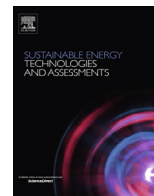




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Original article

Challenges and opportunities of new energy schemes for food security in humanitarian contexts: A selective review

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ABSTRACT

The purpose of this article is to analyse, in the humanitarian context, the key links between energy and food security, energy-related challenges faced by affected populations, current barriers to sustainable energy access, opportunities for addressing energy needs and existing gaps in current research on energy issues. Ensuring access to energy is a major challenge for some 3.1 billion people living in low- and middle-income countries, especially in remote and off-grid areas. Lack of safe, affordable and sustainable energy for cooking, heating, lighting and powering has cross-sectoral implications and is particularly constrained for the roughly 60 million people living in complex emergencies and protracted crisis. Some 80 percent of refugees and displaced people in camps have little access to energy entailing additional exposure to security risks, health hazards and restricted economic and education opportunities. Often people have no choice but to depend on biomass to meet their immediate energy needs. The traditional use of solid biomass and inefficient technologies for cooking, heating and other energy needs, can be harmful to their well-being and food security while being largely unsustainable. The consumption of safe, healthy and nutritious meals often depends on access to energy, allowing for proper preparation and utilisation of food. The inability for people to meet their energy needs for cooking may seriously affect food and nutrition security not only in terms of utilisation, but also has the potential to impair sustainable food systems. The humanitarian system is unable to face the energy challenge and increasing needs if current response measures are not improved. Actions and a substantial change in policy are needed, in order to significantly reduce the total number of people relying on solid fuels by 2030. This article will discuss how underlying barriers are contributing to inadequate access and use of energy and cooking technologies in humanitarian settings and the subsequent adverse impacts on people's lives and environments. The projected effects of the current energy poverty crisis in humanitarian settings is discussed while some of the solutions to address energy needs, including examples based on innovative technologies and new mechanisms, are examined in general terms. Furthermore, the challenges, opportunities and future areas of interest associated with these technologies and mechanisms are also considered.

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Introduction

Lack of access to energy in developing countries is a key barrier to the achievement of Sustainable Development Goal (SDG) 2

which calls for ending hunger, achieving food security, improving nutrition and promoting sustainable agriculture [1]. Energy access can address all of these aspects given the importance of energy for the utilisation of food, diversification of livelihood activities and

Abbreviations: COOPI, Cooperazione Internazionale; COP, Conference of Parties; DFID, United Kingdom Department for International Development; EPFL, Ecole Polytechnique Fédérale de Lausanne; FAO, Food and Agriculture Organisation; GIZ, Deutsche Gesellschaft für Internationale Zusammenarbeit; GACC, Global Alliance for Clean Cookstoves; IASC, Inter-agency Standing Committee; IEA, International Energy Agency; ICRC, International Committee of the Red Cross; IDP, internally displaced person; LPG, liquid petroleum gas; MEI, Moving Energy Initiative; NGO, Non-Governmental Organisation; NRC, Norwegian Refugee Council; OCHA, Office for the Coordination of Humanitarian Affairs; OECD, The Organisation for Economic Co-operation and Development; SAFE, Safe Access to Fuel and Energy; SDG, sustainable development goals; SE4ALL, Sustainable Energy for All; SEI, Stockholm Environment Institute; SET4food, Sustainable Energy Technologies for Food utilisation; UNHCR, United Nations High Commissioner for Refugees; USAID, The United States Agency for International Development; WAME, World Access to Modern Energy; WEF, Water-Energy-Food Nexus; WFP, World Food Programme; WG, Working Group; WHDT, World Humanitarian Data and Trends; WHO, World Health Organisation.

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powering agriculture. The cross-cutting nature of energy access and its importance to numerous sectors in society also means that energy is of crucial importance to achieving sustainable development. This is firmly enshrined in the United Nations SDG 7 which seeks to “ensure access to affordable, reliable, sustainable and modern energy for all” [2]. The intrinsic link between energy and sustainable development is also the main justification for major global initiatives such as the promotion of Sustainable Energy for All (SE4ALL) [3].

Populations in many developing countries face a multitude of challenges associated with their reliance on traditional biomass for domestic- and productive uses. Nearly three billion people rely on fuelwood, charcoal or animal waste as sources of fuel for cooking and heating [4,5]. This has strong implications for human health and climate change. Around 4.3 million people die prematurely every year from illnesses caused by household air pollution from cooking with traditional biomass on open fires or rudimentary stoves, exceeding the number of deaths attributable to malaria or tuberculosis [5]. For women and girls this is the second biggest health risk worldwide and in many developing countries it even ranks first [6].

