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The Role of Sustainable Energy Access in the Migration Debate

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Introduction

The world is facing an unprecedented displacement crisis. In 2013, 232 million people worldwide were registered as living outside their country of origin and according to estimates, one billion people moved internally to another place of residence within their country of birth[1]. The United Nations High Commissioner for Refugees' (UNHCR) 'Global Trends Report' (2016) estimates that by the end of **2015 65.3 million people were forcibly displaced globally, of which 21.3 million were refugees,** a number not seen since the Second World War. The refugee crisis is global, with **developing regions currently hosting 86 % of the world's refugees** under the UNHCR's mandate. The Least Developed Countries (LDC) gave asylum to 4.2 million refugees, 26 % of the global total.

Within the European Union (EU), during the first quarter of 2016, the number of refugees reached 287,100. Furthermore, 2016 was the deadliest year on record; by October[2] 3,740 people were registered as dead or missing after trying to reach European soil[3]. The number of people migrating puts an increased strain on the resources of host countries, which also have problems managing domestic issues such as poverty and lack of access to basic services, such as water, food, energy, health and education. This situation presents an urgent challenge for the international community.

In response to this crisis, the European Union has adopted a **gradual integration of development policy instruments into its migration policy**, reorienting and mobilising its external action to address the root causes of migratory flows.[4] For example, The Global Approach to Migration and Mobility (GAMM) and the European Agenda on Migration explicitly underline the **link between development and migration** in order to tackle the root causes[5].

The links between energy development and migration are numerous. Poverty alleviation is the main goal of EU development policy and **energy access is a prerequisite for poverty alleviation**. Furthermore, the Council of the European Union acknowledges **that the lack of or uneven access to energy is part of the root cause of irregular migration**[6].

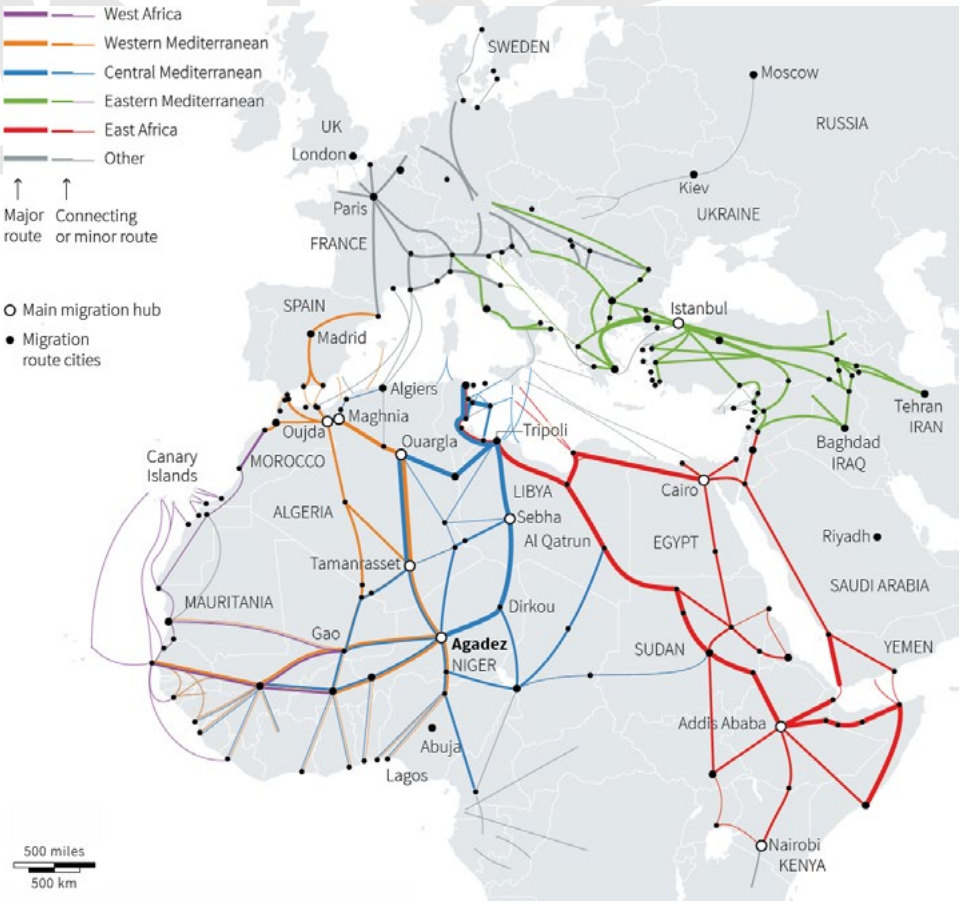

Figure 1- Migratory routes across Africa and Europe
Source: Reuters Graphics

These developments have taken place as the global agenda for sustainable development, international cooperation on energy and the fight against climate change entered a new phase in 2015 and 2016, following the adoption of **Sustainable Development Goals (SDG) 7, 13** and the Paris Agreement. An unprecedented surge in international activity in the field of energy development cooperation can currently be seen, backed up by growing financial flows and new funding mechanisms and initiatives. At the forefront of this increased action is the EU, which is the largest global donor of official development assistance (ODA) and a leading voice in international climate change agreements.

Against the backdrop of increased migration, the acknowledgement that energy is considered one of the root cause of migration, and the importance of European action in energy, development and climate, the EU Energy Initiative Partnership Dialogue Facility (EUEI PDF) is seeking to contribute to the debate – and to solutions to the challenges being faced. With its mandate to support the achievement of the SDGs, in particular on energy, and to promote sustainable energy for equitable development in Africa, Latin America and Asia, the EUEI PDF is uniquely placed to explore the potential contribution of **energy development in the current migration debate**. This paper aims to explore interlinkages between sustainable energy access and migration. On the one hand, it examines the role that energy access plays in tackling the root causes of migration and, on the other hand, seeks to better identify solutions for energy access in humanitarian settings.

Firstly, the paper describes the role energy plays in the migration debate. Secondly, it looks into the interlinkages between economic and environmental drivers of migration as the most directly related to energy access before migration occurs. Furthermore, it presents ideas about the role sustainable energy access plays in stemming the root causes of migration according to these drivers. It also investigates approaches and trends for improving energy access for displaced populations in peri-urban areas and humanitarian contexts after migration has occurred. Finally, it presents recommendations for enabling sustainable energy access in migration settings and puts forward ideas for coordinating migration and energy development policies.

1. The Role of Energy in Migration

Exploring migration drivers is a highly complex topic. It is not easy to draw a line between voluntary and forced migration. Migration occurs due to a variety of causes which can broadly be categorised as either **acute (conflict, violence, natural disasters) or structural (poverty, environmental degradation, lack of social services),** or as a combination of the two (See Annex I for definitions). Migration could be internal (rural-urban), international, temporary or permanent. International migration generally occurs to the nearest border, while migration across several borders has identifiable routes and drivers which often require significant financial resources and social networks to facilitate it[8] (see Figure 1[9]).

