens in cities and towns across the country.

Whilst many government, humanitarian, and development organisations provide support for refugees, in both camps and host communities, most displaced people are faced with challenges such as limited opportunities for work and low incomes. In addition, the public services which refugees have access to are strained by the increased demand for education and healthcare. Displaced people and public buildings alike have been hit by increased energy costs and significant challenges remain, despite support from programmes such as JREEEF and the many experienced humanitarian and private sector organisations.

Electricity needs in Zaatari and Azraq camps are served through large-scale solar power plants, supplemented by additional off-site generation under Jordan's wheeling regulations. Shelters have access to electricity with businesses and humanitarian operations also receive power from the grid. The duration of electricity supply in each camp, however, is limited and power is unavailable at night. LPG is distributed by humanitarian organisations for both cooking and heating but typically runs out and camp residents must buy more to meet their needs. Increasing the duration of the electricity supply, evaluating alternative options for LPG such as electric cooking, and upgrading shelters could improve energy access and living conditions in the camps.

Refugees living in urban settings, meanwhile, face different challenges. Almost all households have a connection to the national grid but, as they are subject to higher tariffs than Jordanian citizens, their electricity usage is limited by high costs. Heating homes and water using gas or electric heaters also presents a financial burden which is exacerbated by limited opportunities for work. As most refugees live in rented accommodation, often without protections for tenants, opportunities to introduce energy-saving measures such as thermal insulation or solar water heaters are extremely limited. Working with landlords to implement renewable energy and energy efficiency measures, and with the Jordanian government to equalise electricity tariffs with those for Jordanian citizens, could both reduce bills for tenants and improve their standard of living.

Schools, hospitals, and other public buildings have received strong support for energy efficiency improvements, solar power installations, and solar water heating. These have reduced the costs associated with providing services for displaced people and Jordanians alike but many issues remain. Building-level data are sparse, bills are often unavailable, outstanding debts prevent new renewable capacity from being connected, and any savings are usually returned to ministerial budgets rather than the facilities themselves. Coordinating and scaling up energy audits, providing energy training for staff and building managers, and developing agreements to redirect savings back the facilities that generate them could help to reduce costs and unlock funding for other areas of core programming. ●

The road to sustainable energy in displacement settings

Improving sustainable energy will require a concerted effort from stakeholders across Jordanian society. Government ministries, humanitarian and development organisations, NGOs, companies, and many others will need to provide support for sustainable energy interventions. The involvement of community members and end users in the design of the solutions will be critical to ensure that the projects reduce costs, improve efficiency, and provide benefits to vulnerable groups.

The READS workshops brought together a diverse range of stakeholders to co-design potential high-impact projects. Whilst these are presented as individual opportunities – and would each merit investment and implementation on their own – rolling out coordinated interventions addressing several energy themes together could have a truly catalytic effect on increasing sustainable energy access as a whole.

Acknowledging this, and the work of other initiatives, the roadmap below presents a vision of how sustainable energy could develop in the short, medium, and long term to support refugees and vulnerable Jordanians alike. Greater coordination will be central to achieving progress, which would be greatly supported by Jordan's experienced partners across both the humanitarian and sustainable energy sectors. ››

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The road to sustainable energy in displacement settings

SHORT TERM (2025-2026)
MEDIUM TERM (2027-2029)
LONG TERM (2030+)