Domestic burning of traditional biomass in open fires or rudimentary stoves additionally accounts for up to 25% of global black carbon emissions, about 84% of which are from households in developing countries [7]. The extraction of wood for fuel and energy purposes, under specific conditions and in certain contexts, has been linked to deforestation and forest degradation. Bailis et al. (2015) have identified a number of “woodfuel hotspots”, which are defined as regions in which more than 50% of the harvested woodfuel is considered non-renewable biomass, i.e. wood harvested in excess of the incremental growth rate. A number of developing countries face a destructive overlap of high per capita woodfuel consumption, high utilisation rates of non-renewable biomass and a high burden of disease from exposure to indoor air pollution [8]. While these risk factors can affect food security indirectly, what is of most concern is that without a reliable, safe and sustainable source of energy, people cannot cook their meals properly and this has severe repercussions for their ability to achieve food security and an adequate level of nutrition.

Nowhere is the magnitude and severity of these multi-sectoral energy-related challenges greater than in acute emergencies, protracted crises, and other humanitarian settings including natural disasters and conflict affected regions. The energy-related risks and challenges faced by people in these settings can have significant impacts on food security, either directly or indirectly. In displacement settings, an estimated 80% of all refugees and internally displaced persons living in camps have minimal access to energy, with an overwhelming dependence on traditional biomass for cooking and almost no access to electricity [9]. Many people, the majority being women, struggle to secure the energy needed to cook a basic meal, adopt coping strategies which have a detrimental impact on nutrition or risk their personal health and safety in order to collect fuelwood [10–12].

The purpose of this article is to analyse, in the humanitarian context, the key links between cooking energy and the different dimensions of food security. The article will explore the energy-related challenges faced by affected populations, current barriers to sustainable energy access, opportunities for addressing energy needs, and existing gaps in current research. While energy is needed at multiple stages of the food system, this article focuses on the lack of access to cooking energy. The content presented will address how underlying environmental, economic, technological, political and socio-cultural barriers are contributing to inadequate access and use of energy and cooking technologies in humanitarian settings and how these underlying factors are leading to adverse impacts on food security, nutrition, livelihoods, safety, environment and health.

Materials and methods

The review aimed to analyse the importance of energy and the use of energy- and cooking fuel technologies for food security in humanitarian settings. Therefore, it considered only papers and documents dealing with the food - energy nexus in humanitarian contexts. In particular, documents about the importance of energy were taken into consideration as long as dealing with direct or indirect impacts on food security. Similarly, only food security aspects somehow linked to the access and use of energy were evaluated. Both academic and non-academic documents were considered, including peer-reviewed papers, and publications such as reports and case studies. This review revealed gaps in existing literature on energy and food security. Therefore, further sourcing of information was required. A two-stage literature analysis was applied using both systematic research and a snowball process. With the latter, publications about specific topics were identified among references of papers already analysed. The authors initially browsed scientific literature on the topic of access to energy in humanitarian contexts. However, given the limited number of papers relevant for this research, the review was expanded to consider other publications, both internal to organisations working on access to energy as well as those publicly available on the web. Within this expanded selection of texts, a set of key documents were reviewed in depth. Hence, the review was selective because only a set of relevant publications was analysed, instead of all the documents with some elements about the topic.

Criteria for scientific literature review

Scopus, *ScienceDirect* and the *ISI-WoK* databases were queried by using different combinations of keywords, including “energy food humanitarian”, “food preservation humanitarian”, “energy food processing humanitarian”, and “energy pumping humanitarian” in all the fields. A large number of papers were identified – for the previously mentioned combinations on ScienceDirect 1209, 310, 1082 and 300 respectively –, but very few were relevant, as easily verified by evaluating title, abstract, keywords and highlights. However, some papers proposing promising technologies were considered, but only if presenting characteristics of “appropriateness” in humanitarian settings (Table 1). In particular, these technologies were considered innovative only if the authors evaluated that they could bring a significant improvement compared to technologies currently in use considering all the five domains described in Table 1.

Table 1

Characteristics of an appropriate energy technology in humanitarian settings according to domains of sustainability (adapted from Zelenika and Pearce (2011) [13]).

Domain	Technology features
Economic	Low cost for both procurement and operation & maintenance
Environmental	Limited use of natural resources; limited load on the environment (e.g. emissions)
Technical	Easy to introduce, operate and maintain or easy to be managed by a small group of trained people at the community level
Socio-cultural	Either at household or community level; no significant socio-cultural barriers regarding introduction and use
Other or crosscutting	Technology either fixed (for stable communities) or movable (for moving communities); easy to be disseminated, distributed or marketed within one or more communities; potential positive impact on other aspects (e.g. health, protection, local economy, life-style)

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