Access to **energy is a basic human need; this has been recognised in SDG 7**, which aims to ensure universal access to affordable, reliable and modern energy services by 2030. This goal also has the target of substantially increasing the share of renewable energy in the global energy mix[10]. Improving energy access is a crucial factor in ending rural poverty and environmental degradation, thus stopping migration before it occurs. It is also fundamental in meeting humanitarian needs once migration has occured (see Figure 2). Furthermore, energy works as an enabler for health and education provision and it can improve food security systems.

1.1 billion people do not have access to electricity, 2.8 billion still rely on wood, charcoal, animal and crop waste or other solid fuels to cook their food and heat their homes[11]. All of this is exacerbated in humanitarian settings where **89 % of displaced populations do not have access to reliable energy services**[12]. Considering the existing links between energy access and sustainable economic development, this paper will analyse the economic and environmental drivers of migration.

1.1. Energy and Economic Migration

An **economic migrant is generally defined as someone who aims to improve their standard of living by moving to a different place**[13]. The economic drivers of migration such as rural poverty, food insecurity, insufficient economic opportunities, unemployment and deficient healthcare and education services are exacerbated by a lack of energy access. Moreover, poverty is characterised not only by unemployment or a lack of regular income, but also by structural conditions such as insufficient infrastructure for basic services (energy access, connection roads, water and sanitation) (see Figure 3).

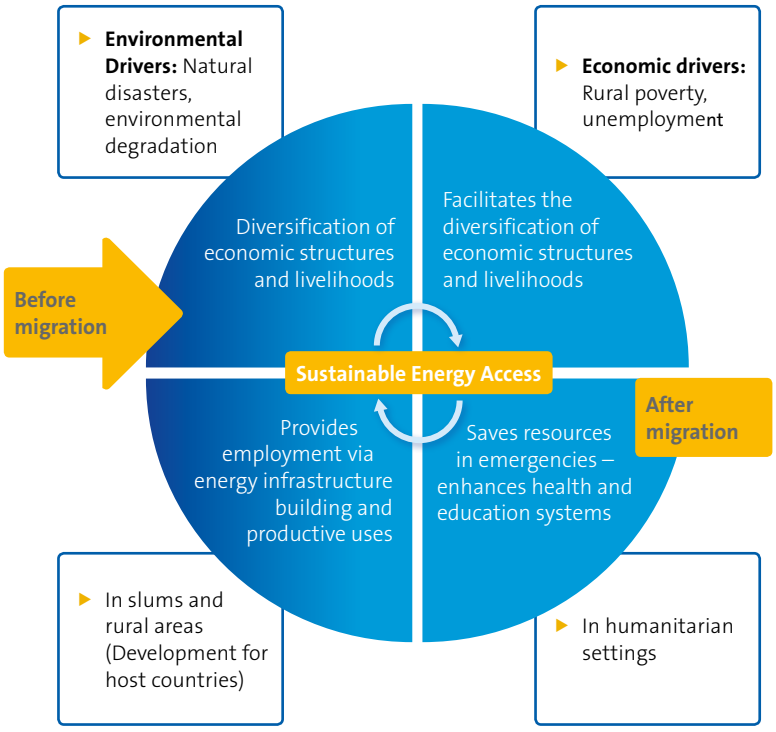

Figure 2 – The role of energy in migration

1.1.1. Considerations on the Effects of Sustainable Energy Access on Stemming the Economic Drivers of Migration

Evidence shows that sustainable energy access can:

- Facilitate the **diversification of economic structures and livelihoods**[14] (see Box 1 for a guide made by the EUEI-PDF about **productive uses of energy**, which can be adapted and used in migration-prone scenarios and humanitarian settings)
- Underpins the creation and **upgrading of value chains**[15]
- **Releases time for paid work, leisure, particularly for rural women**[16] (e.g. time savings from collecting firewood)
- Permits women's empowerment at the household level
- Enhances **business productivity** (e.g. disposable working hours, management efficiency) (see Figure 3)

By way of example, according to the Inter-American Development Bank, an increase in **energy access for rural households in Latin America from 71 % in 2000 to 92.6 % in 2010 brought about not only a decrease in rural-urban migration but also, in some cases, reversed migration flows** back to rural areas[17].

Box 1.

Productive Use of Energy (PRODUSE)

This publication delineates step-by-step guidelines for planning, designing and implementing programs for promoting productive electricity uses of energy. It can be used by power sector practitioners dealing with energy access for displaced populations and peri-urban areas integrating measures with rural electrification action plans (governments, public and private electricity utilities and service providers) as well as international donor agencies and financing institutions. The productive uses of energy represent livelihood opportunities for rural and slums communities and displaced population stemming the need to migrate further.