ELECTRICITY IN CAMPS

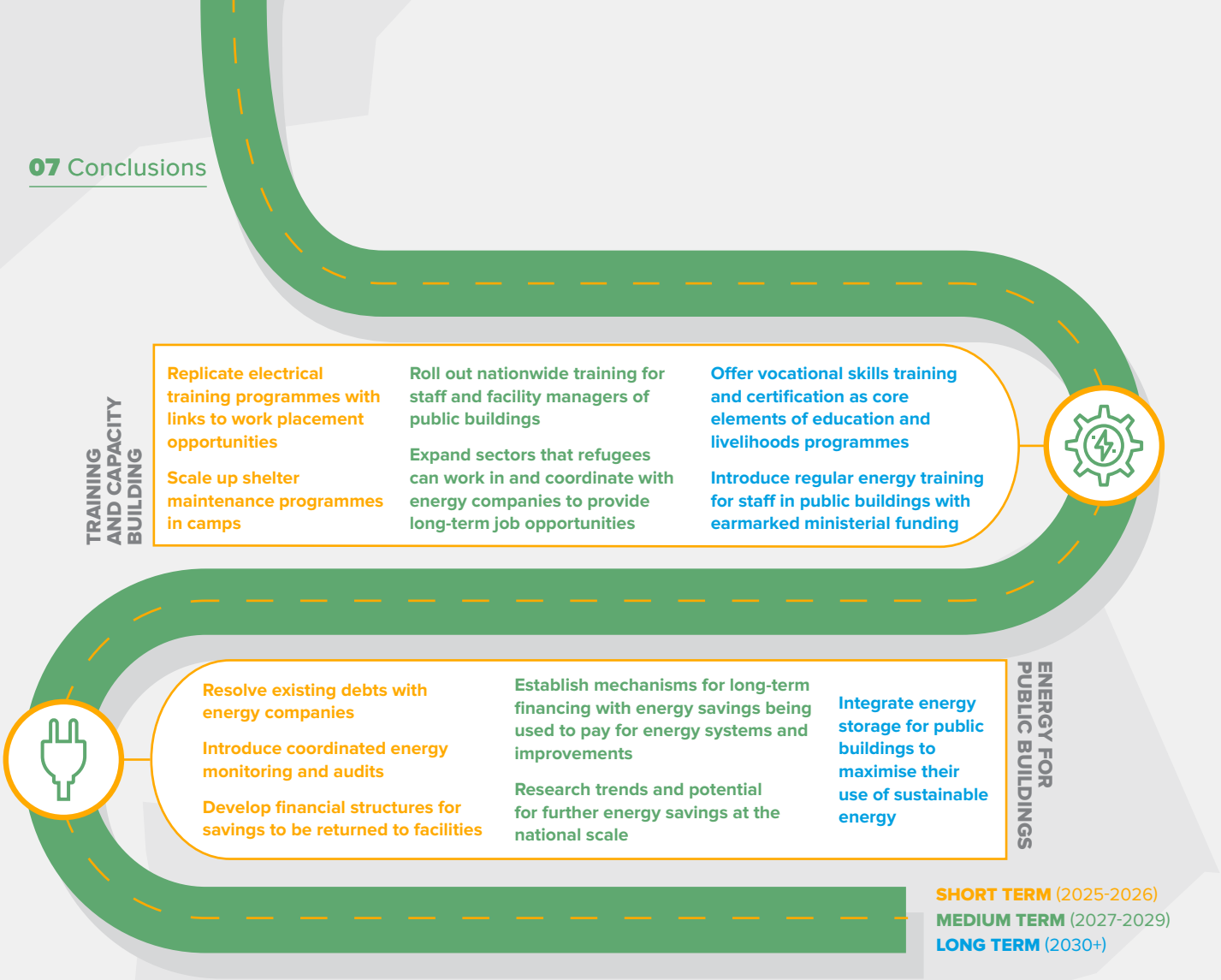
- Rehabilitate and improve existing infrastructure
- Install energy monitoring prioritisation devices
- Increase access to energy-efficient appliances
- Make new agreements for additional off-site generation
- Scale up energy monitoring to promote equitable usage
- Increase hours of service for households and businesses
- Increase the capacity of on-site solar plants with long-term handover agreements

COOKING AND HEATING IN CAMPS

- Increase LPG provision to meet demand
- Evaluate potential for electric cooking
- Improve thermal insulation in shelters
- Upgrade network infrastructure to accommodate heating and cooling appliances
- Scale up electric cooking, if viable
- Introduce energy-efficient heating and cooling appliances for thermal comfort

ELECTRICITY AND HEATING IN URBAN SETTINGS

- Introduce targeted financial support for vulnerable households
- Scale up programmes offering energy improvements alongside more secure rental agreements
- Allow refugees to access the same tariff structure as Jordanians
- Replicate energy improvement programmes for solar power, solar water
- Ensure refugees are included in future energy policies and programmes



The challenge is huge: improving access to more affordable, sustainable, reliable energy for refugees and host communities will require more projects, activities, partners, coordination, and investment than ever before. Fortunately, Jordan benefits from a strong track record of hosting displaced people and a well-established energy sector which together can provide the experience and expertise necessary to develop new projects to support sustainable energy across the country. ●

All stakeholders will need to play a role, with refugee and host communities in the centre, to improve access to sustainable energy.

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