http://www.euei-pdf.org/en/flagship-publications

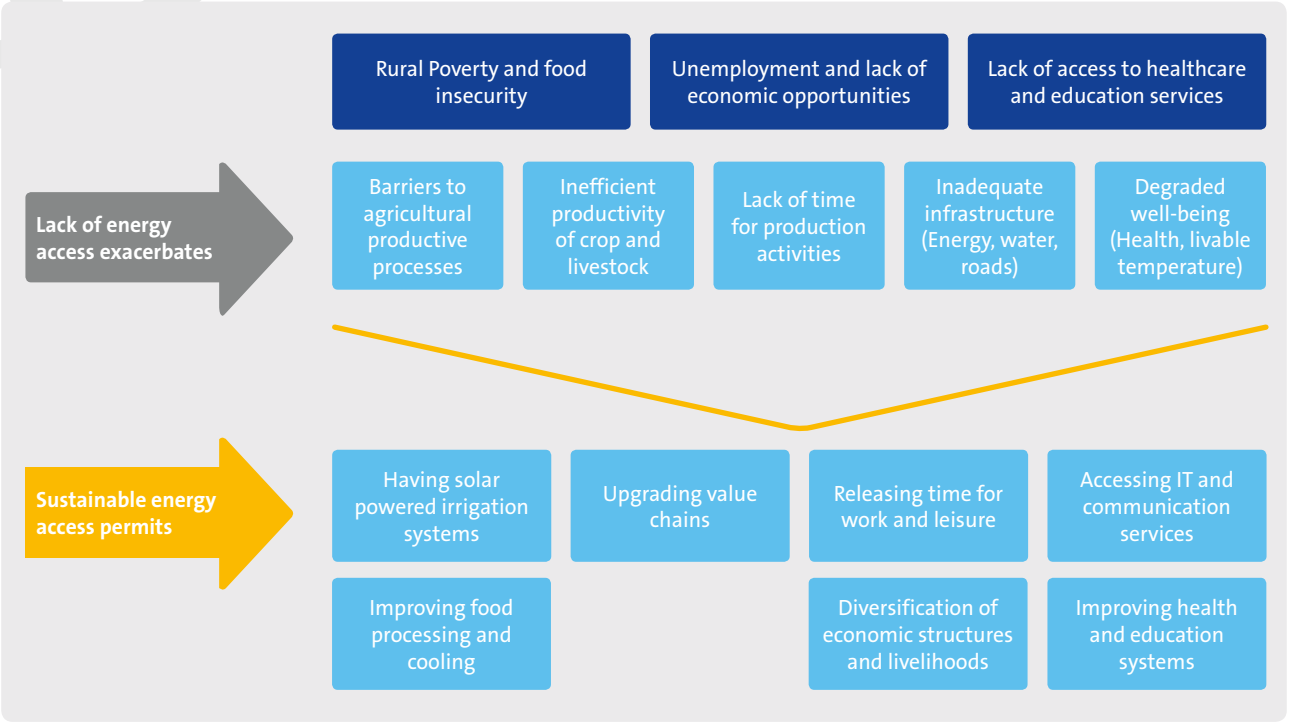

Figure 3 – Economic drivers of migration

1.2. Energy and Environmental Migration

One definition of an environmental migrant is "persons who, for compelling reasons of sudden or progressive changes in the environment that adversely affect their lives or living conditions, are obliged to leave their habitual homes, or choose to do so, either temporarily or permanently, and who move either within or outside of their country"[18]. Figure 4 presents the role that the lack of energy access has in environmental drivers of migration and the positive impacts of sustainable energy access.

Two **main drivers related to environmental migration are environmental degradation and natural disasters**. Environmental degradation tends to be slow and irregular, and is interlinked with the inefficient management of resources and a lack of clean and reliable energy access in rural areas. The degree of vulnerability (ability to cope with the effects of environmental hazards) of a community are interlinked with their sources of energy. For example, communities that rely on natural resources for energy consumption (biomass) and agriculture for livelihoods tend to be more vulnerable. Moreover, the **lack of appropriate regulation in the biomass sector brings about the unsustainable exploitation of forests and other resources** (see Box 2 for a Biomass Energy planning guide produced by EUEI PDF). All of this is exacerbated by changes

Box 2.

Biomass Energy Sector Planning Guide.

Based on EUEI PDF's and GIZ's experiences in African countries, this guide is designed for stakeholders in government institutions, NGOs and donors involved in biomass energy sector management. It outlines the steps for a gradual improvement in the management of sustainable biomass energy sector governance, leading to a fully-implemented strategy. It is relevant as an example of governance of the biomass sector in rural areas to be used in humanitarian settings or slums, taking into account the especial needs of host communities and displaced populations.

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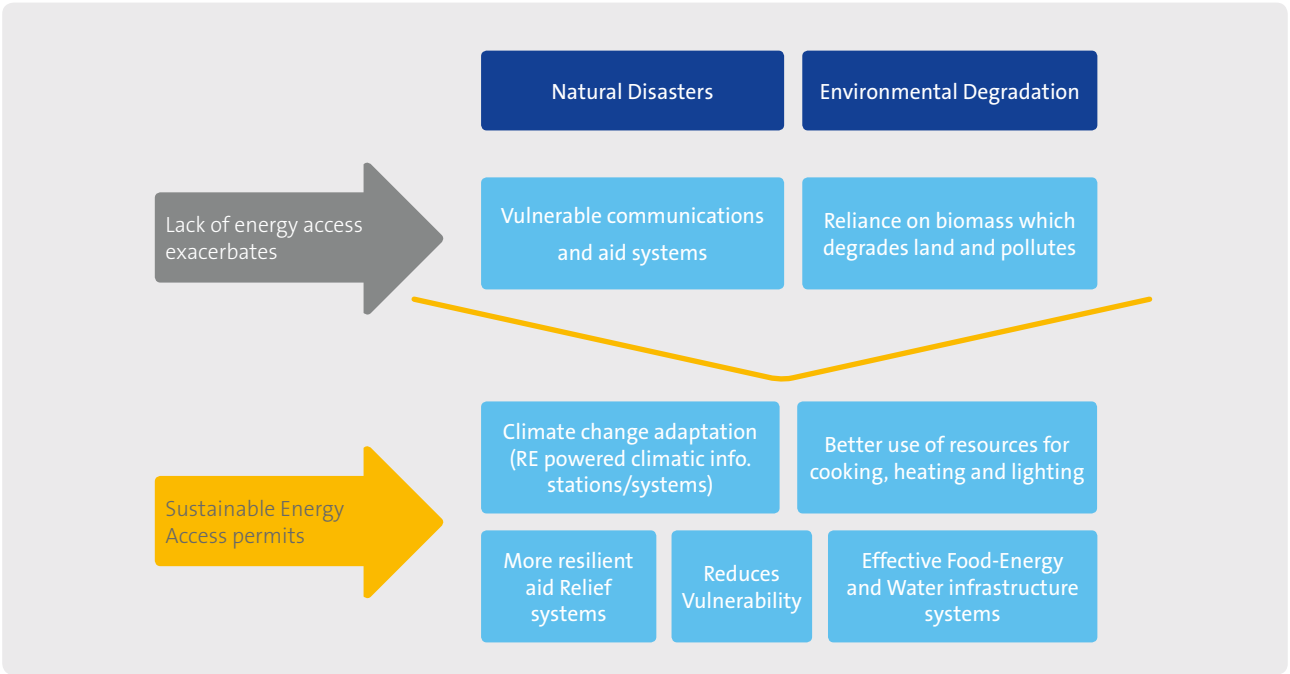

Figure 4 – Environmental drivers of migratiion

in climatic conditions. Therefore, **the more dependent a country is on the agricultural sector, the stronger the impact climate variations can have on migration.** Other patterns related to environmental migration show that seasonal or circular migration patterns occur as a coping strategy to deal with climatic variations which impact agricultural activities. Thus, **adaptation systems that predict climate variations are important to address vulnerability in the agricultural sector.**

Populations **tend to migrate where there are better economic opportunities** (e.g. crops yielding) or economic activities that need the use of energy for production (e.g. food processing, manufacturing, construction etc.).

Natural disasters occur suddenly, and the level of vulnerability of the population affected is exacerbated when there is a lack of access to energy. Sudden migration in such an acute situation needs **communication systems that rely on electricity to be functional; this is needed to coordinate the aid response.** Furthermore, strong, resilient systems of power provision to health facilities are necessary to deal with the human casualties which disasters create.

1.2.1. How Sustainable Energy Access can help in Stemming Environmental Drivers of Migration

Sustainable energy access plays an important role in climate adaptation strategies, particularly when **agricultural systems have the potential to absorb the benefits of reliable, clean and sustainable energy** (see Figure 4).

Water provision and food production systems that benefit from sustainable energy can create opportunities for adaptation to climate change in rural and peri-urban areas. It is important to **coordinate agricultural policies with investments in water and renewable energy infrastructure**.[19] As one of the central consequences of climate change, drought necessitates increased water infrastructure which is also resilient to changes in the climate. In developing countries, solutions drawing on renewable energy technologies are particularly suitable. Examples of this include **solar-powered water pumps**[20]. Clean, reliable and sustainable energy access for cooking and lighting enhances possibilities for rural communities to adapt to environmental degradation.

Other possibilities are renewable energy powered climate change information stations that work as tools for screening weather variations in remote areas, helping to better coordinate the mechanisms of adaptation to climate change, reducing vulnerability and improving agricultural practices according to changing climatic conditions (e.g. rainfall patterns). Furthermore, these monitoring stations are an employment opportunity for energy technicians in rural areas. Following natural disasters, **resilient energy systems can respond better to a crisis**. For example, clean energy technologies, especially **solar-powered generators, seem a good choice during disaster relief efforts** as they do not require fuel supplies to be shipped in or rely on critical grid infrastructure to be operational[21]. Renewable energy generation technologies have the advantage of resuming activity at a far faster pace than traditional generation plants. When energy systems have collapsed, off-grid renewable technologies can enable hospitals and other critical public facilities to operate[22].

2. Migration Patterns

In order to understand the complex role that energy development policies can play in the migration debate, it is important to understand the different patterns of population movements. More than half of those populations arriving in Europe in 2015-2016 were fleeing Syria, Afghanistan, and Iraq. These are refugees fleeing war and only a few can be considered economic or environmental migrants. Nevertheless, **there are overlapping relationships between 'forced' and 'economic' drivers of migration to Europe**. People who leave their home countries primarily due to economic reasons can become refugees of war, such as those in Libya who were forced to move due to the conflict. Some refugees who originally moved because of war and arrived in transit countries like Jordan, Lebanon, Turkey, Uganda, Kenya or Ethiopia continue on due to the lack of economic opportunities, bad conditions of employment, inadequate infrastructure (water, energy and food nexus systems), and the lack of access to healthcare and education[23]. (see Figure 5) It has also been found that the routes economic migrants use are often shared with refugees fleeing war[24].

The most traditional migration pattern that occurs is rural-urban. When populations arrive in slums or humanitarian settings, they face harsh conditions, exacerbated by a lack of access to energy; it is necessary to prevent migrants from embarking on long arduous and often unsafe migration routes. Assessing the impact different energy development programmes have in humanitarian settings can therefore help to prevent displaced populations from continuing their migration.

The next section presents the importance of energy access in peri-urban areas for displaced populations after migration has occurred. It is then followed by a section on energy needs in humanitarian settings. This explains the challenges of coordinating energy provision at the early stages of aid relief within a long-term approach and the opportunities of energy development outcomes for host communities.

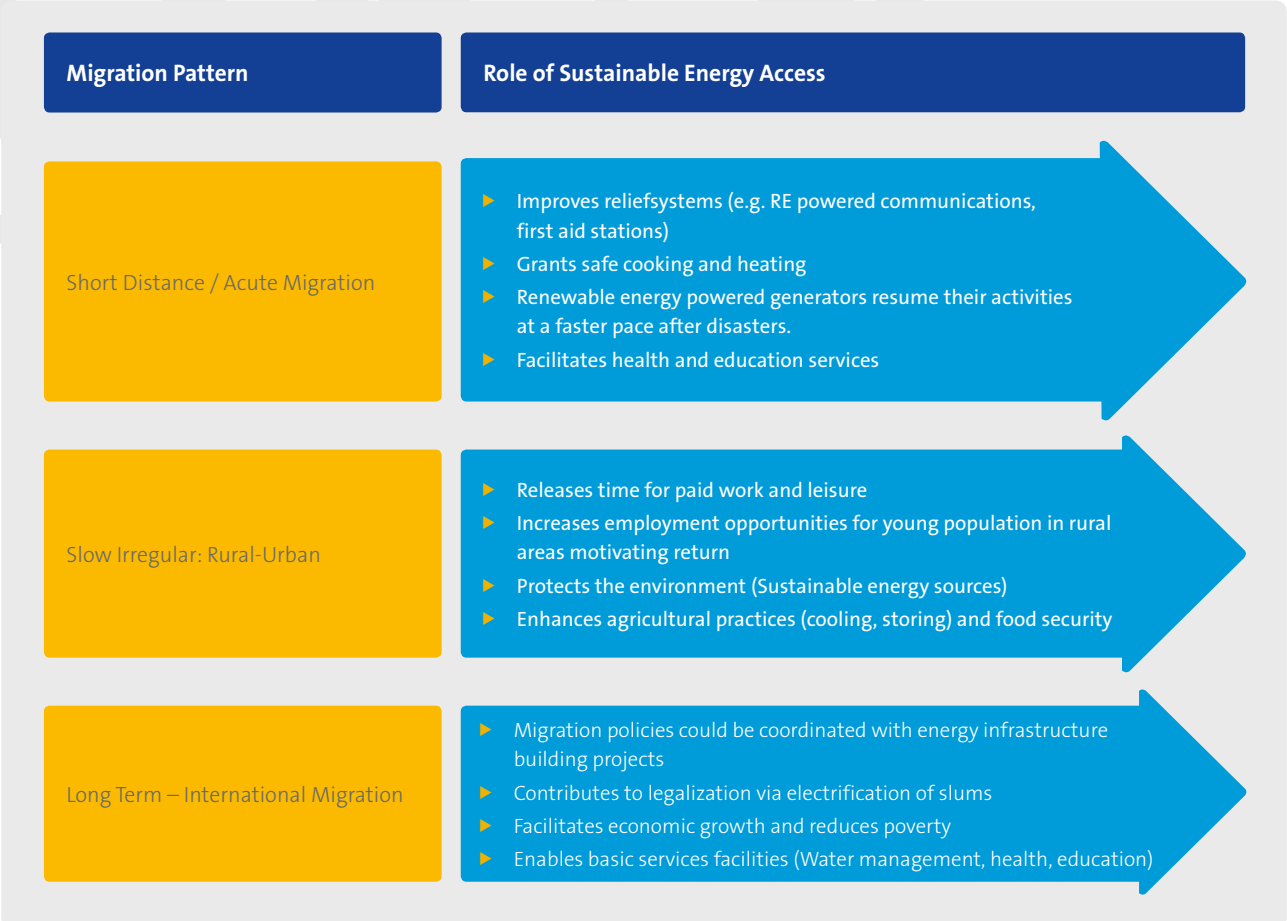

Figure 5 – The role of sustainable energy access on migration patterns

3. Energy Access in Peri-urban Areas, Slums

The majority of displaced populations (around 82 % of persons of concern to the UNHCR) live outside camps, in rented accommodation and informal settlements[25]. Estimates by UN-Habitat (2003) show that in sub-Saharan Africa, about 72 % of urban residents live in slums or slum-like conditions[26]. As more people migrate to urban centres in search of jobs and better social amenities, or due to environmental degradation, extra pressure is put on city infrastructure and job availability. Constraints on urban housing and city resources e.g. water and energy decreases the quality of life for those living in urban or peri-urban contexts. Authors such as Marchiori claim that an increase in the urban population can drive down wages; combined with a reduction of "amenities" this can trigger out-migration at the international level[27]. Strains on energy infrastructure can also be considered an out-migration push factor. Legalising informal settings in an unsystematic, intransparent manner can eventually push populations on to other countries, where the energy infrastructure is stronger and economic opportunities better as a result.

Box 3.

EdM Prepayment Project

City/Town Matola and Maputo
Country Mozambique

As a result of thirty years of armed conflict in Mozambique an unprecedented migration to urban areas occurred. The majority of migrants establish themselves in informal settlements. Out of Maputo's population of 1.3 million, 70 % live in informal settlements with limited or no access to modern energy services. The case of electrification to Matola a slum situated 12 km from Maputo, identified customers in the informal settlements who would benefit from the project and implemented a pre-paid meter system, with a progressive financial approach with the utility paying for connections and subsequently receiving grid expansion credits paid for by the government. As an outcome 5,000 households benefited from better service quality as well as better control of the family budget. The installation of pre-paid meters also stimulated voluntary demand reduction and led to improved revenue collection improving livelihoods for migrants.

Source:
www.unhabitat.org/downloads/docs/7803

3.1. The Role of Energy Development Policies at Stemming Migration Flows from Slums

In cities where energy access to peri-urban areas is limited, energy development policies should support local governments to deal with large populations arriving into slums. According to a study conducted by the EUEI PDF on future energy scenarios for sub-Saharan African cities, the development of energy programmes in slum areas requires support to different stakeholders. These include national and municipal governments, civil society and the private sector. This support ranges from capacity building and policy support for institutions, to skills development, access to finance, and technology transfer to businesses and the population[28]**.** It also requires vertical integration (national, sub-national and municipalities) of **governance processes** which involves different stakeholders such as **civil society leaders, electric utilities and other public infrastructure services.** This process of **electrification according to participatory urban development planning can include the migrant population** (e.g. technical energy training and maintenance service of new energy infrastructure), which can thus contribute to integration.

Legalisation of slums in a planned, transparent manner may prevent further migration. An interesting example of providing energy to the urban poor is Mozambique electrification programme in Maputo's slums (see Box 4).

4. Energy Needs for Humanitarian Relief

After migration occurs for the over 125 million people affected by conflict-related crises and natural disasters, the situation is often that they have even less access to energy. With a huge shortage of funding as well as limited policies and practices on sustainable and clean energy provision within the humanitarian community, current energy practices in camps are often inefficient, polluting, unsafe for users, and damaging to the surrounding environment[29]. **Approximately 10 % of refugees have reliable access to electricity for lighting, heating, cooking and powering, while 89 % of those in camps rely on firewood for cooking and heating.** As a result, an estimated 20,000 people – primarily women and children – die prematurely each year due to pollution from indoor fires. Wood equalling around 49,000 football pitches worth of forest (64,700 acres) is burned by displaced families living in camps each year.[30]

The Moving Energy Initiative (MEI)[31] reports that humanitarian agencies, national governments and NGOs spend significant amounts of money on operational activities in camps, which themselves require energy to deliver essential services, such as infrastructure equipment, water pumps, street lights, and facilities such as schools, training centres, hospitals and camp offices. Many of these expenses are charged to the UNHCR main's operation budget. Generally, electricity for camp management comes from diesel generators which have high costs. An example of this from Dadaab refugee camp in Kenya presents an **annual spending of around $2.3 million on operations and $9.2 million fulfilling household needs**[32].

Taking this into consideration, it becomes apparent that providing sustainable energy access with a long-term approach will save money and additionally provide sustainable development outcomes for host countries. However, several challenges exist for long-term energy planning in humanitarian settings.

4.1. The Challenge of Transition and Coordination of Energy Provision in Humanitarian Settings

One of the main challenges to providing durable solutions of energy access to displaced populations lies in the different approaches taken by humanitarian and development actors. On the one hand, humanitarian agencies try to meet the acute needs of refugee populations in the fastest way possible, sometimes providing free resources directly to the populations. On the other hand, development practitioners approach crises with a mandate of transitional assistance, aiming for outcomes in the mid- to long-term, working through governments and the private sector. (see Annex 4 for a coordination model of aid and development in the energy sector). These differences present a barrier in planning and coordinating energy services in a sustainable manner.

A common **challenge is the political instability and legal status of the populations** (including mobility and work permits). In some cases, local political leaders see sustainable energy access in humanitarian settings as a threat to the stability of their own countries because it indicates that the settlements are becoming formalised. This, in turn, may place addition pressures on limited budgetary resources, and also could undermine the government's political credibility. Furthermore, many host communities face challenges of poverty and low energy access themselves, similar to those encountered by migrants (see Annex 3 for a chart with the challenges for linking relief, rehabilitation and development in energy provision for displaced populations).

4.2. Alternatives to Improve Energy Provision in Humanitarian Settings with a Long-Term Perspective

The concept of **Linking Relief Rehabilitation and Development [LRRD]**[33] has been in place in the EU since the 1980s, stemming from times of acute food crises in Africa. Its aim is to link short-term relief measures with long-term development programmes, and to create a more sustainable response in crisis situations. It is especially useful to avoid aid dependency by building resilience capacities within the population.[34]

When it comes to sustainable energy access programmes, there are clear interlinkages between what can be done for displaced people and for host communities. For example, **in slums and rural areas reliable energy access is required for food preparation, lighting, water and sanitation systems, and health facilities - which is also required in humanitarian settings.** Thus, implementing these programmes can serve not only displaced populations but also host communities. As a result, development practitioners often argue that sustainable energy access with long-term planning saves financial resources and facilitates the process of resettlement and/or the integration of refugees into the host community – further underlining the need for a long-term approach.

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Alternative fuels to firewood can increase the safety and reduce the exposure of women to sexual violence when they go to look for wood, and can free-up time for other pursuits. Sustainable energy access enables them to work, cook, study and socialise. Lessons learned from a review of cases in refugee camps of more than a year in duration[35] also shows that a more holistic approach to energy provision in humanitarian settings can have benefits for both the refugees and host communities.

4.3. Lessons Learned from Sustainable Energy Access Programmes for Displaced Populations

Drawing on a series of interviews conducted amongst development and aid practitioners working on energy access for displaced populations, and a literature review of best practices[36] the following lessons were identified:

- Start with a **coordinated approach to energy planning,** with a common assessment and the active involvement of possible stakeholders (aid/development actors, the private sector, local populations and local authorities).[37]
- **Invest in local infrastructures which serve** both **refugee and host communities**. This represents an opportunity for long-term planning in energy access (e.g. building solar farms that employ the refugee and local populations increases the supply of energy and lowers energy costs) (see Annex 2 for further examples).
- **Renewable energy provision can support social infrastructure,** e.g. health centres, schools, training centres, refugee camp offices and refugee reception centres. These can work as **anchor clients** given their regular demand of power, which can serve to de-risk private investment. (see Box 4 for a guide that helps develop effective interventions for supporting energy market development).
- Sustainable access to electricity enables the use of **ICT as learning tools in schools and in training centres,** which help support **future livelihood opportunities** for refugees and host communities (see Annex 2).
- It is important to retain budget for research on improved energy planning. Research enables a better **understanding** of **the political economy of the refugee camps**. This can facilitate understanding of consumers' energy preferences and their availability to pay, enabling the design of **business models which respond to the needs of displaced populations**.
- There is a need for improved **financing mechanisms for energy initiatives in humanitarian settings** that maintain a long-term investment approach.
- Engage local energy contractors and stakeholders according to options identified in the local context to **build ownership**.

Box 4.

Building Energy Access Markets

This guide aims to improve the understanding of how decentralised energy markets operate while illustrating how to increase energy access and investment in different settings.

It can be adapted and used by aid and development professionals at policy and practitioner level in-order to support energy market development in humanitarian settings or slums.

5. Recommendations to Coordinate Migration and Energy Development Policies

As outlined in this paper, the link between energy and migration is complex and can be explored from various perspectives. Before migration occurs, the role of **energy as a facilitator for environmentally sustainable economic development** may represent ways of stemming economic and environmental drivers of migration. Particularly in rural-urban migration patterns, sustainable energy access in rural and peri-urban areas offers increased employment opportunities through economic diversification and upgrading value chains. Additionally, more efficient systems of food production and water management can allow for better coping mechanisms and increased capacity to respond to crisis (relief systems).

After migration occurs, **migrants that arrive in transit countries may seek means of onward travel because they do not have opportunities to develop their own means of living in the reception countries – and energy is a central factor in enabling them to do so**[38]. Therefore special attention should be paid to managing local energy development and coordinating migration policies in first destination, transit and least developed host countries.

The **most important role** energy access has in the migration debate is in facilitating **environmentally sustainable socio-economic opportunities for poor rural populations or displaced persons that arrive in informal urban settlements or humanitarian settings.** Some of these opportunities include the construction of **renewable energy infrastructure systems**, the development of **productive uses of energy to enhance food production in agriculture or in projects such as climate adaptation information stations**. Further, such measures and opportunities can also relieve pressure on infrastructure and enhance climate resilience.

In order to stem the drivers of migration, it is important to tailor policies according to migration patterns and enable sectors such as energy to take part in providing sectorial expertise in the transition from aid to development measures. It is advisable to think about **new participatory models of energy governance for access in slums and rural areas close to camps;** financial models can then be **adapted to the difficult conditions of vulnerable populations**.

Partnerships between migration policy projects such as the **refugee centres/camps in countries of transit and vocational training, green growth and energy transition promotion** can boost developmental outcomes. This is also a way of coherently integrating migration policy with development cooperation policies.

Annex I Glossary of Key Terms

- **Acute causes of migration:** are those that forced people to leave their country in order to escape war, persecution or due to natural disasters. These people are then legally protected under international human rights conventions. Temporary shelters and camps often house refugees for either short or extended time periods and require access to sustainable energy sources[39].
- **Economic migrant**: a person leaving his/her habitual place of residence to settle outside his/her country of origin in order to improve his/her quality of life. This term is also used to refer to persons attempting to enter a country without legal permission and/or by using asylum procedures without bona fide cause. It also applies to persons settling outside their country of origin for the duration of an agricultural or tourist season, appropriately called seasonal workers[40].
- **Energy services:** Modern energy access is defined as an individual or household having reliable and affordable access to clean cooking facilities, a first connection to electricity, heating and/or cooling and then an increasing level of electricity consumption over time to reach the regional average (IEA, 2014). It enables basic human needs such as food and shelter to be met. Modern energy services also contribute to socio-economic development by improving education and public health. Since energy is an enabler which underlies all economic activity, it is posited that sustainable energy access can help improve livelihoods, which, in turn, addresses structural causes for migration.
- **Energy for Social Infrastructure (ESI):** is defined as the provision of energy for community services contributing to well-being, e.g. energy for health centres and schools, communal street lighting or communal water pumps. An improvement in the power supply can make a contribution to save lives and improved health care and education at the same time.
- **Environmental migrant**: persons or groups of persons who, for compelling reasons of sudden or progressive changes in the environment that adversely affect their lives or living conditions, are obliged to leave their habitual homes, or choose to do so, either temporarily or permanently, and who move either within their country or abroad[41].
- **Forced migration:** A migratory movement in which an element of coercion exists, including threats to life and livelihood, whether arising from natural or man-made causes (e.g. movements of refugees and internally displaced persons as well as people displaced by natural or environmental disasters, chemical or nuclear disasters, famine, or development projects e.g. large-scale infrastructure projects such as dams, deforestation etc.[42]
- **Internal vs external displacement**: displacement occurring within or outside of national borders
- **LRRD (Linking Relief Rehabilitation and Development**): "The basic idea of LRRD is to link short-term relief measures with longer term development programmes in order to create synergies and provide a more sustainable response to crisis situations" (EPRS, 8 October 2016)
- **Migration:** The movement of a person or a group of persons, either across an international border, or within state boundaries. It is a population movement, encompassing any kind of movement of people, whatever its length, composition and causes. It includes migration of refugees, displaced persons, economic migrants, and persons moving for other purposes, including family reunification[43].
- **Productive Uses of Energy (PUE):** are those which increase income or productivity; "(...) agricultural, commercial and industrial activities involving electricity services as a direct input to the production of goods or provision of services" (Brüderle et al. 2011:13). PUE could be associated with agro-processing, basic industries such as carpentry, tailoring, welding and looming, refrigeration or mobiles charging. (Brüderle et al. 2011) According to Bellanca et al (2013), the need to plan beyond lighting and cooking towards productive usage of energy has been overlooked by practitioners. The expert argues that access to energy should be seen as the beginning of a process to stimulate several impacts for productive uses as well as for welfare-improving services. Also, she recalls on the importance of developing appropriate productive uses of energy trough seed capital, capacity building and technology transfer. Improved provision of basic energy services contributes to independence and self-determination of the population's living conditions.

- **Refugees:** A person who, "owing to a well-founded fear of persecution for reasons of race, religion, nationality, membership of a particular social group or political opinions, is outside the country of his nationality and is unable or, owing to such fear, is unwilling to avail himself of the protection of that country"[44]. In order to determine whether a group of people fleeing conflict or serious disturbances of the public order are prima facie refugees is in most cases to acknowledge that they are victims of violations of human rights or humanitarian law.
- **Structural causes:** are multifarious including unequal distribution of rights, land and natural resources, few socio-economic opportunities, rural poverty, lack of access to energy, food insecurity, environmental degradation and poor governance, especially in the rural areas[45]
- **Vulnerability:** The characteristics and circumstances of a community, system or asset that make it susceptible to the damaging effects of a hazard. There are many aspects of vulnerability, arising from various physical, social, economic, and environmental factors. Examples may include poor design and construction of buildings, inadequate protection of assets, lack of public information and awareness, limited official recognition of risks and preparedness measures, and disregard for wise environmental management. Vulnerability varies significantly within a community and over time[46].

Annex 2 Energy for Social Infrastructure Example in Refugee Camps

Project Name / Location / Time	Description	Approach	Challenges	Results	Lessons learned
Access to public lighting in refugee camps.					
Jordan. Zaatari. 2012 – present 4 years (WAME, 2015)	Zaatari camp hosts Syrians fleeing the civil war. 2012 45000 people lived in the camp (now approx. 150000). Darkness in the night represents lack of security for women and children who needed or use cooking and toilet facilities.	Actors involved: UNHCR ESF (Electriciens Sans Frontières) Sunna Design, a French company manufacturing. (WAME, 2015) decided install street lights above facilities and alongside the pathways. Breakthrough technology for solar street lights that offers unequalled resistance to extreme heat. 10 years durability	Because of extreme weather conditions the appropriate technology needed a heat resistant product able to guarantee lighting throughout the night and the years.	100 Sunna ISSL+ streetlights have been installed throughout the Zaatari camp, more specifically around the toilet and cooking facilities. "Reduction of the risk of sexual and gender-based violence. Reduction of the incidence of crime. Improvement of the lives of refugees, enabling more community gatherings and social activities" (Merieau & Gebre Egyziabher 2012)	Products with durable technology need less maintenance cost. Portable devices are better at RS Multi-stakeholder partnerships are important to deploy new business models and bring innovative solutions tailored to the context
Solar powered drinking water pumps Kenya.					
Dadaab IFO-II Refugee Camp 2012 Installation. Camp duration 25 years [	Project installed by Epicenter Trading Co. Ltd. Located in Dadaab the "largest refugee camp in the world". Dadaab is totally dependent on the infrastructure provided by UNHCR and other agencies. Power is only available from several large Diesel Generators, which run 24 hours per day. The only source of water is from boreholes 130m deep[	Findings on an UNHCR energy assessment to explore the use of renewable energy indicated that solar energy was a sustainable solution for pumping water. Project has replaced diesel generator powered pumps with a solar powered pump. The region has a good solar irradiation. (10 hours of sunshine daily)	Maintenance experts and training courses. Adaptation to new technologies. .	Savings of operation cost, diminished risk and complexity in water supply. System is expected to provide an annual saving of about $10,000 compared to a generator powered-system of a similar capacity. Annual operation cost reduced 70% and by 60% including the capital cost of the system	High operational cost savings validate the higher investment in solar technologies quickly

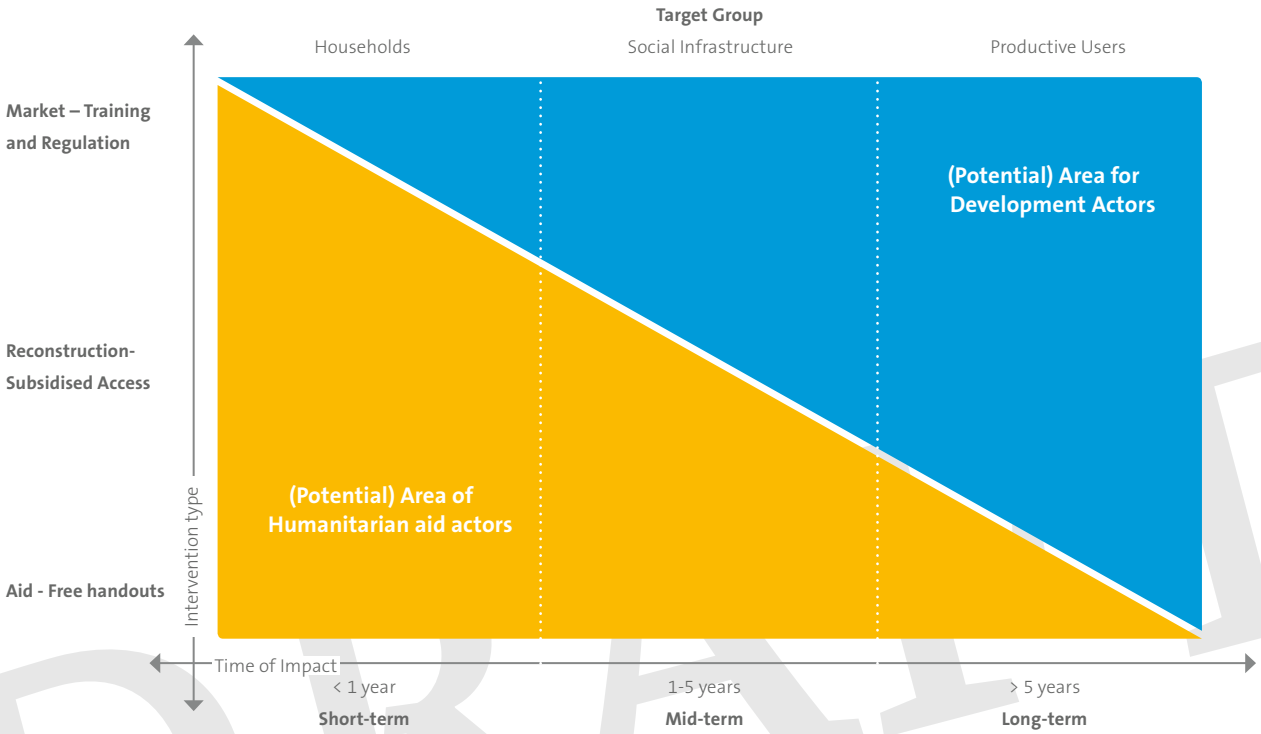
Project Name / Location / Time	Description	Approach	Challenges	Results	Lessons learned
Instant Network Schools					
(UNHCR, 2015) and Dadaab Community Technology Access Centre (CTA) (Badsah, 2013) Kenya, Dadaab Refugee camp 1992 - present 24 years	Leveraging mobile technology to improve the quality of education provided for refugees. Many existing school services for displaced children suffer from under-investment. Educating refugees and internally displaced people is crucial considering the average duration of their displacement exceeds 17 years. UNHCR and Vodafone foundation established 13 Instant Network Classrooms located within three secondary schools, six primary schools and four vocational training centers. Each class room was powered with solar +batteries and back-up generators, satellite or mobile networks, suit of content and other online resources.	Human-centered approach and community consultation to members about their ideal learning environment. Instant Network School model was developed tailoring it with particular context. Training of coaches and IT support members. Train the trainer scheme. Focusing less on the technology and more on developing a cohesive system with a strong emphasis on content and capacity building. Vodafone Foundation's staff, including volunteers who have travelled to the camps to assist with the setup and trainings. All Instant Network Schools are built on existing ICT projects to create synergies among the local community. Schools are offering additional training programmes after hours, charging a small fee to create ownership and a flair for business.	Deconstructing traditional models of teaching, and culturally embedded models of lecturing alone.	20,000 students impacted "The project has helped with children's retention in school and led to an increase in primary school enrolment" (UNHCR, 2015). Computer studies have become a highly valued and demanded course in the community. 214 computers were distributed to 39 schools and four vocational centers, effectively increasing formal access by 100% in schools and doubling the number of available computers to vocational learners. 145 secondary school students enrolled within a week to IT skills classes. Over 800 vocational students registered for the 2013 curriculum (Badsah, 2013).	Partnerships with private actor foundations while built in a transparent way are beneficial in a long-term approach. The leverage form the private actors is significant to deploy new approaches The built on existing ICT projects presents potential to sustainable solutions and livelihoods possibilities for providing remote basic ICT services (Bellanca 2014) Capacity building for individuals as training of trainers' networks increases the possibilities for sustainability.

Project Name / Location / Time	Description	Approach	Challenges	Results	Lessons learned
6. Solar Farm in Jordan					
Azraq. 2015-1026 (Lahn et al. 2016) April 2014-present + 2 years (Lahn et al. 2016)	Population 54,605. Opened by UNHCR and Jordanian government Limited connection to the national grid. Electricity is provided to the base camp. Diesel generation for power facilities and NGOs. Controlled environment with little economic activity and low income (Lahn et al. 2016).	Mustaqbal – private Jordanian company constructor partnership with UNHCR and the IKEA Foundation. IKEA provides capital. UNHCR expect the first 2 MW of capacity to be completed in October 2016. Intended market based approach to raison use. The energy generated by the solar farm will feed the national grid, diminishing energy demands overflows. Refugees are been trained and hired to build the solar farm.	Sustainability of financing Transience of residence. Lack of payment ability. "Jordanian authorities may reject smart metering systems on the basis that they make the population appear more permanent".(Lahn et al. 2016:20). Collecting money needs a special permit and has to be managed by the local electrical companies. Prepaid metering also needs institutional arrangement and a legitimate partner willing to participate.	Provide electricity for refugees, provide a lasting legacy for local populations, and reduce pressure on the electricity grid. "The cost of the amount of electricity generated by the farm and fed back into the grid will be deducted from Azraq camp's electricity bill" (Lahn et al. 2016). Three highly qualified Jordanians employed and 20 Syrians (Lahn et al. 2016). Government committed to 12 hours of electricity supply to the camps (Hammed Ziadé).	Negotiate with the hosting governments, aligning with their priorities in order to ensure that humanitarian interventions can benefit hosting countries' development goals. EMS (Metering installations) has a highly political factor that has to be negotiated involving the local authorities into the most adequate solution between a semi-permanent structure and a reliable energy provision. Assessments of private contractors' capacities is necessary. Lack of clarity in renewable energy regulation is a constraint for implementation on humanitarian settings.

Annex 3 Challenges to Provide Sustainable Energy Access in Humanitarian Settings with Linking Relief, Rehabilitation and Development

Elements for LRRD	Description	Challenges
1.Politics	Detailed evaluation and planning for specific political contexts	In some hosting countries there is a lack of policy regulation to provide coordination with production and distribution utilities to implement sustainable energy projects. The legal status of the population to work and perform economic activities is burdensome. In some hosting countries there is a passive role to have a mid-long term planning.
2. Coordination among stakeholders (international, national and local)	Coordinated context evaluation and planning coordination among agencies, local governments and others	There is not a clear lead agency for energy provision in refugee settings due to the lack of an energy cluster in the humanitarian United Nations system. Data on energy consumption is collected by various agencies, which disaggregates the information. The different approach of humanitarian and development practitioners impedes coordination to transition from relief to long term development interventions
3. Participation of the beneficiaries in the design	Sense of ownership for the beneficiaries and integration with host communities to design innovative solutions	Cultural preferences can impede the adoption of certain technologies (e.g. solar cooking, people prefer the taste of traditional cooking stoves). Lack of ownership of public goods make populations to deteriorate or stole public lighting.
4.Technical aspects	Technological assessment for adapting technology, priority to local availability	Different levels of technical capacities within the communities are an impediment to adopt new available technology. Sometimes is difficult to Identify appropriate local providers
5. Flexibility – adaptation (including budgets)	Long-term planning especially for humanitarian agencies	Uncertainty is a barrier for further planning. Humanitarian agencies have a one-year budget planning and renewable energy takes longer periods of time to deploy. EMS would not work if the refugees are going to be resettled.
6.Market perspectives	Market possibilities tied to livelihoods possibilities	Lack of data on consumer preferences and energy demand on the camps is an impediment to deploy energy market systems.
7. Ownership.	Measures interconnected with national, regional, local institutions and policies	Local authorities should lead and appropriate their resilience and coping strategies. Insufficient institutional structures put constraints on the implementation of long-term development plans.

Annex 4 Energy access in Aid-Development Transition: A Coordination Model



Endnotes

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5 In respond to that approach, analysts claim on one hand, that using development policies to reduce migration is a faulty assumption. There is data that shows that economic growth can even increase some of the patterns of migration, because people have more money to pay for the travel cost. Only in countries with incomes per capita above $7,300 is economic growth associated with decreases in emigration. (Riccardo Faini and Alessandra Venturini, "Trade, Aid and Migrations: Some Basic Policy Issues," European Economic Review 37, no. 2 (1993): 435-442.)

On the other, there is the argument of the importance of coordinating EU external policies to coherently have more leverage on the effectiveness of aid budgets and combine efforts at stemming migration flows, while at the same time having development outcomes for countries and regions that currently have an increase stress due to migration flows.

6 (EU Development Ministers statement 14839/1- 28/11/2016)

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